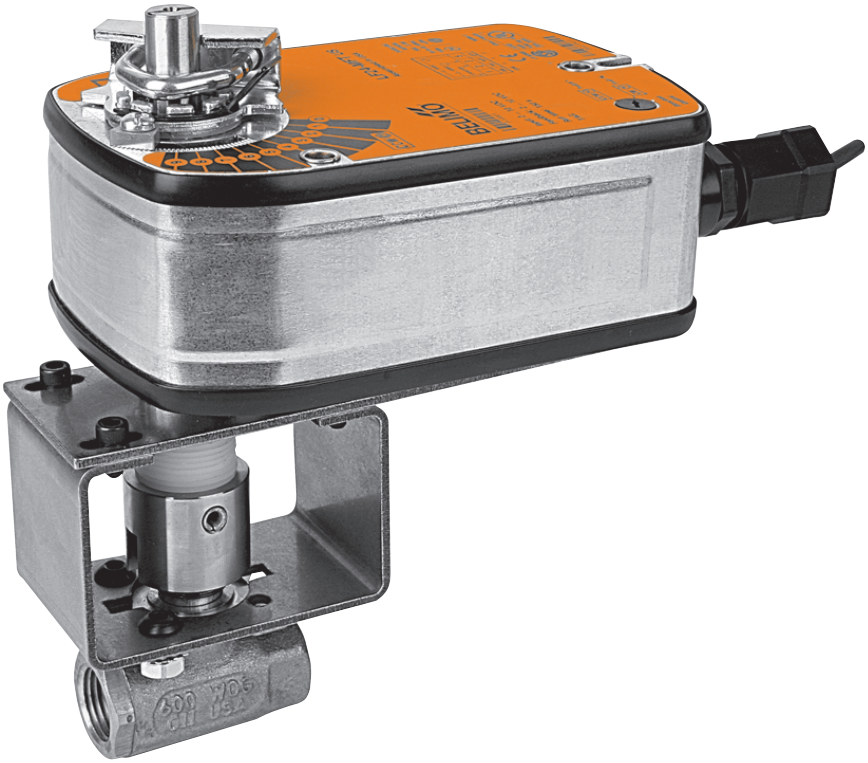
Ball Valve
Features and Benefits
B2...VS / VSS and B3...L

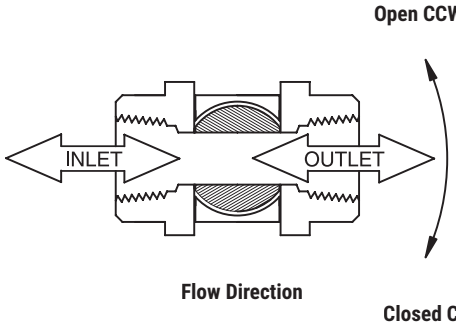


- 2-way and 3-way configuration
- Bronze with stainless steel trim (2-way)
- Nickel plated brass body (3-way)
- Reduced and full port capacities
- Two piece construction
- Electronic actuation
- NPT and flanged connections
- Wide C_v range
- Air gap for use with hot water and steam systems
- Live load low maintenance stem packing
- 2 year warranty

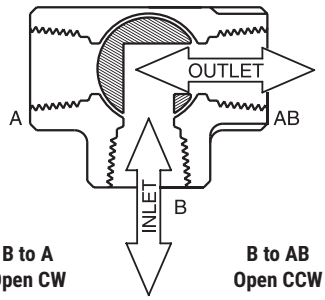
General Information / Typical Installation

FLOW PATTERN

B2..VS/VSS



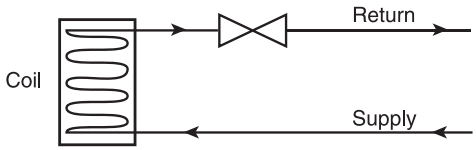
B3..L



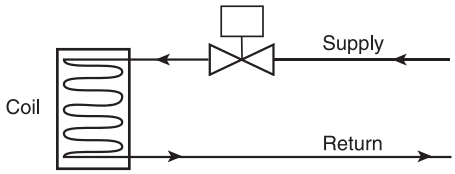
NOTE: B3..L are piped differently than B3 CCV Valves.

PIPING DIAGRAMS

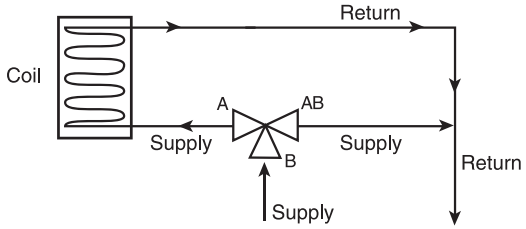
2-way Valve Piping Diagram Water

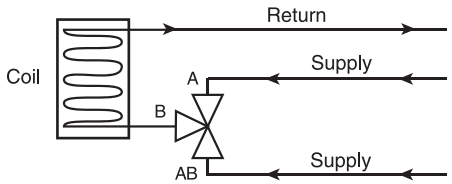


2-way Valve Piping Diagram Steam



B3..L Diverting & Changeover (Switching) Valve Piping Diagram

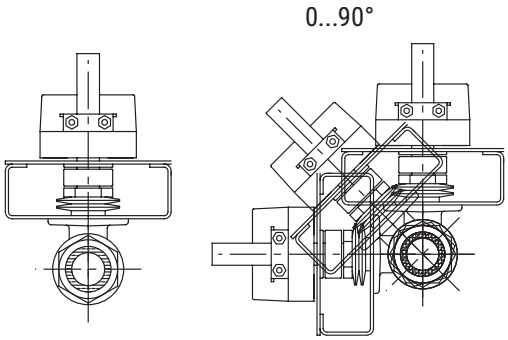




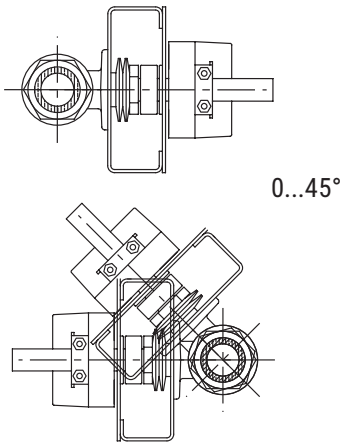
NOTE:
To avoid torque increase during off season shut down or other periods of inactivity longer than 1 month, the valve should be exercised (actuator or manually driven full open-closed cycle) at least once per month. This is necessary to avoid any application problems after an off season shut down. This is not required for B3..L valves.

PIPING/MOUNTING ORIENTATION

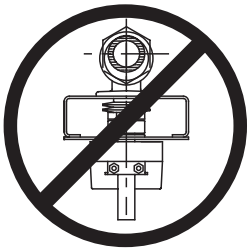
Assembly can be mounted horizontally or vertically for water applications. For steam applications the valve cannot be mounted vertically. When mounted horizontally, the valve must be 0...45° off center of the pipe. Do not install with actuator below pipe.



Water Applications



Steam Applications



				LINE SIZE							
VALVE SIZE	C_V	TYPE	MODEL #	¾″ Fp Cv	1″ Fp Cv	1¼″ Fp Cv	1½″ Fp Cv	2″ Fp Cv	2½″ Fp Cv	3″ Fp Cv	4″ Fp Cv
½″	1	2W NPT	B2050VS-01	1.0	1.0	-	-	-	-	-	-
½″	2	2W NPT	B2050VS-02	2.0	1.9	-	-	-	-	-	-
½″	4	2W NPT	B2050VS-04	3.8	3.6	-	-	-	-	-	-
½″	15	2W NPT	B2050VS-15	8.9	7.2	-	-	-	-	-	-
¾″	30	2W NPT	B219VS/VSS	30.0	21.6	17.4	15.6	-	-	-	-
¾″	51	2W NPT	B220VS	51.0	26.5	19.9	17.3	-	-	-	-
1″	43	2W NPT	B224VS/VSS	-	43.0	36.1	30.5	25.8	-	-	-
1″	68	2W NPT	B225VS	-	68.0	48.3	36.7	29.2	-	-	-
1½″	177	2W NPT	B240VS	-	-	-	177.0	102.7	77.9	67.3	-
2″	108	2W NPT	B249VS/VSS	-	-	-	-	108.0	100.4	91.8	83.2
½″	6.4	3W NPT	B315L	5.5	5.0	4.8	-	-	-	-	-
¾″	12.8	3W NPT	B320L	12.8	11.8	11.0	10.5	-	-	-	-
1″	11	3W NPT	B325L	-	11.0	10.9	10.7	10.4	-	-	-
1¼″	34	3W NPT	B332L	-	-	34.0	32.8	29.9	28.2	-	-
1½″	57	3W NPT	B340L	-	-	-	57.0	51.9	47.4	44.9	-
2″	87	3W NPT	B350L	-	-	-	-	87.0	82.8	77.9	72.3

GENERAL WIRING INSTRUCTIONS

WARNING The wiring technician must be trained and experienced with electronic circuits. Disconnect power supply before attempting any wiring connections or changes. Make all connections in accordance with wiring diagrams and follow all applicable local and national codes. Provide disconnect and overload protection as required. Use copper, twisted pair, conductors only. If using electrical conduit, the attachment to the actuator must be made with flexible conduit.

Always read the controller manufacturer's installation literature carefully before making any connections. Follow all instructions in this literature. If you have any questions, contact the controller manufacturer and/or Belimo.

Transformer(s)
Typically actuators require a 24 VAC class 2 transformer and draw a maximum of 10 VA per actuator. The actuator enclosure cannot be opened in the field, there are no parts or components to be replaced or repaired.

- EMC directive: 89/336/EEC
- Software class A: Mode of operation type 1
- Low voltage directive: 73/23/EEC

Typical transformer sizing

Actuator Series	Voltage	Max. VA Per Actuator
AF	24	10
LF	24	6
AR	24	6
NR	24	4
LR	24	3

CAUTION It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these two different types of power supplies are connected to the same power transformer and the DC commons are connected together, a short circuit is created across one of the diodes in the full wave power supply, damaging the controller. Only use a single power transformer to power the controller and actuator if you know the controller power supply uses half wave rectification.

Multiple actuators, one transformer
Multiple actuators may be powered from one transformer provided the following rules are followed:

1. The TOTAL current draw of the actuators (VA rating) is less than or equal to the rating of the transformer.
2. Polarity on the secondary of the transformer is strictly followed. This means that all No. 1 wires from all actuators are connected to the common leg on the transformer and all No. 2 wires from all actuators are connected to the hotleg. Mixing wire No. 1 & 2 on one leg of the transformer will result in erratic operation or failure of the actuator and/or controls.

Multiple actuators, multiple transformers
Multiple actuators positioned by the same control signal may be powered from multiple transformers provided the following rules are followed:

1. The transformers are properly sized.
2. All No. 1 wires from all actuators are tied together and tied to the negative leg of the control signal. See wiring diagram.

Wire type and wire installation tips
For most installations, 18 or 16 Ga. cable works well with Belimo actuators. Use code-approved wire nuts, terminal strips or solderless connectors where wires are joined. It is good practice to run control wires unspliced from the actuator to the controller. If splices are unavoidable, make sure the splice can be reached for possible maintenance. Tape and/or wire-tie the splice to reduce the possibility of the splice being inadvertently pulled apart.

Wire length for actuator installation
Keep power wire runs below the lengths listed in the following tables. If more than one actuator is powered from the same wire run, divide the allowable wire length by the number of actuators to determine the maximum run to any single actuator. See section 1 for specific transformer sizing information for the actuator selected.

Example: 3 actuators, 16 Ga wire
350 Ft ÷ 3 Actuators = 117 Ft. Maximum wire run

B2	19	VS	+NMX	24	-MFT-X1	
Valve B2 = 2-way B3 = 3-way	**Valve Size** 15-50 = ½...2"	**Industrial Construction/ Material** VS = Bronze Body, Stainless Steel Ball and Stem VSS = Stainless Steel Body, Ball and Stem L = Nickel Plated Brass Body, Chrome Plated Brass Ball and Stem	**Actuator Type** **Non Fail-Safe** LMB, LMX NMB, NMX AMB, AMX GMB, GMX NRB, NRX ARB, ARX LRB, LRX GRCX PRB, PRX **Fail-Safe Spring Return** LF NFB, NFX AFB, AFX **Electronic** GKB, GKX	**Power Supply** 24 = AC/DC 24 V 120 = AC 120 V UP = AC 24...240 V or DC 24...125 V	**Control** -3-X1 = On/Off, Floating Point -MFT-X1 = Multi-Function Technology -MFT95-X1 = 0...135 Ω	-S = Built-in Auxiliary Switch

"X" models are customizable.
Refer to page 13-4 of the PGPL for programming options.

Ordering Example

1 Choose the valve actuator combination.
B219VS+NMX24-MFT-X1

2 Specify preference or configuration.

3 **For MFT orders only - select programming code**

NO | **Tagging (if needed)**

Set-Up

Non Fail-Safe Models
NO = Normally Open
NC = Normally Closed

Fail-Safe Models
NO/FO = Normally Open/Fail Open
NO/FC = Normally Open/Fail Closed

NC/FO = Normally Closed/Fail Open
NC/FC = Normally Closed/Fail Closed

Refers to valve ports A to AB.

P-10001 (A01)

P-100.. (A..)	Control voltage applications
P-200.. (W..)	Pulse width modulation applications
P-300.. (F..)	Floating point applications
P-400.. (J..)	On/off applications
X-XXXXX	Create custom MFT configuration code
X-XXXXX	Create custom MFT configuration in the field with MFT actuator PC-Tool software

4 Does order require tagging?

Tagging:
Valves may be tagged per customer specification. ($12.00 per tag)

Example:
AHU-1
FCU-2

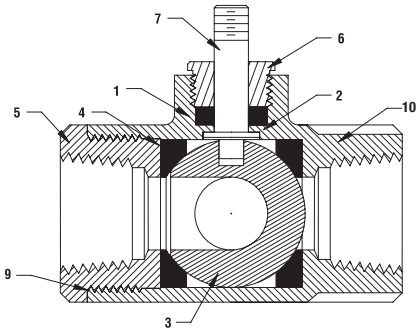
Part number for tagging:
99981-00101

5 Complete Ordering Example: B219VS+NMX24-MFT-X1
Configuration: +NO
Programming: +A01

B2...VS Series, 2-way, Ball Valve
Bronze Body, Stainless Steel Ball and Stem

2-year warranty

Technical Data		
Media		chilled or hot water, glycol, 35# steam
Flow characteristic		modified equal percentage
Action		90° rotation valve open CW, valve closed CCW
Sizes		½", ¾", 1", 1¼", 1½", 2"
Type of end fitting		SAE NPT (female connections)
Materials:		
1	Stem packing	reinforced PTFE
2	Stem bearing	reinforced PTFE
3	Ball	316 stainless steel
4	Seat (x2)	reinforced PTFE w/ Durafill
5	Retainer	B16 (¾" - 1") stainless steel B584 (1¼" - 2") stainless steel
6	Gland	B16 brass
7	Stem	316 stainless steel
8	Jam nut	stainless steel
9	Body seal	PTFE (1-1/4" to 2")
10	Body	B584-C84400 bronze



Pressure rating	600 psig WOG
Media temp. range	-22°F to +280°F (-30°C to +138°C)
Close-off pressure	600 psig @ 100°F
Maximum differential pressure (ΔP)	<600 psig

Flow Patterns

- **Live-load packing set**
- **Stainless steel ball & stem**
- **Blow-out proof stem design**

Application

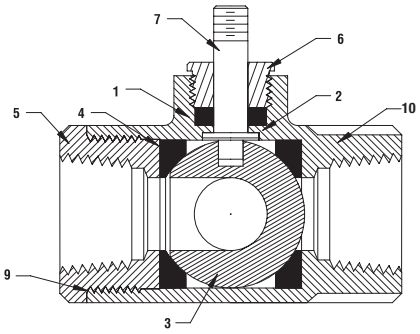
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV Box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

This valve is designed with MFT functionality which facilitates the use of various control input.

