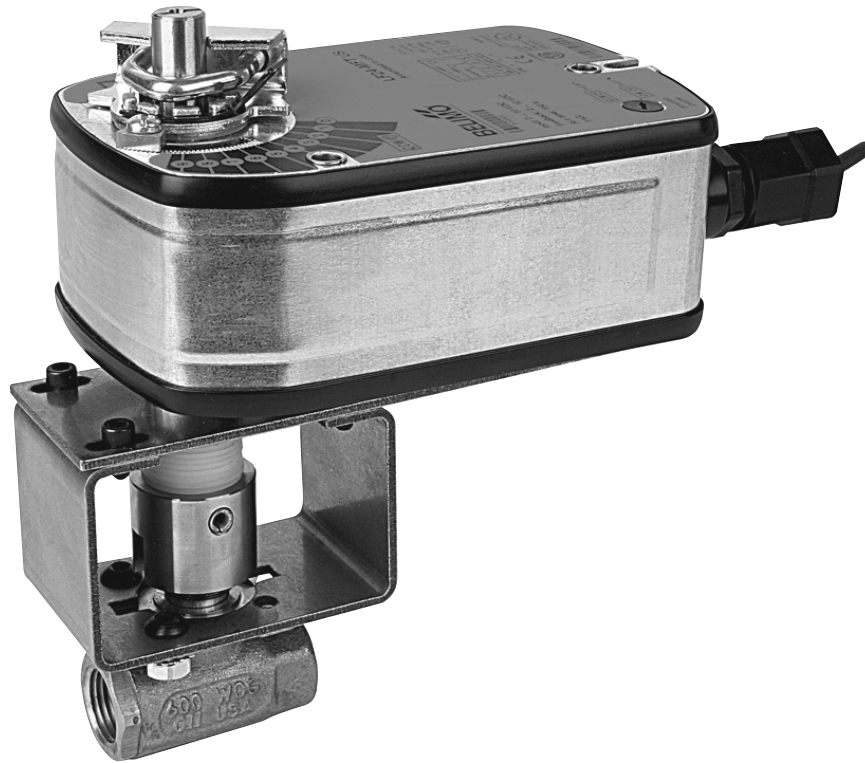


Ball Valve

Features and Benefits

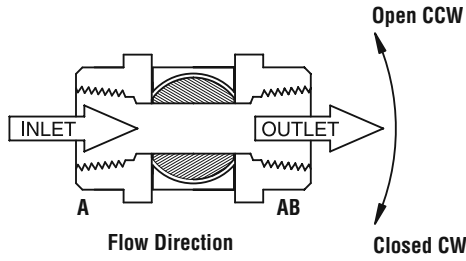
B2...VS / VSS and B3...L



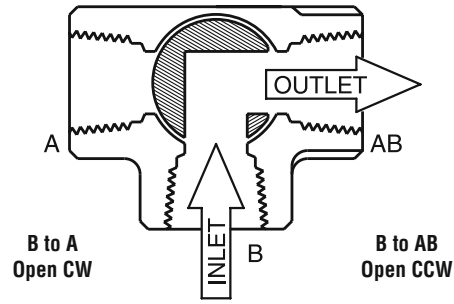
- 2-way and 3-way configuration
- Bronze with stainless steel trim (2-way)
- Nickel plated brass body (3-way)
- Reduced and full port capacities
- Two piece construction
- Electronic actuation
- NPT and flanged connections
- Wide C_v range
- Air gap for use with hot water and steam systems
- Live load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

FLOW PATTERN

B2...VS/VSS



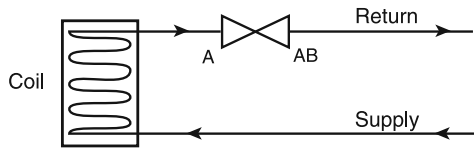
B3...L



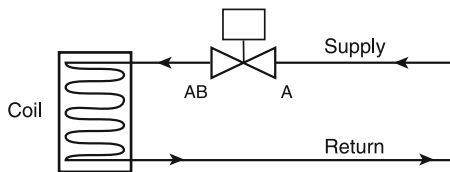
NOTE: B3...L are piped differently than B3 CCV Valves.