- Up to 35 psi steam
- ½" - 600 PSIG WOG, Cold Non-Shock.
- Federal Specification: WW-V-35C,Type II
  Composition: BZ
  Style: 3

2
2-year warranty

Technical Data	
Media	chilled or hot water, glycol, 50# steam
Flow characteristic	modified equal percentage
Action	90° rotation valve open CW, valve closed CCW
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	SAE NPT (female connections)
Materials:	
1 Stem packing	reinforced PTFE
2 Stem bearing	reinforced PTFE
3 Ball	316 stainless steel
4 Seat (x2)	reinforced PTFE w/ Durafill
5 Retainer	B16 (¾" - 1") stainless steel B584 (1¼" - 2") stainless steel
6 Gland	A276-316
7 Stem	316 stainless steel
8 Jam nut	stainless steel
9 Body seal	PTFE (1¼" to 2")
10 Body	A351-CF8M 316 stainless steel



Pressure rating	2000 psig WOG (½" - 1")
Media temp. range	-22°F to +298°F (-30°C to +148°C)
Close-off pressure	600 psig @ 100°F
Maximum differential pressure (ΔP)	<600 psig

Flow Patterns

- **Live-load packing set**
- **Stainless steel ball & stem**
- **Blow-out proof stem design**

Application

These threaded valves are designed to provide modulating or two position control of hot or chilled water and saturated steam systems under 50 psi.

Typical applications include reheat coils, VAV terminal control, unit ventilators, and air handlers, especially in areas which have minimum profile requirements.

- Up to 50 psi steam
- ½" - 2000 PSIG WOG, Cold Non-Shock.
- Federal Specification: WW-V-35C,Type II,
  Composition: SS
  Style: 3

B3...L Series, 3-way, Ball Valve
Chrome Plated Brass Ball and Nickel Plated Stem

2-year warranty

Technical Data	
Media	chilled or hot water, 60% glycol
Flow characteristic	modified linear
Action	90° rotation B to A open CW, B to AB open CCW
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	NPT female ends
Materials:	
Body	nickel plated brass
Ball	chrome plated brass
Stem	nickel plated brass
Stem seal	o-ring EPDM
Valve seat	PTFE
Leakage	ANSI VI
Pressure rating	600 psig WOG 600 psi DN 15-25 (B3...L) 400 psi DN 32-50 (B3...L)
Media temp. range	0°F to 250°F [-18°C to +120°C]
Close-off pressure	200 psi
Maximum differential pressure (ΔP)	50 psi

	Valve Nominal Size		Type		Suitable Actuators			
C_V	Inches	DN [mm]	2-way NPT	3-way NPT	Non Fail-Safe			Fail-Safe
1	½	15	B2050VS-01*		LM Series	GR Series		LF Series
2	½	15	B2050VS-02*					
4	½	15	B2050VS-04*					
15	½	15	B2050VS-15*					
30	¾	20	B219VS		NM Series			NF Series
51	¾	20	B220VS					
43	1	25	B224VS					AF Series
68	1	25	B225VS		AM Series			
48	1¼	32	B232VS					
84	1½	40	B239VS		GM Series		PR Series	
177	1½	40	B240VS					
108	2	50	B249VS					
15	½	15	B2050VSS-15*		LM	GR Series		LF
30	¾	20	B219VSS**		NM			NF
43	1	25	B224VSS**		AM			AF Series
108	2	50	B249VSS**		GM		PR Series	
6.4	½	15		B315L***	LR Series			LF Series
12.8	¾	20		B320L***				
11	1	25		B325L***				
34	1¼	32		B332L***	NR			AFR Series
57	1½	40		B340L***	AR Series			
87	2	50		B350L***				

* For hot only or cold only applications. Not for temperature changeover applications.
** NSF/ANSI/CAN 61 Section 8, Annex G, NSF/ANSI 372 - Drinking Water System Components - Lead Content
*** Not for steam applications.

NOTE: Industrial ball valves (B2..VS, B2..VSS) have serviceable components. Proper maintenance of these parts will ensure a longer in-service life for the valves. The seats of these valves will require replacement at an interval consistent with number of full cycles the valve has be operated, or as field condition dictates.

2-year warranty

Mode of Operation
The control valve is operated by an electronic actuator that responds to a standard voltage for on/off control, by a modulating 4...20 mA, or floating point control system. The actuator will then move the ball of the valve to the position dictated by the control signal thus changing the flow.

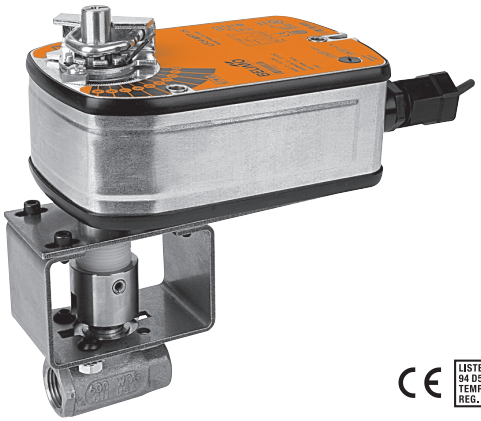
Product Features
Modified equal percentage of flow for B2. Modified linear flow for B3.
B3..L valves are for diverting applications and are not rated for steam.

Actuator Specifications

Control type	on/off, floating point, modulating, 2...10 V multi-function technology (MFT)
Manual override	LM, NM, GM, AM, GR, PR, AF, NF, GK
Electrical connection	3 ft. [1 m] cable with ½" conduit fitting

Valve Specifications

Fluid	chilled or hot water, (60% glycol), steam (2-way)
Flow characteristic	modified equal percentage (B2), modified linear (B3..L)
Sizes	½", ¾", 1", 1¼", 1½", 2"
End fitting	FNPT
Materials	
Body	bronze (B2..VS) stainless steel (B2..VSS) nickel plated brass (B3..L)
Ball	stainless steel, bronze (B2050VSS-15) chrome plated brass (B3..L)
Stem	stainless steel nickel plated brass (B3..L)
Seats	
2-way	MPTFE, RPTFE (B2050)
3-way	Teflon PTFE
Stem packing	
2-way NPT	MPTFE
O-rings	NPT EPDM (B3..L)
Fluid temp range	
B2..VS	-22...+280°F [-30...+138°C]
B2..VSS	-22...+298°F [-30...+148°C]
B3..L	0...250°F [-18...+120°C]
Body pressure rating	
3-way	600 psi DN 15...25 (B3..L ½...1") 400 psi DN 32...50 (B3..L 1¼...2")
Maximum inlet pressure	
Steam	35 psi B2..VS 50 psi B2..VSS
Leakage	ANSI Class VI (B2..VS, VSS) 0% (B3..L)



2-year warranty

Models

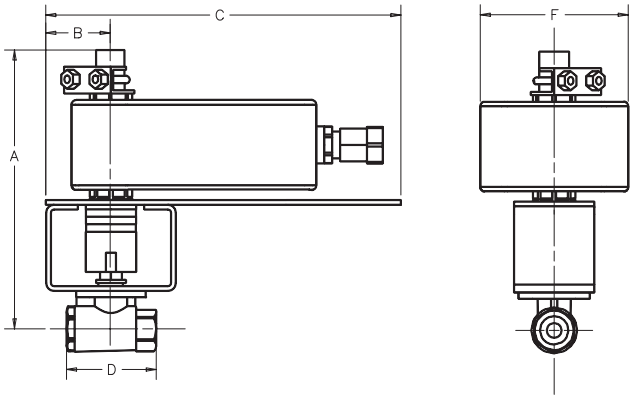
LF24 US	
LF24-S US	w/built-in Aux. Switch
LF120 US	
LF120-S US	w/built-in Aux. Switch

Technical Data		
Control		on/off, floating point
Power supply		
LF24(-S) US		24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
LF120(-S) US		120 VAC ± 10% 50/60 Hz
Power consumption		
LF24(-S) US	running	5 W
	holding	2.5 W
LF120(-S) US	running	5.5 W
	holding	3.5 W
Transformer sizing		7 VA, class 2 power source
Electrical connection (-S models have 2 cables)		½" conduit connector 3 ft. [1m], 18 GA appliance cable
Electrical protection		120V actuators double insulated
Overload protection		electronic throughout rotation
Angle of rotation		95°
Spring return direction		reversible with CW/CCW mounting
Position indication		visual indicator 0° to 90°
Running time		<40 to 75 sec. (on/off)
	spring	<25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @ -22°F [-30°C]
Ambient temperature		-22° F to +122° F [-30° C to +50° C]
Housing		NEMA 2
Agency listings†		UL 873, CSA C22.2 No. 24 certified, CE
Quality standard		ISO 9001
Noise level		max. 62 dB(A)

LF...-S US	
Auxiliary switch	1 x SPDT, 6A (1.5A) @ 250 VAC, UL Listed, adjustable 0° to 95° (double insulated)

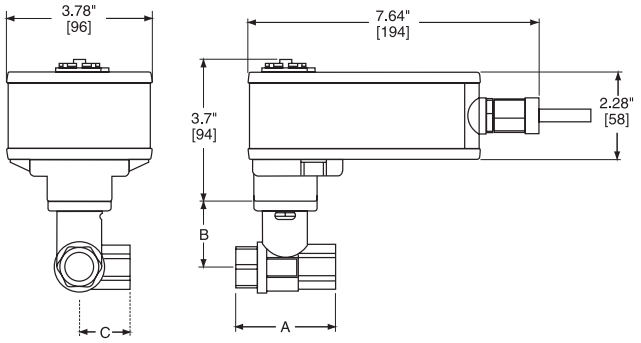
† Rated impulse voltage 800V (4kV for 120V model), Control pollution degree 3, Type of action 1.AA (1.AA.B for -S models)

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B2050VS-01	50	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-02	50	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-04	50	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-15	50	½	15	6.70	2.00	8.00	2.25	6.25

Dimensions with 3-Way Valve



		Valve Nominal Size		Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B315L	50	½	15	2.63" [67]	1.73" [44]	1.42" [36]
B320L	50	¾	20	3.01" [78]	1.81" [46]	1.63" [42]
B325L	50	1	25	3.42" [87]	1.81" [46]	1.77" [45]

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel.
Power consumption must be observed.

3 Actuator may also be powered by 24 VDC.

4 For end position indication, interlock control, fan startup, etc., LF24-S US and LF120-S US incorporates a built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @ 250 VAC, UL listed, adjustable 0° to 95°.

APPLICATION NOTES

◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

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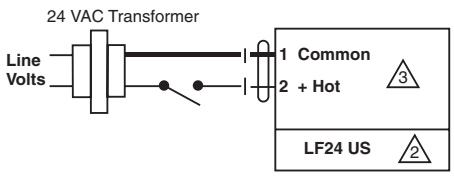
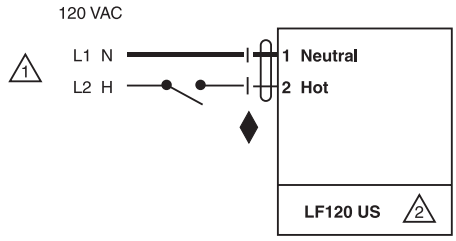


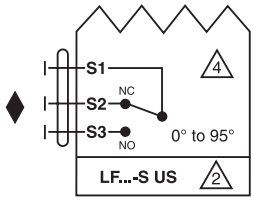
On/Off wiring for 24 VAC/DC

W049-LF-08



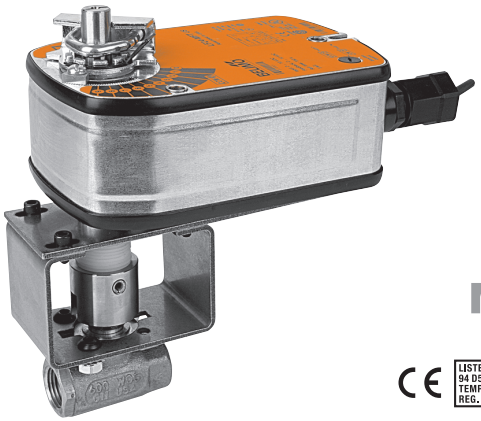
On/Off wiring for 120 VAC

W048-AUX



Auxiliary Switch

LF24-MFT US Actuators, Multi-Function Technology



2

MFT 2-year warranty

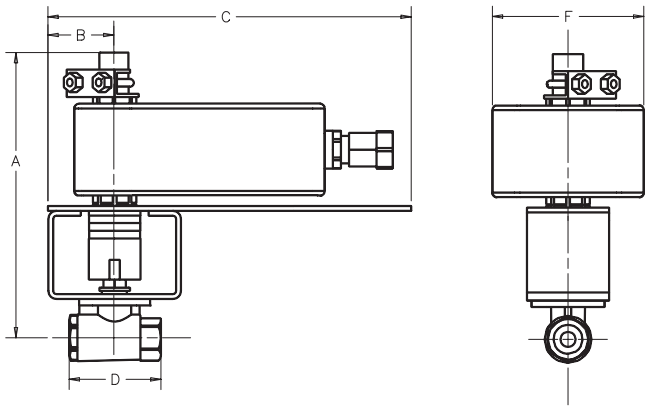
Models

LF24-MFT US
LF24-MFT-S US w/built-in Aux. Switch

Technical Data		
Control		MFT
Control signal		2 to 10 VDC (4-20mA with 500 Ω resistor)
Power consumption	running	2.5 W
	holding	1 W
Transformer sizing		5 VA (class 2 power source)
Electrical connection (-S models have 2 cables)		½" conduit connector 3 ft. [1m], 18 GA appliance cable
Overload protection		electronic throughout 0° to 95° rotation
Input impedance		100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20mA 750 Ω for PWM 500 Ω for on/off and floating point
Feedback		2 to 10 VDC, 0.5 mA max
Angle of rotation		95°
Direction of rotation	spring	reversible with CW/CCW mounting
	motor	reversible with built-in switch
Position indication		visual indicator
Running time		<40 to 75 sec. (on/off) 150 sec. independent of load (proportional)
	spring	<25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @-22°F [-30°C]
Ambient temperature		-22° F to +122° F [-30° C to +50° C]
Housing		NEMA 2
Agency listings		UL 873, CSA C22.2 No. 24 certified, CE
Noise level		max. 62 dB(A)
Quality standard		ISO 9001

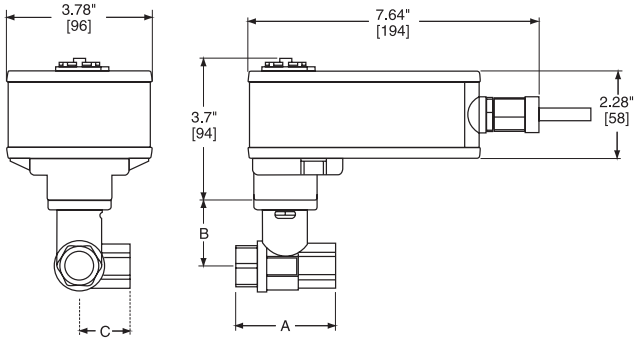
LF24-MFT-S US	
Auxiliary switch	1 x SPDT, 6A (1.5A) @ 250 VAC, UL Listed, adjustable 0° to 95° (double insulated)

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B2050VS-01	100	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-02	100	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-04	100	½	15	6.75	2.00	6.75	2.25	4.00
B2050VS-15	100	½	15	6.70	2.00	8.00	2.25	6.25

Dimensions with 3-Way Valve



		Valve Nominal Size		Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B315L	200	½	15	2.63" [67]	1.73" [44]	1.42" [36]
B320L	200	¾	20	3.01" [78]	1.81" [46]	1.63" [42]
B325L	200	1	25	3.42" [87]	1.81" [46]	1.77" [45]

Wiring Diagrams

INSTALLATION NOTES

2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).