PIPING DIAGRAMS

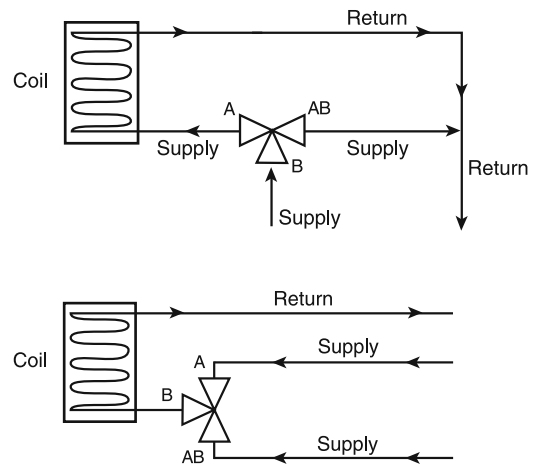
2-way Valve Piping Diagram
Water



2-way Valve Piping Diagram
Steam



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

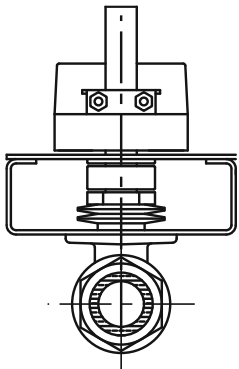


NOTE:

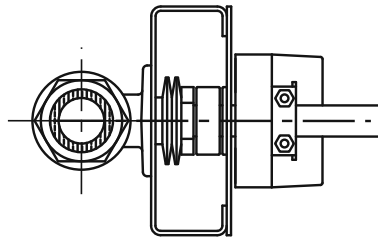
To avoid torque increase during off season shut down or other periods of inactivity longer than 1 month, the valve should be exercised (actuator or manually driven full open-closed cycle) at least once per month. This is necessary to avoid any application problems after an off season shut down. This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

PIPING/MOUNTING ORIENTATION

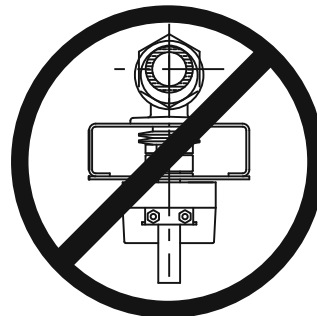
Assembly can be mounted horizontally or vertically for water applications. For steam applications the valve can be mounted vertically but if mounted horizontally the valve must be 90° off center of the pipe. Do not install with actuator below pipe.



(Water application only)



(Steam or water application)



VALVE SIZE	C _v	TYPE	MODEL #	LINE SIZE								
				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

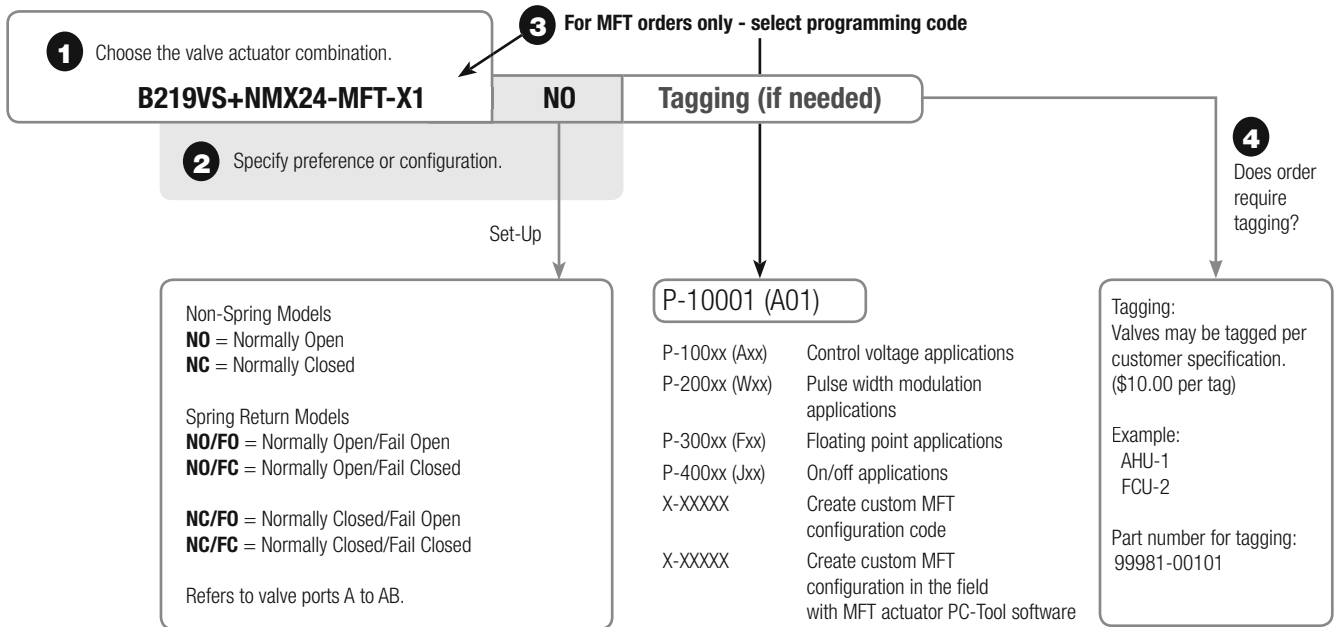
Keep power wire runs below the lengths listed in the following tables. If more than one actuator is powered from the same wire run, divide the allowable wire length by the number of actuators to determine the maximum run to any single actuator. See section 1 for specific transformer sizing information 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" to 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-Spring Return LMB, LMX NMB, NMX AMB, AMX GMB, GMX NRB, NRX ARB, ARX LRB, LRX SY Spring Return LF NFB, NFX AFB, AFX Electronic Fail-Safe GKB, GKX	Power Supply 24 = 24 VAC/DC 120 = 120 VAC 230 = 230 VAC UP = 24-240 VAC or 24-125 VDC	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.