5 Triac A and B can also be contact closures.

6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.

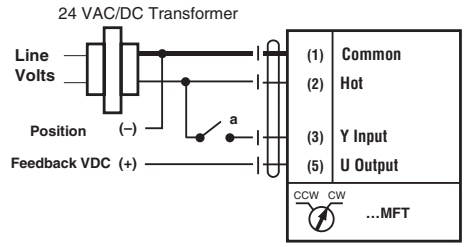
7 Position feedback cannot be used with Triac sink controller.
The actuators internal common reference is not compatible.

APPLICATION NOTES

◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

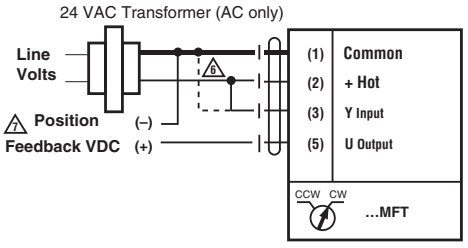
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

W043



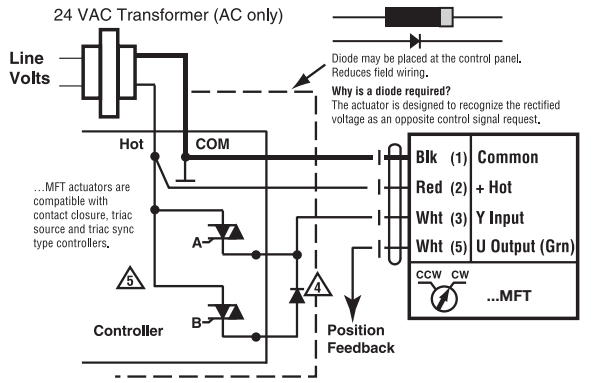
On/Off control

W041



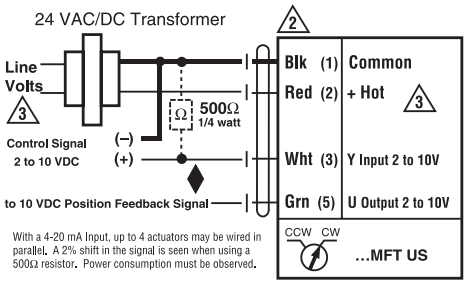
PWM, triac source and sink

W302

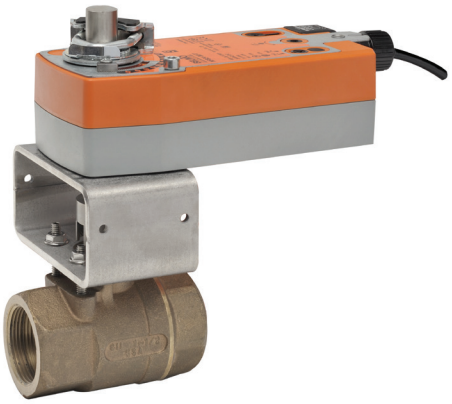


Floating Point control

W303



Propotional 2 to 10 or 4 to 20 mA control signal



2-year warranty

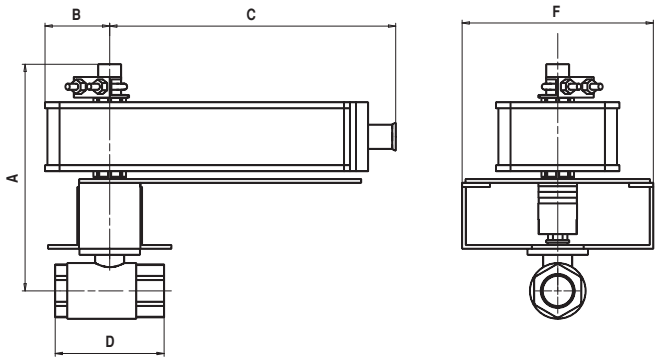
Models

NFB24-X1
NFBUP-X1
NFBUP-S-X1 w/built-in Aux. Switch

Technical Data		
Control		on/off
Power consumption		
NFB24-X1	running	6 W
	holding	2.5 W
NFBUP-X1	running	6 W
	holding	2.5 W
Transformer sizing	NFB24-X1	8.5 VA (class 2 power source)
	NFBUP(-S)-X1	6 VA @ 24 VAC (class 2 powe source) 6.5 VA @ 120 VAC 9.5 VA @ 240 VAC
Electrical connection (-S model has 2 cables)		½" conduit connector 3 ft. [1m], 18 GA appliance cables
Electrical protection		120V actuators double insulated
Overload protection		electronic throughout 0° to 95° rotation
Angle of rotation		95°
Position indication		visual indicator
Running time	control	<75 seconds
	spring	<20 seconds
Ambient temperature		-22° F to +122° F [-30° C to +50° C]
Housing		NEMA 2 / IP54
Agency listings		UL 873, CSA C22.2 No. 24 certified, CE
Noise level		max. 45 dB(A)

NFBUP-S-X1	
Auxiliary switch	2 x SPDT, 3A (0.5A inductive) @ 250 V

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B219VS	400	¾	20	7.00	1.25	6.77	3.37	6.25
B220VS	400	¾	20	7.00	1.25	6.77	3.37	6.25
B219VSS	1000	¾	20	7.00	1.25	6.77	3.37	6.25

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel.
Power consumption must be observed.

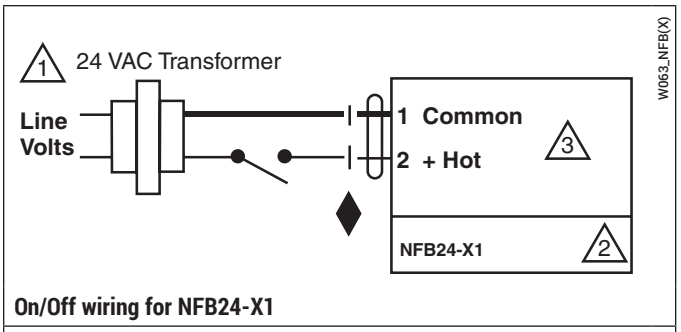
3 Actuators may also be powered by 24 VDC.

4 For end position indication, interlock control, fan startup, etc., NF24-S US incorporates a built-in auxiliary switch: 1 x SPDT, 7A (2.5A) @ 250 VAC, UL listed, adjustable 5° to 85°.

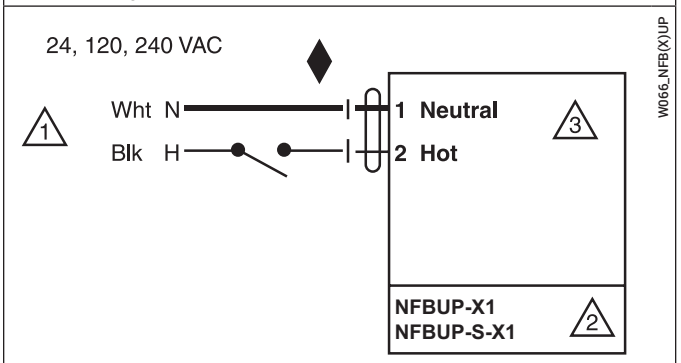
APPLICATION NOTES

Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

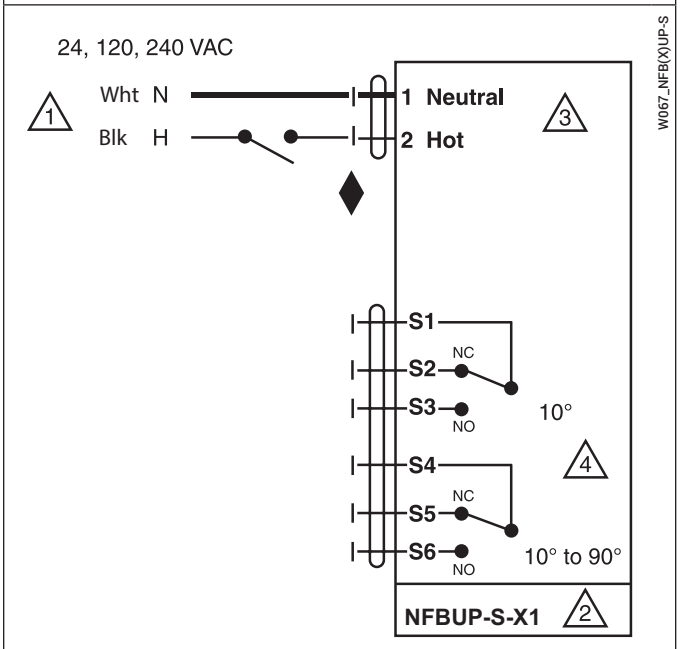
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



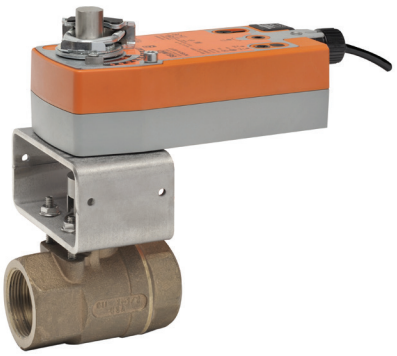
On/Off wiring for NFB24-X1



On/Off wiring for NFBUP-X1, NFBUP-S-X1



Auxiliary Switch



MFT 2-year warranty

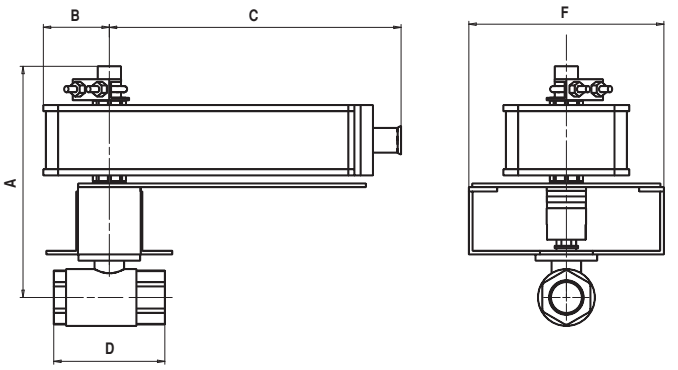
Models

NFX24-MFT-X1
NFX24-MFT-S-X1

Technical Data		
Control		MFT
Control signal		2 to 10 VDC, (4 to 20 mA with 500 Ω resistor)
Power supply		24 VAC ± 20% 50/60 Hz 24 VDC ± 20% / -10%
Power consumption	running	6.5 W
	holding	3 W
Transformer sizing		9 VA, (class 2 power source)
Electrical connection		½" conduit connector 3 ft. [1m], 18 GA appliance cable
Overload protection		electronic throughout 0 to 95° rotation
Input impedance		100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for on/off and floating point
Feedback output		2 to 10 VDC, 0.5 mA max
Angle of rotation		95°
Direction of rotation	spring	reversible with CW/CCW mounting
	motor	reversible with built-in ↷/↶ switch
Position indication		visual indicator, 0° to 95°
Running time	motor	150 seconds (default), variable (40 to 220 seconds)
	spring	<20 sec @ -4°F to +122°F [-20°C to +50°C]; <60 sec @ -22°F [-30°F]
Ambient temperature		-22°F to +122°F [-30°C to +50°C]
Housing		NEMA 2 / IP54, Enclosure Type 2
Agency listings		cULus acc. to UL60730-1A/ -2-14, CAN/ CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Noise level		<40 dB(A) motor @ 150 seconds, run time dependent <62 dB(A) spring return

NFX24-MFT-S-X1	
Auxiliary switch	2 x SPDT, 3A (0.5A) @ 250 VAC, UL Approved one set at +10°, one adjustable 10° to 90°

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B219VS	400	¾	20	7.00	1.25	6.77	3.37	6.25
B220VS	400	¾	20	7.00	1.25	6.77	3.37	6.25
B219VSS	1000	¾	20	7.00	1.25	6.77	3.37	6.25

Wiring Diagrams

INSTALLATION NOTES

CAUTION *Equipment damage!*
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).

5 Triac A and B can also be contact closures.

6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.

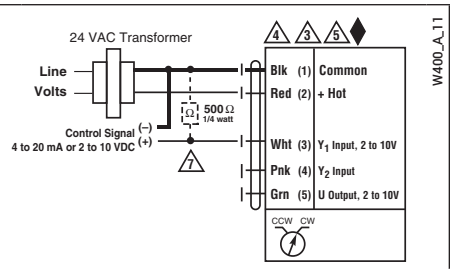
7 Position feedback cannot be used with Triac sink controller.
The actuators internal common reference is not compatible.

APPLICATION NOTES

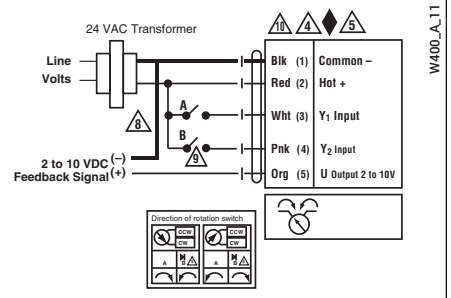
The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

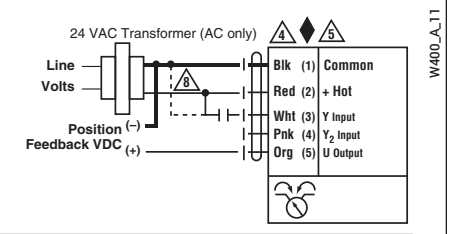
WARNING *Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



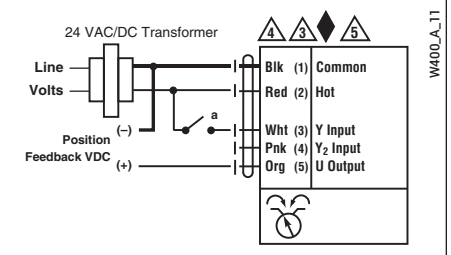
VDC/4-20 mA



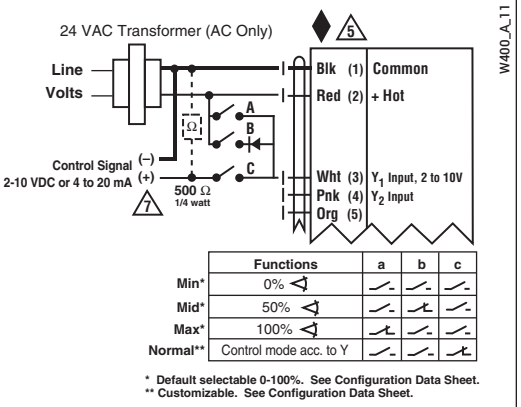
Floating Point



PWM



Two Position



Functions	a	b	c
Min* 0%			
Mid* 50%			
Max* 100%			
Normal** Control mode acc. to Y			

* Default selectable 0-100%. See Configuration Data Sheet.
** Customizable. See Configuration Data Sheet.

Override Control to Min, Mid, Max, Positions

BELIMO

2-year warranty

Models

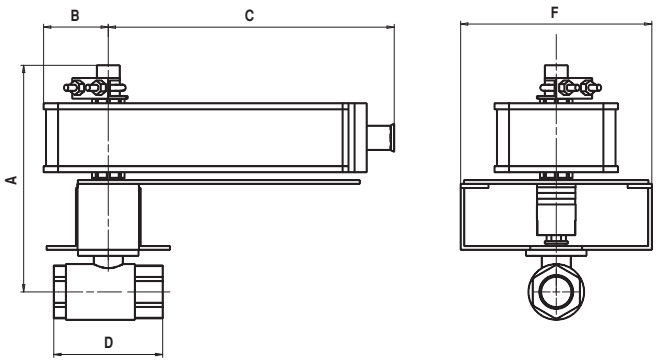
AFB24-X1
AFBUP-X1
AFBUP-S-X1 w/built-in Aux. Switches
AFRB24-3
AFRX24-3

Technical Data		
Control		on/off
Power consumption		
AFBUP-X1	running	5 W
	holding	2.5 W
AFBUP-S-X1	running	7 W
	holding	3.5 W
Transformer sizing	AFB24-X1	7.5 VA (class 2 power source)
	AFBUP(-S)-X1	7 VA @ 24 VAC (class 2 power source) 8.5 VA @ 120 VAC 18 VA @ 240 VAC
Electrical connection (-S model has 2 cables)		½" conduit connector 3 ft. [1m], 18 GA appliance cables
Electrical protection		120V actuators double insulated
Overload protection		electronic throughout 0° to 95° rotation
Angle of rotation		95°
Position indication		visual indicator
Manual override		hex crank
Running time	control	150 seconds independent of load
	spring	<20 seconds
Ambient temperature		-22°F to +122°F [-30°C to +50°C]
Housing		NEMA 2 / IP54
Agency listings		UL 873, CSA C22.2 No. 24 certified, CE
Noise level		max. 45 dB(A)

AFBUP-S-X1	
Auxiliary switches	2 x SPDT, 7A (2.5A) @ 250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85° (double insulated)

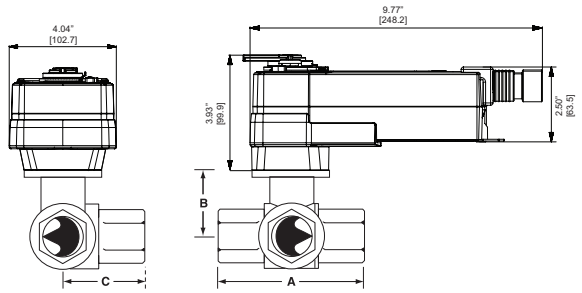
* Dual Mounted Actuators

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B224VS	400	1	25	7.00	1.25	6.77	3.37	6.25
B225VS	200	1	25	7.00	1.25	6.77	3.62	6.25
B232VS	600	1¼	32	7.00	1.25	6.77	3.97	6.25
*B239VS	600	1½	40	15.00	N/A	13.54	4.37	6.25
*B240VS	600	1½	40	15.00	N/A	13.54	4.75	6.25
*B249VS	600	2	50	15.00	N/A	13.54	4.68	6.25
B224VSS	1000	1	25	7.00	1.25	13.54	3.37	6.25
*B249VSS	1000	2	50	15.00	N/A	13.54	4.68	6.25

Dimensions with 3-Way Valve



	Valve Nominal Size		Dimensions (mm)			
Valve Body	COP	Inches	DN [mm]	A	B	C
B332L	200	1¼	32	4.13" [105]	2.00" [51]	2.19" [56]
B340L	200	1½	40	4.80" [122]	2.44" [62]	2.61" [67]
B350L	200	2	50	5.60" [142]	2.67" [68]	3.11" [79]

Wiring Diagrams

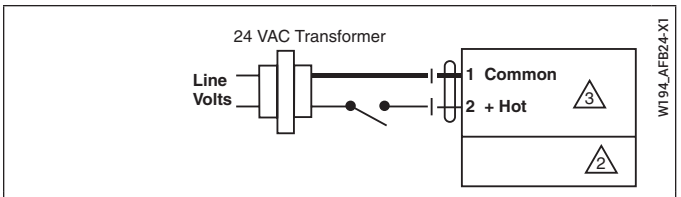
INSTALLATION NOTES

1. Provide overload protection and disconnect as required.
2. ***CAUTION** Equipment damage!*
   Actuators may be connected in parallel.
   Power consumption must be observed.
3. Actuators may also be powered by 24 VDC.
4. For end position indication, interlock control, fan startup, etc., AF24-S US incorporates two built-in auxiliary switches: 2 x SPDT, 7A (2.5A) @ 250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85°.

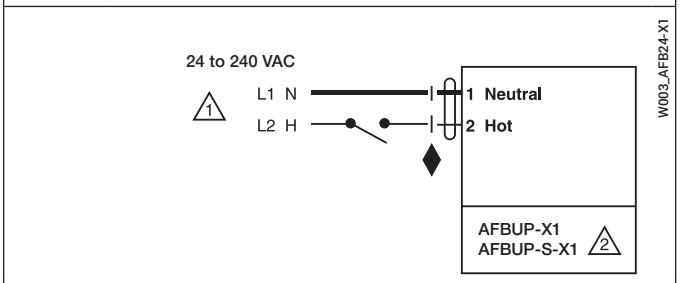
APPLICATION NOTES

- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

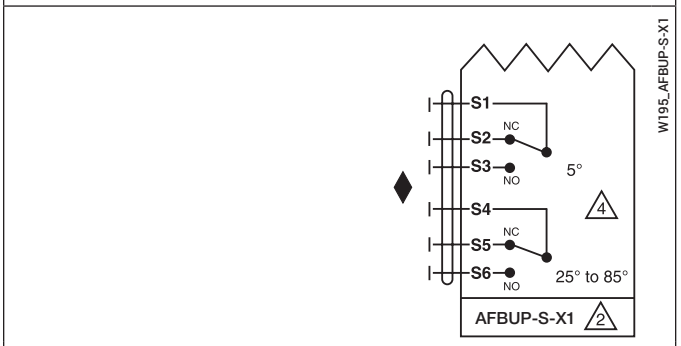
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



On/Off Wiring for AFB24-X1, AFRB24-3, AFRX24-3

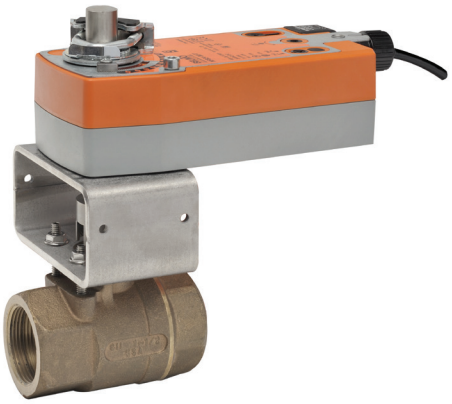


On/Off Wiring for AFBUP-X1, AFBUP-S-X1



Auxiliary Switches

BELIMO



MFT 2-year warranty

Models

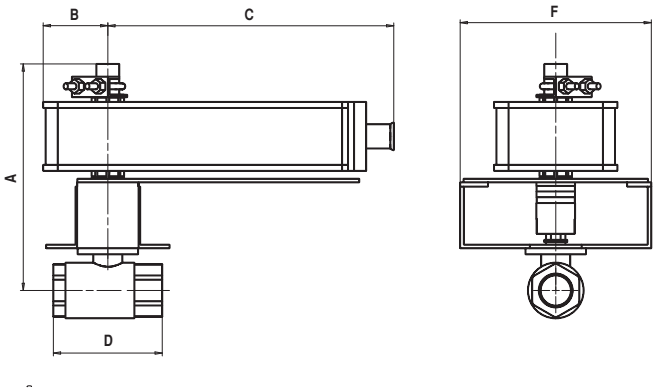
AFX24-MFT-X1
AFX24-MFT-S-X1 w/built-in Aux. Switches
AFX24-MFT95-X1
AFRX24-MFT

Technical Data		
Control		MFT
Control signal		2 to 10 VDC, (4 to 20 mA with 500 Ω resistor) 0-135 Ω (MFT95)
Power supply		24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running	7.5 W
	holding	3 W
Transformer sizing		10 VA (class 2 power source)
Electrical connection (-S model has 2 cables)		½" conduit connector 3 ft. [1m], 18 GA appliance cable
Overload protection		electronic throughout rotation
Input impedance		100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback output		2 to 10 VDC, 0.5 mA max
Angle of rotation		95°
Direction of rotation	spring	reversible with CW/CCW mounting
	motor	reversible with built-in ↷/↶ switch
Position indication		visual indicator
Manual override		hex crank
Running time	control	150 seconds independent of load
	spring	<20 seconds
Ambient temperature		-22°F to +122°F [-30°C to +50°C]
Housing		NEMA 2 / IP54
Agency listings		UL 873, CSA C22.2 No. 24 certified, CE
Noise level		max. 45 dB(A)

AFX24-MFT-S-X1	
Auxiliary switches	2 x SPDT, 7A (2.5A) @ 250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85° (double insulated)

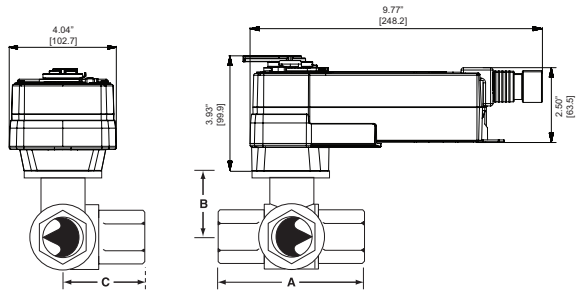
* Dual Mounted Actuators

Dimensions with 2-Way Valve



		Valve Nominal Size		Dimensions (Inches)				
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F
B224VS	400	1	25	7.00	1.25	6.77	3.37	6.25
B225VS	200	1	25	7.00	1.25	6.77	3.62	6.25
B232VS	600	1¼	32	7.00	1.25	6.77	3.97	6.25
*B239VS	600	1½	40	15.00	N/A	13.54	4.37	6.25
*B240VS	600	1½	40	15.00	N/A	13.54	4.75	6.25
*B249VS	600	2	50	15.00	N/A	13.54	4.68	6.25
B224VSS	1000	1	25	7.00	1.25	6.77	3.37	6.25
B232VSS	1000	1¼	32	7.00	1.25	6.77	3.97	6.25
*B249VSS	1000	2	50	15.00	N/A	13.54	4.68	6.25

Dimensions with 3-Way Valve



		Valve Nominal Size		Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B332L	200	1¼	32	4.13" [105]	2.00" [51]	2.19" [56]
B340L	200	1½	40	4.80" [122]	2.44" [62]	2.61" [67]
B350L	200	2	50	5.60" [142]	2.67" [68]	3.11" [79]

Wiring Diagrams

INSTALLATION NOTES

2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).

5 Triac A and B can also be contact closures.

6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.

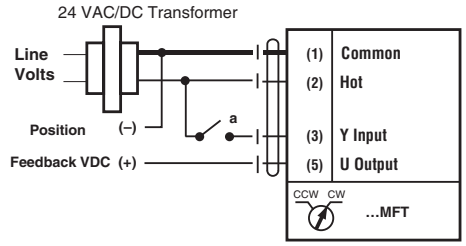
7 Position feedback cannot be used with Triac sink controller.
The actuators internal common reference is not compatible.

APPLICATION NOTES

- The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.
- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

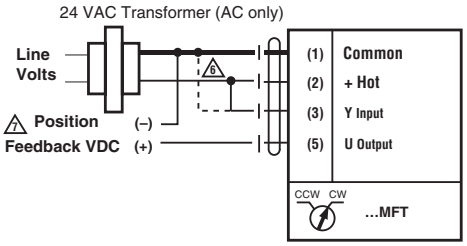
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

W043



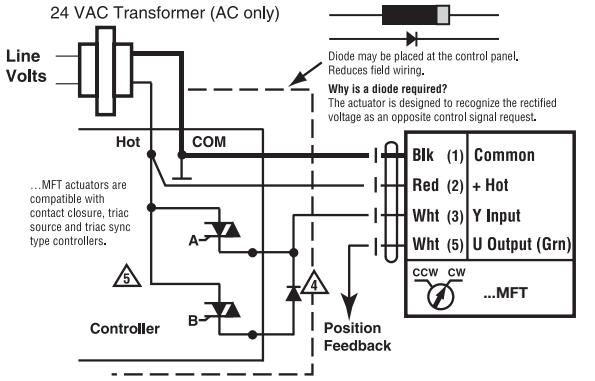
On/Off control

W041



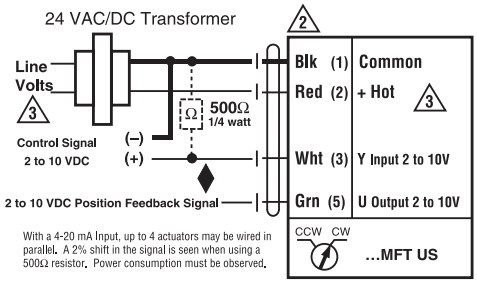
PWM, triac source and sink

W302_AFBX24-MFT



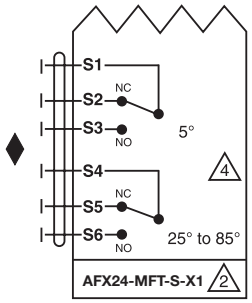
Floating Point control

W303



Propotional 2 to 10 or 4 to 20 mA control signal

W195-AFX24-MFT-S-X1



Auxiliary Switches

INSTALLATION NOTES

21 Provide overload protection and disconnect as required.

22 Actuators and controller must have separate transformers.

23 Consult controller instruction data for more detailed information.

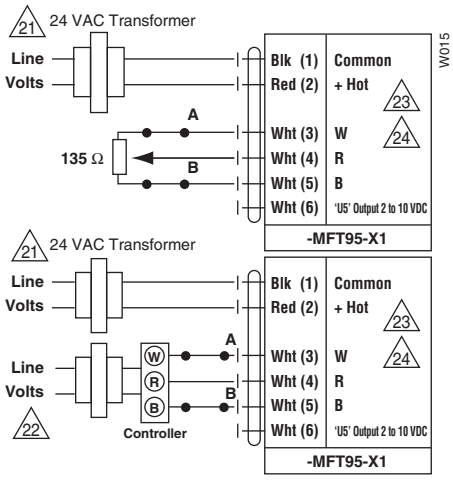
24 Resistor value depends on the type of controller and the number of actuators. No resistor is used for one actuator. Honeywell® resistor kits may also be used.

25 To reverse control rotation, use the reversing switch.

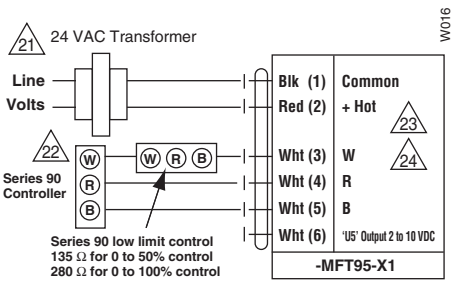
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

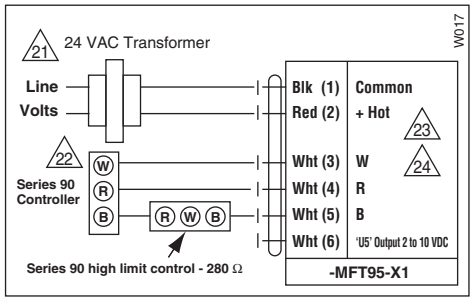
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



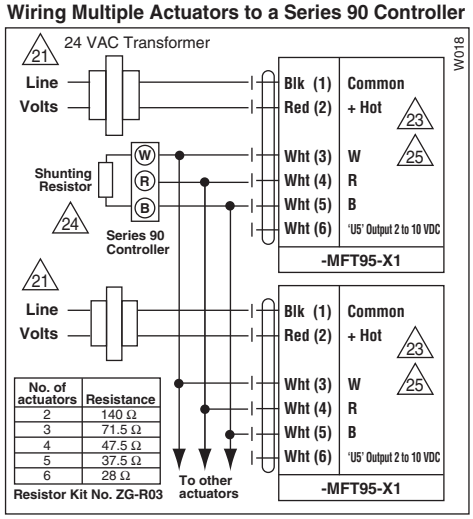
Low Limit Control



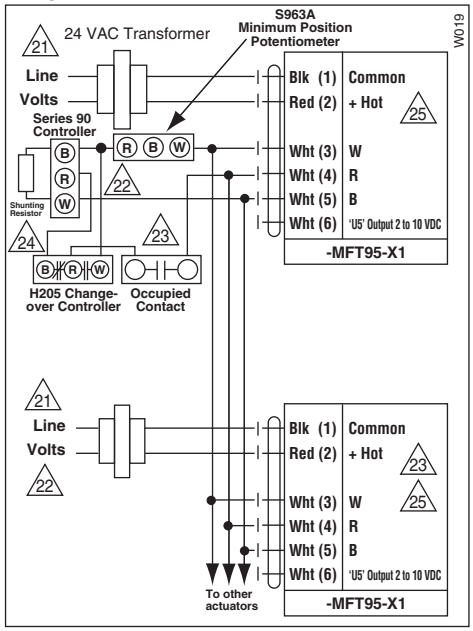
High Limit Control



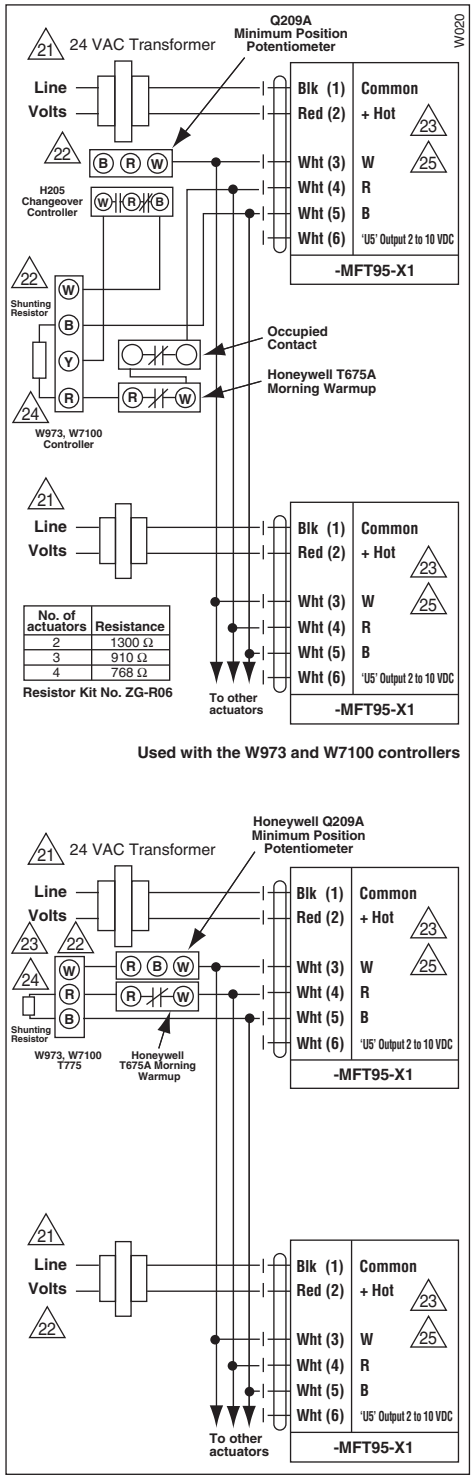
Wiring Multiple Actuators to a Series 90 Controller

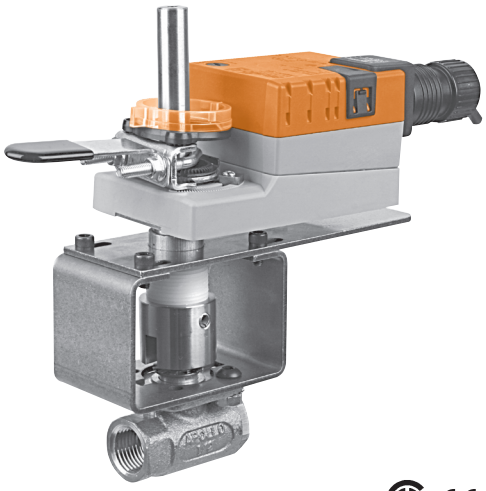


Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers





2-year warranty

Models

LMB24-3-X1
LMX24-3-X1
LRX24-3

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	1.5 W
holding	0.2 W
Transformer sizing	3 VA (class 2 power source)
Electrical connection LMB24-3-X1	½" conduit connector 3 ft., 18 GA plenum rated cables
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	600 Ω
Angle of rotation	95°
Torque	45 in-lbs [5 Nm]
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	95 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC
Noise level	<35 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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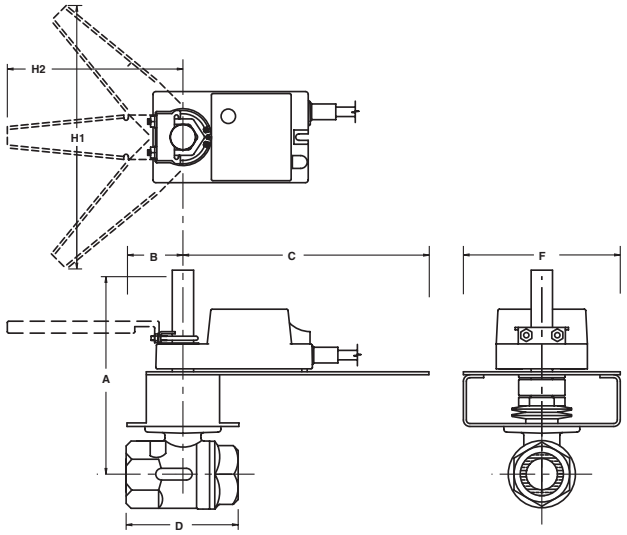
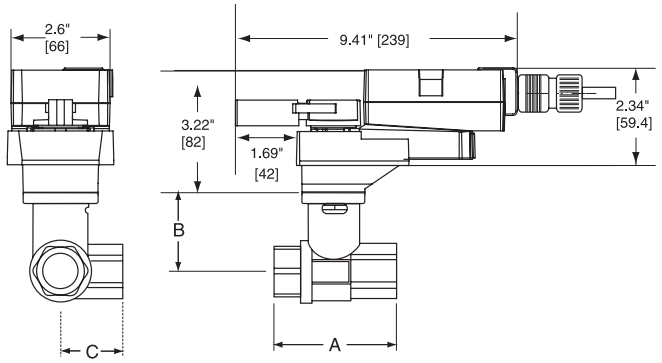


		Valve Nominal Size		Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B2050VS-01	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-02	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-04	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-15	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50

Dimensions with 3-Way Valve



		Valve Nominal Size		Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B315L	200	½	15	2.63" [67]	1.73" [44]	1.42" [36]
B320L	200	¾	20	3.01" [78]	1.81" [46]	1.63" [42]
B325L	200	1	25	3.42" [87]	1.81" [46]	1.77" [45]

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

APPLICATION NOTES

Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

***WARNING** Live Electrical Components!*

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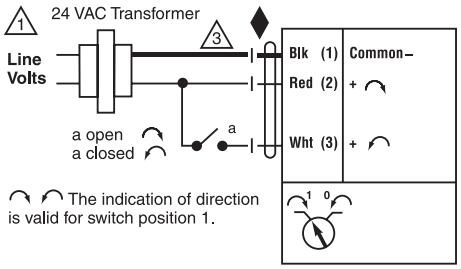
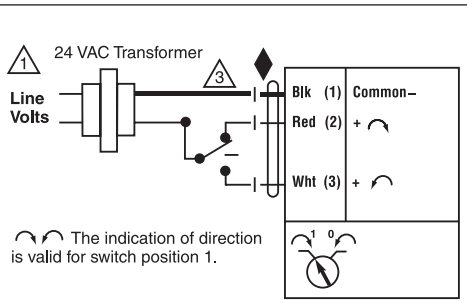


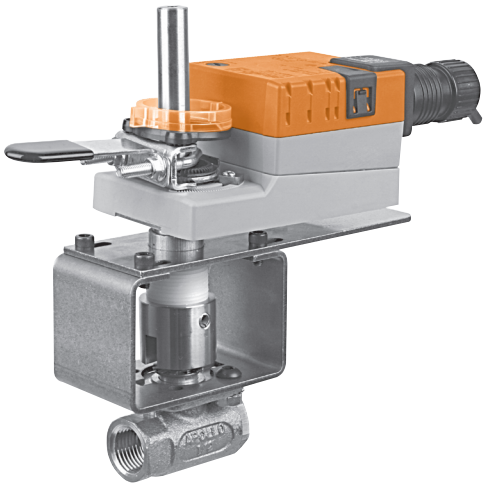
On/Off control



Floating Point or On/Off control

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.



2

2-year warranty

Models

LMX24-MFT-X1
LRX24-MFT

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	2 W
Transformer sizing	3.5 VA (class 2 power source)
Electrical connection	3 ft. [1m], 10 ft. [3m], 16 ft. [5m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	100k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	95°
Torque	45 in-lbs [5 Nm]
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	150 seconds (default) variable (35 to 150 seconds)
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<35 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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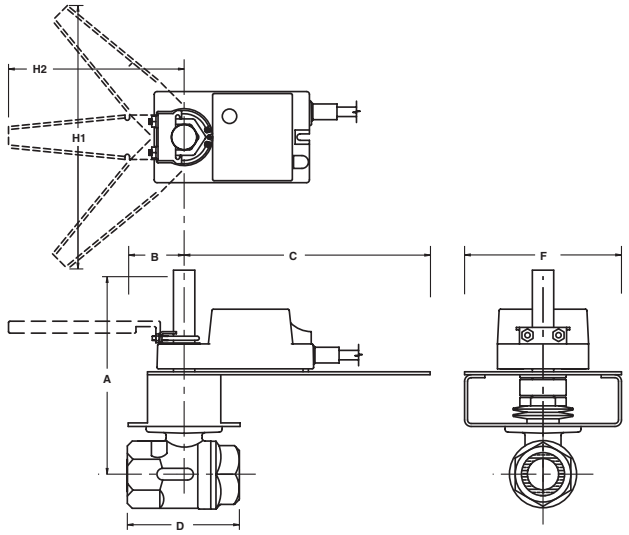
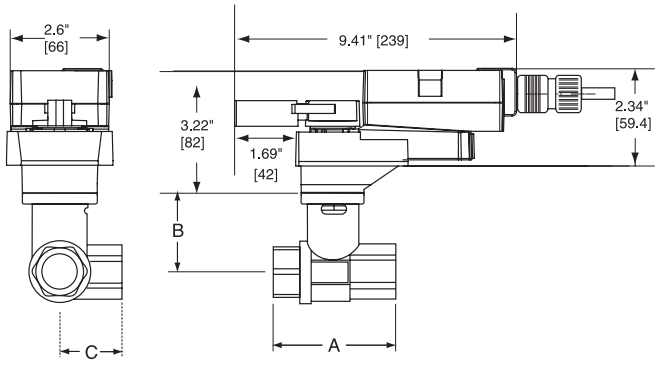


Valve Nominal Size				Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B2050VS-01	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-02	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-04	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50
B2050VS-15	100	½	15	6.75	2.00	6.75	2.25	4.00	9.75	8.50

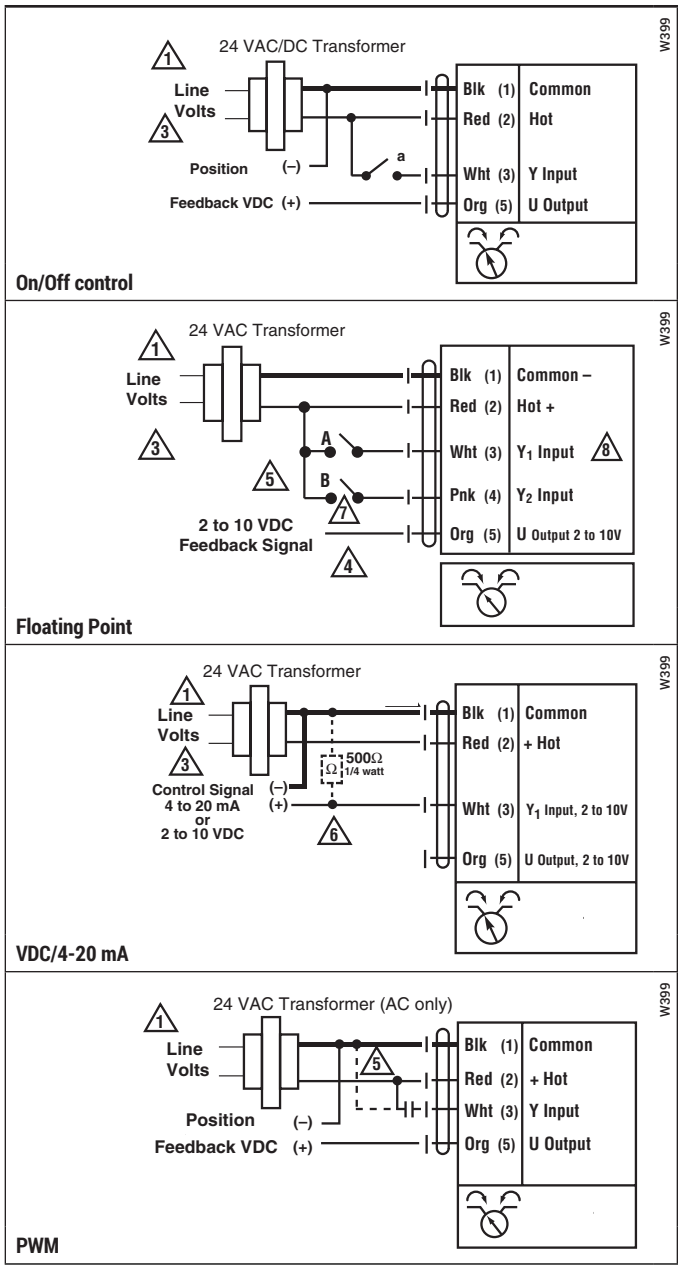
Dimensions with 3-Way Valve

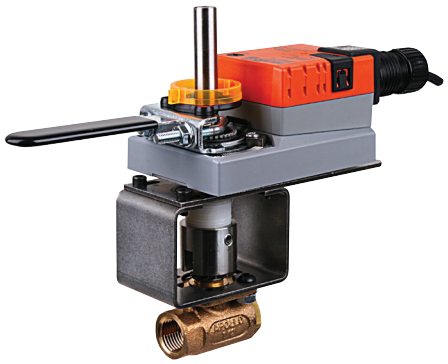


Valve Nominal Size				Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B315L	200	½	15	2.63" [67]	1.73" [44]	1.42" [36]
B320L	200	¾	20	3.01" [78]	1.81" [46]	1.63" [42]
B325L	200	1	25	3.42" [87]	1.81" [46]	1.77" [45]

Wiring Diagrams

1. Provide overload protection and disconnect as required.
3. Actuators may also be powered by 24 VDC.
4. Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
5. Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
6. ZG-R01 may be used.
7. Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.
8. For triac sink the common connection from the actuator must be connected to the hot connection of the controller.





2-year warranty

Models

NMB24-3-X1
NMX24-3-X1
NRB24-3

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	2.0 W
holding	0.2 W
Transformer sizing	4 VA (class 2 power source)
Electrical connection NMB24-3-X1	3 ft., 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	600 Ω
Angle of rotation	max 95°, adjustable with mechanical stop
Torque	90 in-lbs [10 Nm]
Direction of rotation	reversible with ↷/↶ switch ↶ =CCW with decreasing control signal (10-2V) ↷ =CW with decreasing control signal (10-2V)
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	95 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC
Noise level	<45 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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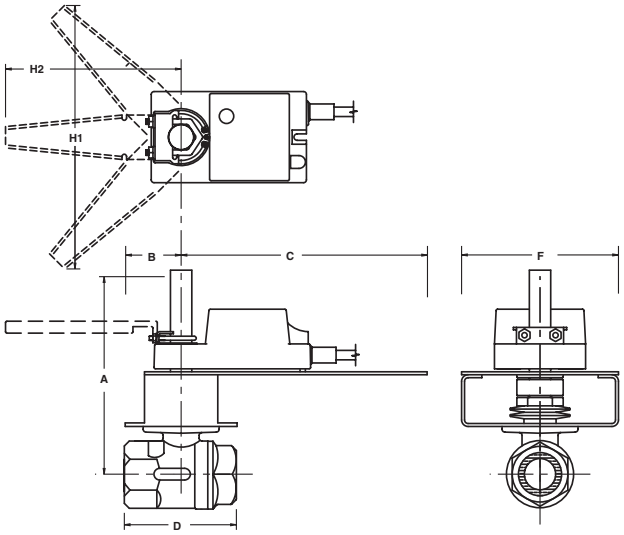
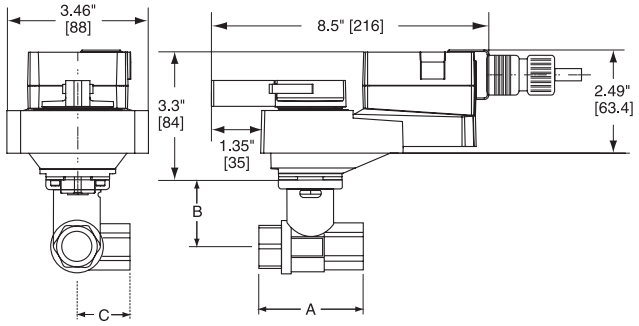


	Valve Nominal Size		Dimensions (Inches)							
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B219VS	400	¾	20	6.70	2.00	8.00	3.00	6.25	9.75	8.50
B220VS	400	¾	20	6.70	2.00	8.00	3.12	6.25	9.75	8.50
B2050VSS-15	1000	½	15	6.70	2.00	8.00	2.25	6.25	9.75	8.50
B219VSS	1000	¾	20	6.70	2.00	8.00	3.00	6.25	9.75	8.50

Dimensions with 3-Way Valve



	Valve Nominal Size		Dimensions (mm)			
Valve Body	COP	Inches	DN [mm]	A	B	C
B332L	200	1¼	32	4.13" [105]	2.00" [51]	2.19" [56]

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

APPLICATION NOTES

Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

***WARNING** Live Electrical Components!*

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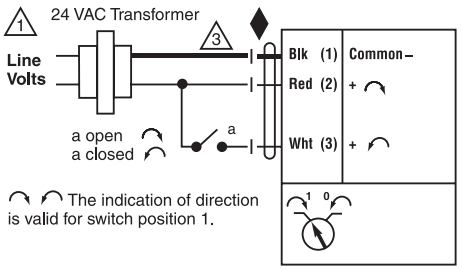
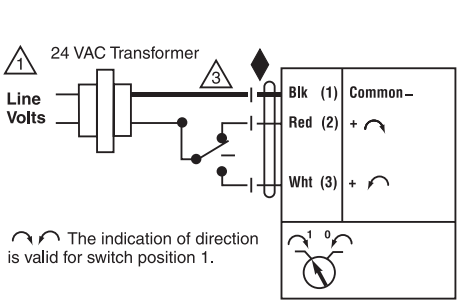


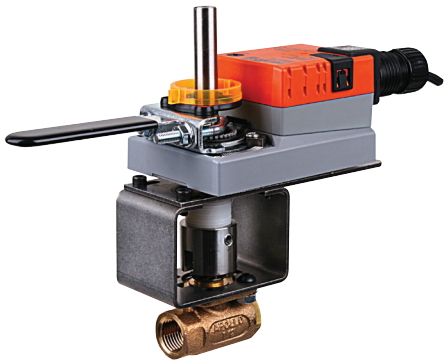
On/Off control



Floating Point or On/Off control

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.



2

2-year warranty

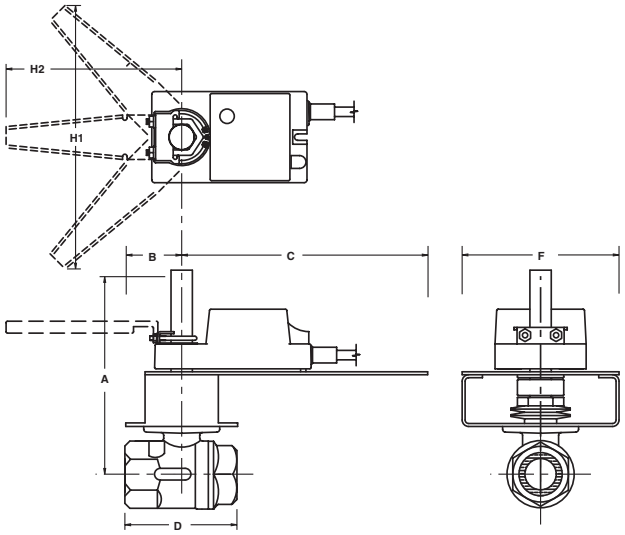
Models

NMX24-MFT-X1
NRX24-MFT

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	3.5 W (1.25 W)
Transformer sizing	5.5 VA (class 2 power source)
Electrical connection	3 ft. [1m], 10 ft. [3m], 16 ft. [5m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	max 95°, adjust. with mechanical stop electronically variable
Torque	90 in-lbs [10 Nm]
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	150 seconds (default) Variable (45 to 170 secondss)
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<45 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

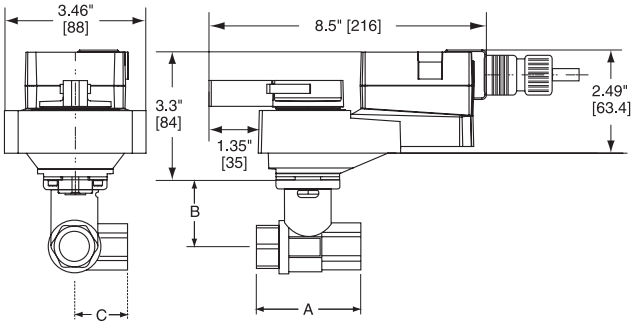
Dimensions with 2-Way Valve

PAGE7



	Valve Nominal Size			Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B219VS	400	¾	20	6.70	2.00	8.00	3.00	6.25	9.75	8.50
B220VS	400	¾	20	6.70	2.00	8.00	3.12	6.25	9.75	8.50
B2050VSS-15	1000	½	15	6.70	2.00	8.00	2.25	6.25	9.75	8.50
B219VSS	1000	¾	20	6.70	2.00	8.00	3.00	6.25	9.75	8.50

Dimensions with 3-Way Valve



	Valve Nominal Size			Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B332L	200	1¼	32	4.13" [105]	2.00" [51]	2.19" [56]

Wiring Diagrams

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

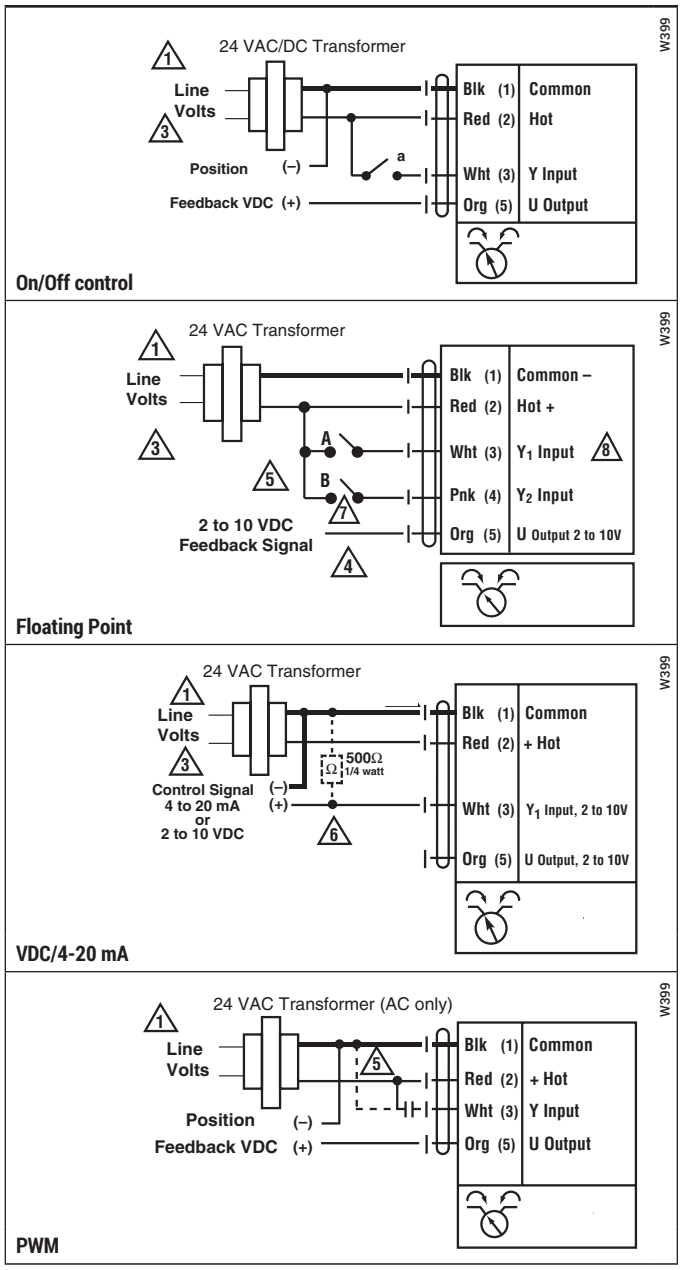
4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.

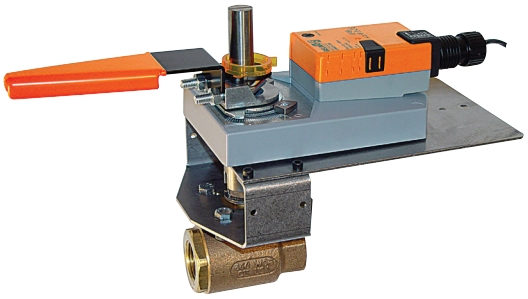
5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.

6 ZG-R01 may be used.

7 Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.

8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.





2-year warranty

Models

AMB24-3-X1
AMX24-3-X1
ARX24-3
ARB24-3
ARB24-3-S

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	2.5 W
holding	0.2 W
Transformer sizing	5.5 VA (class 2 power source)
Electrical connection AMB24-3-X1	½" conduit connector 3 ft., 18 GA plenum rated cable
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	600 Ω
Angle of rotation	max 95°, adjustable with mechanical stop
Torque	180 in-lbs [20 Nm]
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	95 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC
Noise level	<45 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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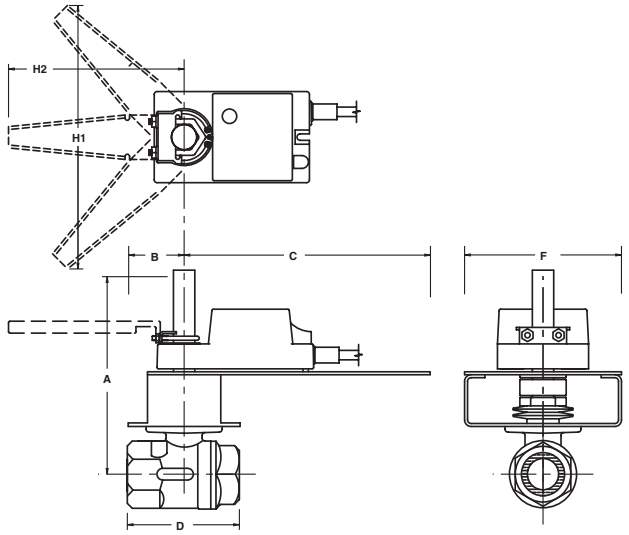
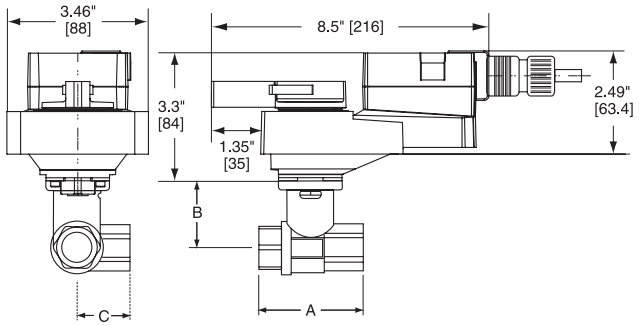


Valve Body	COP	Valve Nominal Size Inches	DN [mm]	A	B	C	D	F	H1	H2
				Dimensions (Inches)						
B225VS	200	1	25	7.00	2.00	8.00	3.62	6.25	9.75	8.50
B232VS	600	1¼	32	7.25	2.00	8.00	3.97	6.25	9.75	8.50
B224VSS	1000	1	25	7.00	2.00	8.00	3.37	6.25	9.75	8.50

Dimensions with 3-Way Valve



Valve Body	COP	Valve Nominal Size Inches	DN [mm]	A	B	C
				Dimensions (mm)		
B340L	200	1½	40	4.80" [122]	2.44" [62]	2.61" [65]
B350L	200	2	50	5.60" [142]	2.67" [68]	3.11" [79]

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.

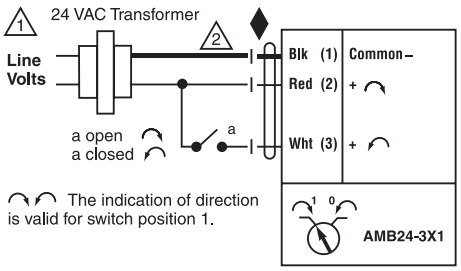
3 Actuators may also be powered by 24 VDC.

5 Only connect common to neg. (–) leg of control circuits.

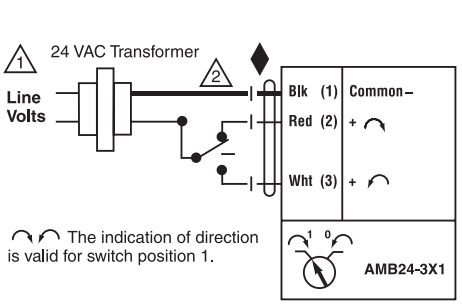
APPLICATION NOTES

Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



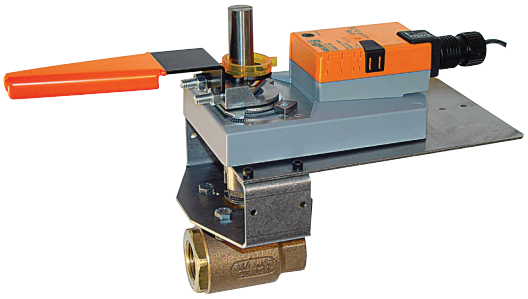
On/Off control



Floating Point or On/Off control

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.



2

2-year warranty

Models

AMX24-MFT-X1
AMX24-MFT95-X1
ARX24-MFT

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	4 W (1.25 W)
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft. [1m], 10 ft. [3m], 16 ft. [5m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	max 95°, adjust. with mechanical stop electronically variable
Torque	180 in-lbs [20 Nm]
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	150 seconds (default) variable (90 to 350 seconds)
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2/IP54
Housing material	UL94-5VA
Agency listings	cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<45 db(A)
Servicing	maintenance free
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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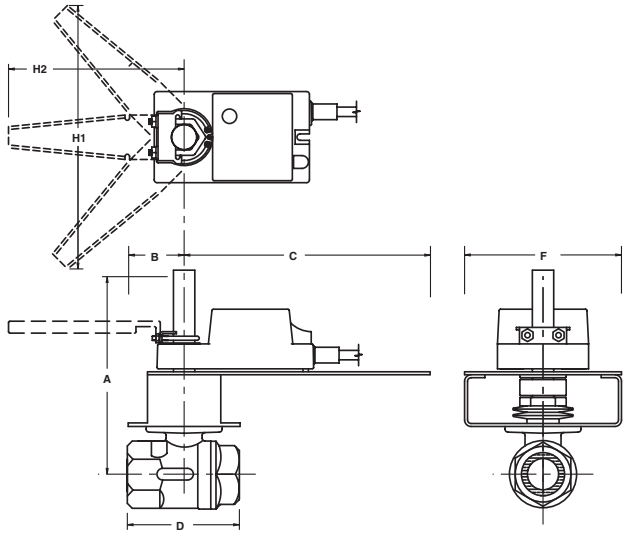
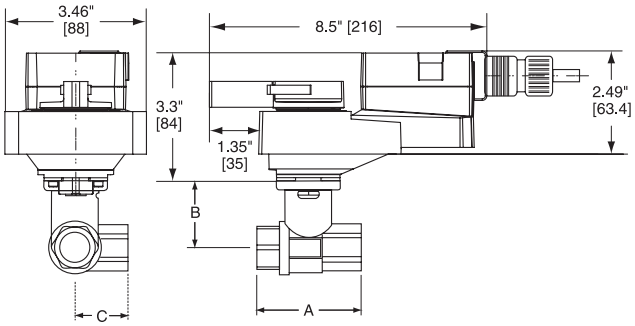


	Valve Nominal Size			Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B225VS	200	1	25	7.00	2.00	8.00	3.62	6.25	9.75	8.50
B232VS	600	1¼	32	7.25	2.00	8.00	3.97	6.25	9.75	8.50
B224VSS	1000	1	25	7.00	2.00	8.00	3.37	6.25	9.75	8.50

Dimensions with 3-Way Valve



	Valve Nominal Size			Dimensions (mm)		
Valve Body	COP	Inches	DN [mm]	A	B	C
B340L	200	1½	40	4.80" [122]	2.44" [62]	2.61" [65]
B350L	200	2	50	5.60" [142]	2.67" [68]	3.11" [79]

Wiring Diagrams

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

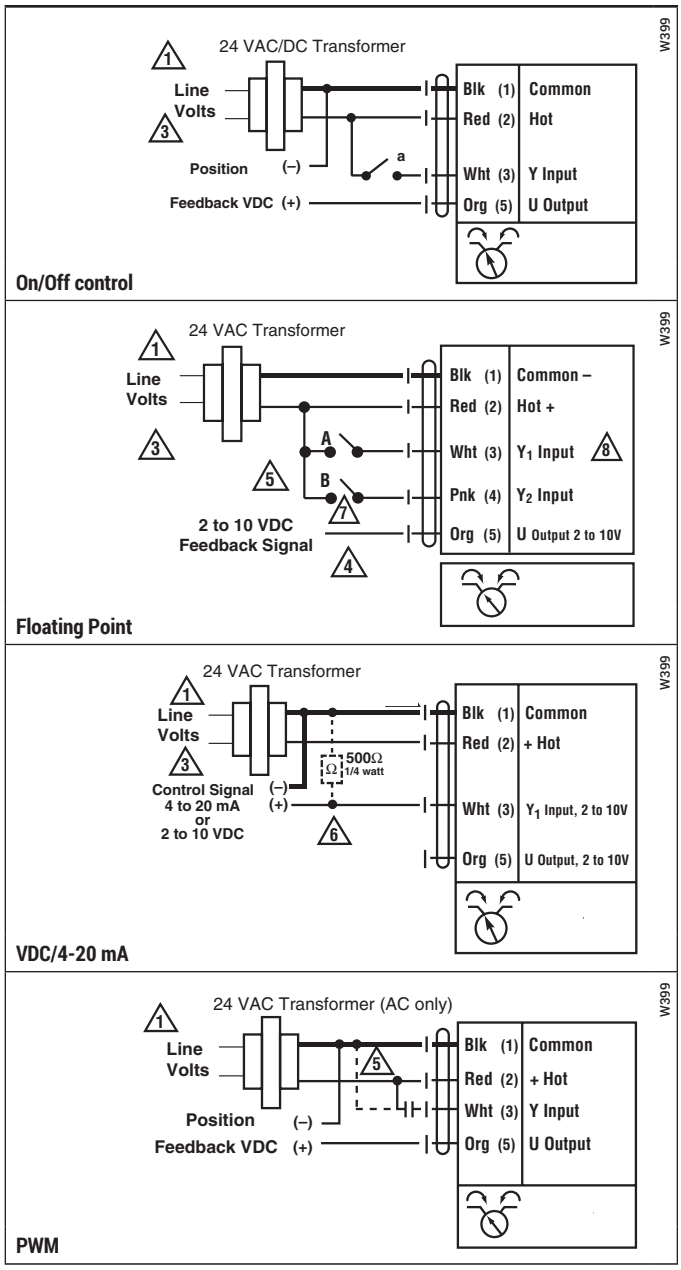
4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.

5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.

6 ZG-R01 may be used.

7 Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.

8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



INSTALLATION NOTES

21 Provide overload protection and disconnect as required.

22 Actuators and controller must have separate transformers.

23 Consult controller instruction data for more detailed information.

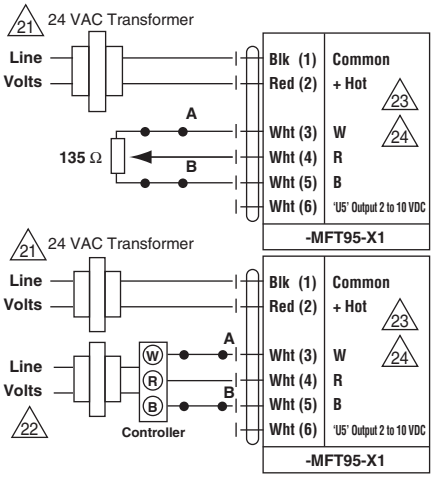
24 Resistor value depends on the type of controller and the number of actuators. No resistor is used for one actuator. Honeywell® resistor kits may also be used.

25 To reverse control rotation, use the reversing switch.

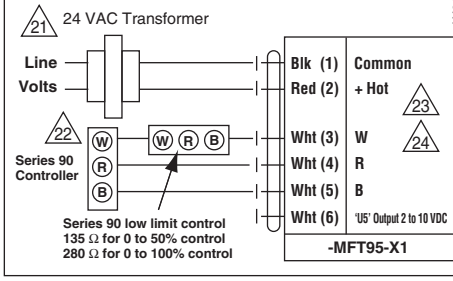
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

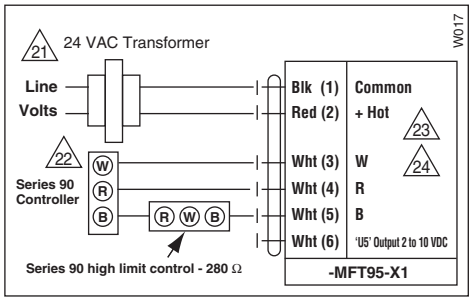
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



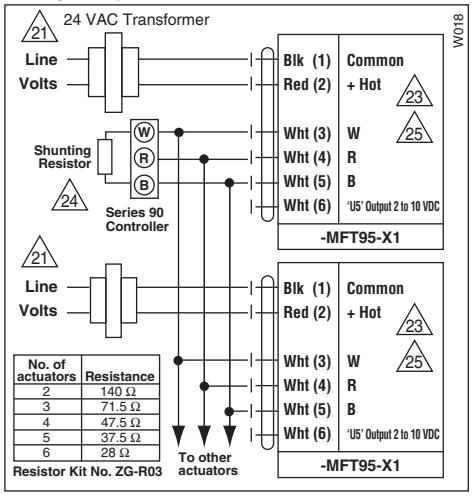
Low Limit Control



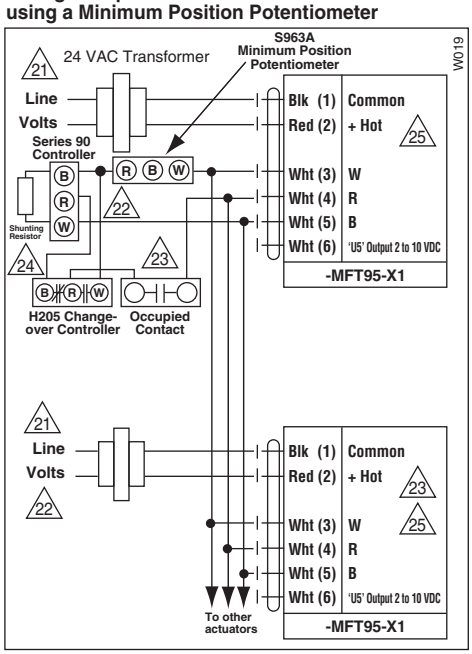
High Limit Control



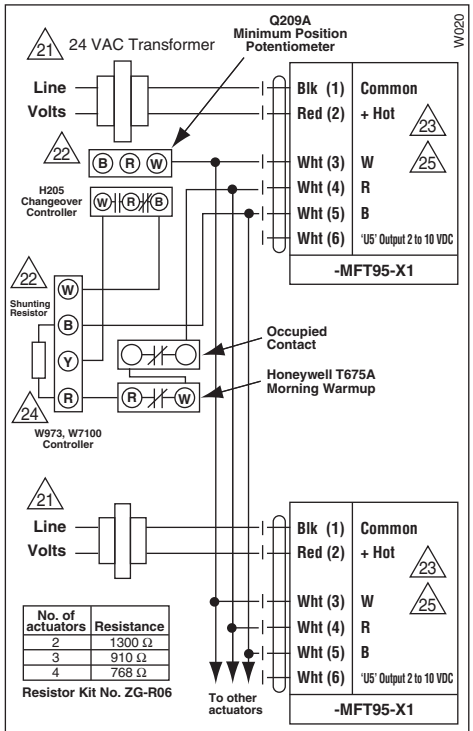
Wiring Multiple Actuators to a Series 90 Controller



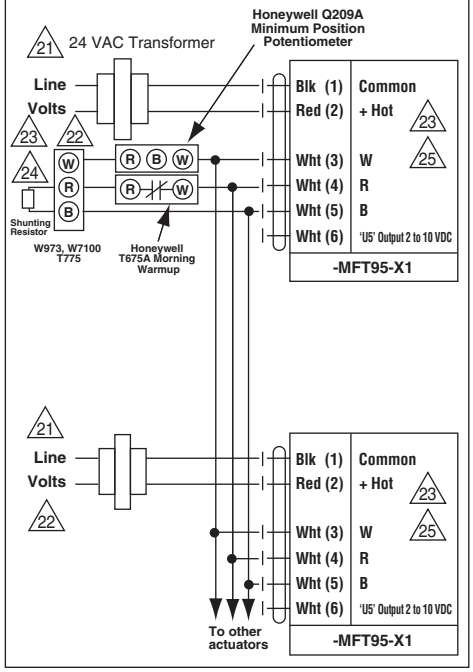
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



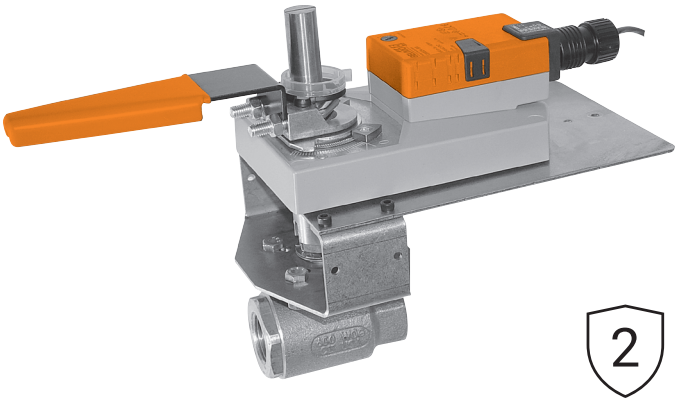
Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers



GMB24-3-X1 Actuators, On/Off, Floating Point



2-year warranty

Models

GMB24-3-X1

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	4 W
Power consumption holding	2 W
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft. [1m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout stroke
Angle of rotation	95°
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Running time	150 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Housing	NEMA 2/IP54 with cable entry down
Housing material	UL94-5V (flammability rating)
Agency listings	cULus acc. to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<45 dB(A)
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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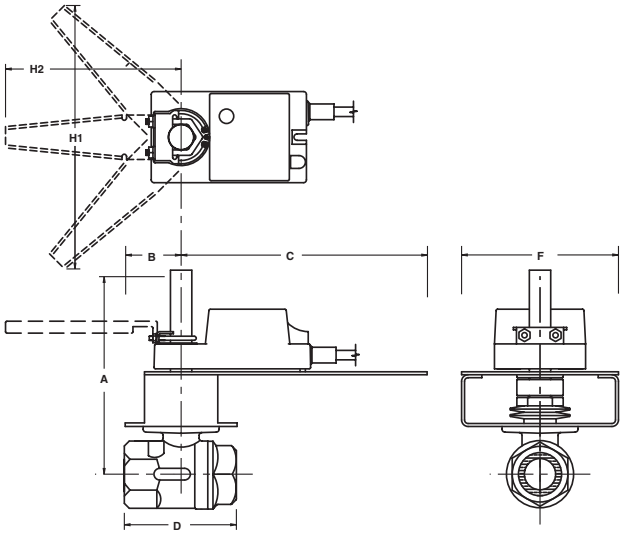


	Valve Nominal Size		Dimensions (Inches)							
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B239VS	400	1½	40	7.50	3.00	8.00	4.37	6.25	9.75	8.50
B240VS	400	1½	40	7.50	3.00	8.00	4.75	6.25	9.75	8.50
B249VS	400	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50
B249VSS	1000	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50

Wiring Diagrams

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.

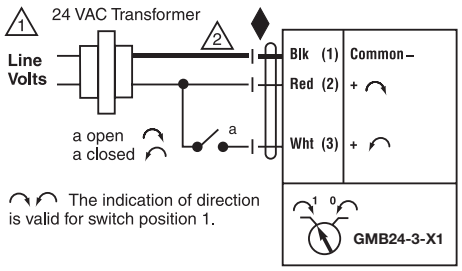
3 Actuators may also be powered by 24 VDC.

4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.

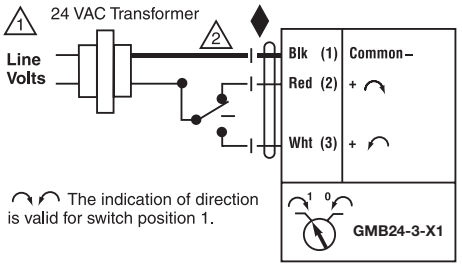
5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.

7 Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.

8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



On/Off control

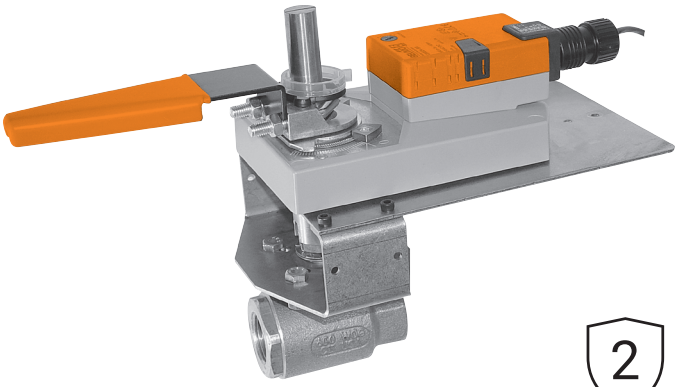


Floating Point or On/Off control

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.

GMX24-MFT-X1 Actuators, Multi-Function Technology



2-year warranty

Models

GMX24-MFT-X1
GMX24-MFT95-X1

Technical Data	
Control	on/off, floating point, 2 to 10 VDC
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	4.5 W
holding	3 W
Transformer sizing	7 VA (class 2 power source)
Electrical connection	3 ft. [1m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout stroke
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	95°
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Running time	150 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Housing	NEMA 2/IP54 with cable entry down
Housing material	UL94-5V (flammability rating)
Agency listings	cULus acc. to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<45 dB(A)
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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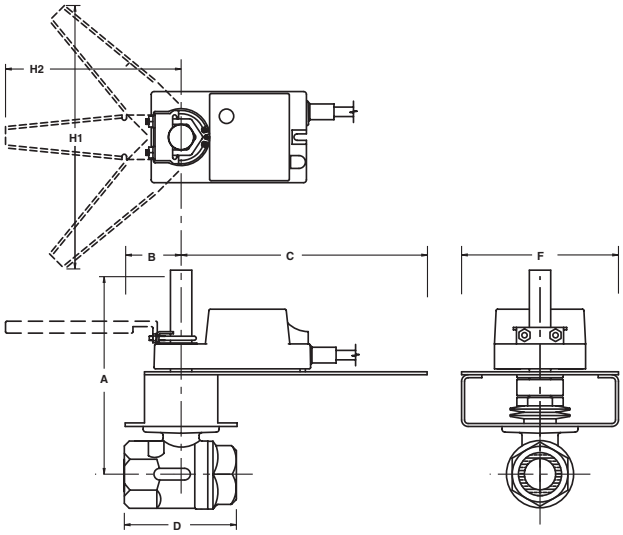


Valve Nominal Size				Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B239VS	400	1½	40	7.50	3.00	8.00	4.37	6.25	9.75	8.50
B240VS	400	1½	40	7.50	3.00	8.00	4.75	6.25	9.75	8.50
B249VS	400	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50
B249VSS	1000	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50

Wiring Diagrams

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

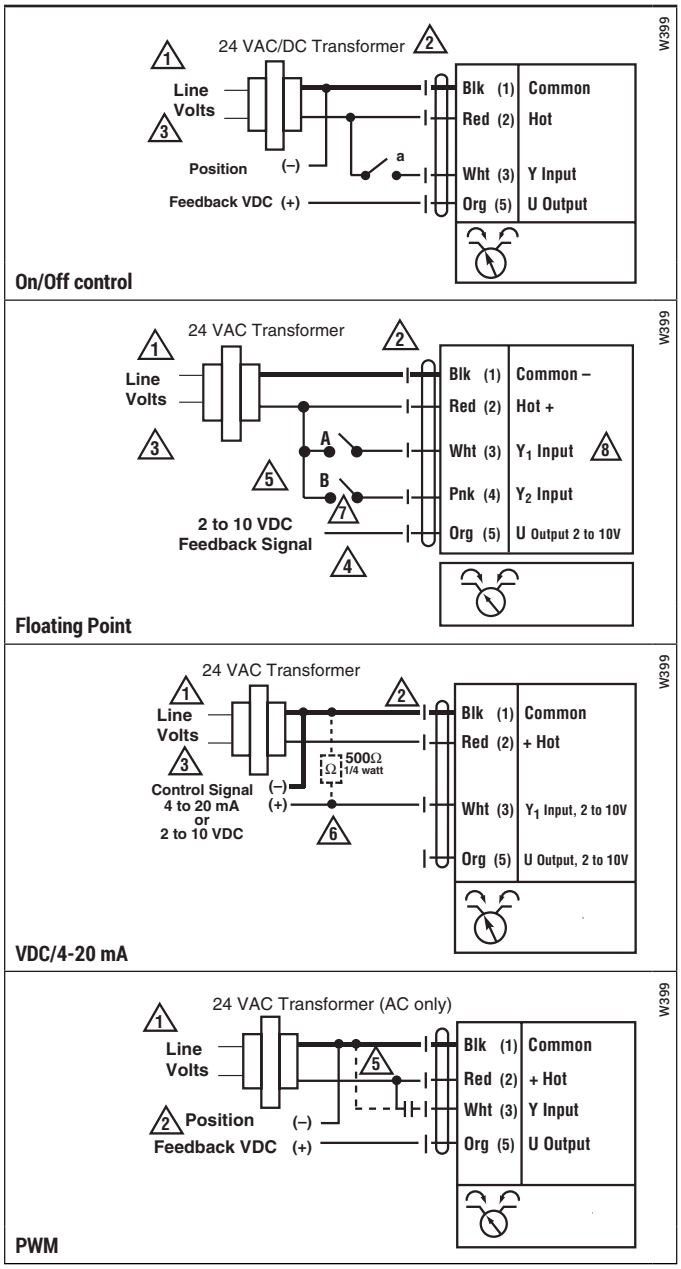
4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.

5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.

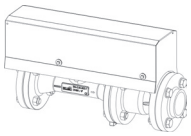
6 ZG-R01 may be used.

7 Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.

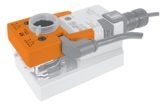
8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



Valve Accessories

WEATHER SHIELDS		VALVES	LR	NR	AR	GR	AKR	GK/ GKR	LF	NF	AF/ AFR	LM	NM	AM	GM
	**ZS-EPIV-EV-20-NF** For valve sizes ½" [DN15] to ¾" [DN20] (cover only)	Energy Valves	•												
		ePIV	•												
	**ZS-EPIV-EV-50-SCNF** For valve sizes 1" [DN25] to 2" [DN50] on non-fail-safe actuator series (cover only) For valve sizes ½" [DN15] to 2" [DN50] on electronic fail-safe actuator series (cover only)	Energy Valves	•	•	•		•								
		ePIV	•	•	•		•								
	ZS-EPIV-EV-80 For ANSI 125, valve sizes 2½" [DN65] and 3" [DN80] (cover only)	Energy Valves			•		•								
		ePIV			•		•								
	**ZS-EPIV-EV-150** For ANSI 125, valve sizes 4" [DN100], 5" [DN125], and 6" [DN150] (cover only)	Energy Valves				•		•							
		ePIV				•		•							
	**ZS-CCV-90*** Kit for LF actuator series	PICCV							•						
		CCV							•						
	ZS-CCV-100* Kit for LR/AR actuator series	PICCV	•		•										
		CCV	•		•										
	**ZS-CCV-110*** Kit for AFR actuator series	PICCV									•				
		CCV									•				
	ZS-SPBV-10 For NM, AM,GM, NF, AF, and GK actuator series	Ball Valves						•		•	•		•	•	•
	ZS-SPBV-20 For dual mounted GM, AF, and GK actuator series							•			•				•
	ZS-BVVS-0002 For LM actuator series on VS/VSS models											•			
	ZS-BVVS-0003 For LF actuator series on VS/VSS models								•						

ZTH REPLACEMENT CABLES		VALVES	AM	GM	AR	GR	DR	GK	DK	SY
	**ZK1-GEN** Cable for use with ZTH US to connect to new generation non-spring return actuator via diagnostic/ programming socket	Ball Valves	•	•						
		Butterfly Valves	•	•	•	•	•	•	•	
	**ZK2-GEN** Cable for use with ZTH US to connect to new generation non-spring return actuator via diagnostic/ programming socket	*Available for all MFT Actuators*								
	**ZK6-GEN** Cable for use with ZTH US to connect to SY actuator via RJII port	Ball Valves								•
		Butterfly Valves								•

AUXILIARY SWITCHES & POTENTIOMETERS		VALVES	LR/LM	NR/NM	AR/AM	GR/GM	AK	GK/GKR
	**S1A** Auxiliary switch 1x SPDT, 3A (0.5A inductive) @ 250 VAC	Available for All Valves	•	•	•	•	•	•
	S2A Auxiliary switch 2x SPDT, 3A (0.5A inductive) @ 250 VAC		•	•	•	•	•	•
	P140A GR Feedback potentiometer 140 Ω		•	•	•	•	•	•
	P500A GR Feedback potentiometer 500 Ω		•	•	•	•	•	•
	P500A GR Feedback potentiometer 500 Ω		•	•	•	•	•	•
	P1000A GR Feedback potentiometer 1000 Ω		•	•	•	•	•	•
	P2800A GR Feedback potentiometer 2800 Ω		•	•	•	•	•	•
	P5000A GR Feedback potentiometer 5000 Ω		•	•	•	•	•	•
	P10000A GR Feedback potentiometer 10000 Ω		•	•	•	•	•	•

PROGRAMMING TOOLS		
	**Near Field Communication (NFC) App** Allows fast programming, commissioning, and troubleshooting even when the actuator is not powered. Available through Google Play	*Where Available on NFC Labeled Actuators Only*
	**MFT-P** Belimo MFT configuration software (V3.X), includes PC-Tool software (interface cables [ZTH US] not included). Physical copy of software. Free download also available at www.belimo.us/americas/mft.html	*Available for all MFT Actuators*
	**ZTH US** Handheld interface module that allows field programming. Includes ZK1-GEN, ZK2-GEN, and ZK6-GEN cables	*Available for all MFT Actuators*

COVERS		
	**ZS-T** Terminal cover for NEMA 2, -T models	*Available for all -T Model Actuators (except TR)*

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