Ordering Example



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



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

Application

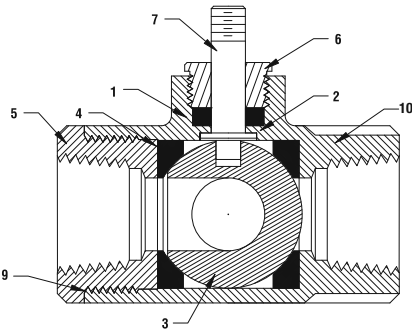
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV Box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

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

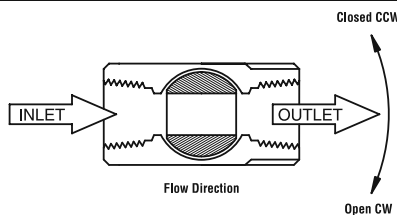
Technical Data	
Media	chilled or hot water, glycol, 35# steam
Flow characteristic	modified equal percentage
Action	90° rotation valve open CW, valve closed CCW
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	SAE NPT (female connections)
Materials:	
1 Stem packing	reinforced PTFE
2 Stem bearing	reinforced 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

C _v	Valve Nominal Size		Type	Suitable Actuators	
	Inches	DN [mm]	2-way NPT	Spring Return	Non-Spring Return
1	½	15	B2050VS-01	LF Series	LM Series
2	½	15	B2050VS-02		
4	½	15	B2050VS-04		
15	½	15	B2050VS-15	NF	NM
30	¾	20	B219VS		
51	¾	20	B220VS	AF Series	AM Series
43	1	25	B224VS		
68	1	25	B225VS		
48	1¼	32	B232VS		
84	1½	40	B239VS		
177	1½	40	B240VS		
108	2	50	B249VS	GM Series	SY Series



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



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

Application

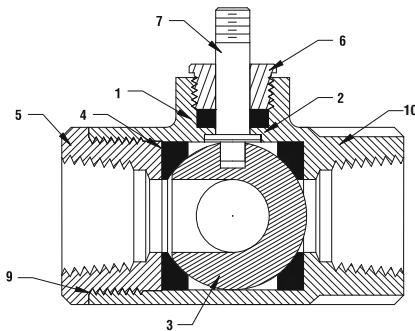
These threaded valves are designed to provide modulating or two position control of hot or chilled water and saturated steam systems under 50 psi.

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

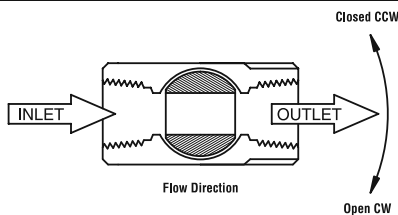
Technical Data	
Media	chilled or hot water, glycol, 50# steam
Flow characteristic	modified equal percentage
Action	90° rotation valve open CW, valve closed CCW
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	SAE NPT (female connections)
Materials:	
1 Stem packing	reinforced PTFE
2 Stem bearing	reinforced 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

C _v	Valve Nominal Size		Type	Suitable Actuators		
	Inches	DN [mm]	2-way NPT	Spring Return	Non-Spring Return	
15	½	15	B2050VSS-15	LF Series	NM Series	SY Series
30	¾	20	B219VSS			
43	1	25	B224VSS	AF Series	GM AM Series	
108	2	50	B249VSS			



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



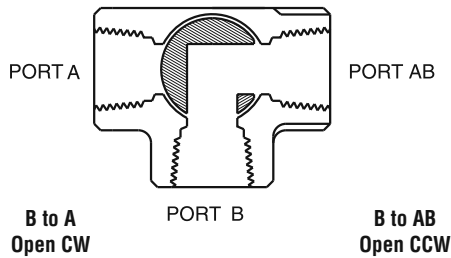
B3...L Series, 3-way, Ball Valve

Chrome Plated Brass Ball and Nickel Plated Stem



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

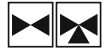
Flow Patterns



Application

This valve is typically used in air handling and fan coil units on heating or cooling coils, unit ventilators, VAV box re-heat coils, and bypass loops. This valve is suitable for use as a diverting valve only.

C _v	Valve Nominal Size		Type	Suitable Actuators		
	Inches	DN [mm]	3-way NPT	Spring Return	Non-Spring Return	Electronic Fail-Safe
6.4	½	15	B315L	LF Series	LR Series	
12.8	¾	20	B320L			
11	1	25	B325L			
34	1¼	32	B332L	AFR Series	NR	
57	1½	40	B340L		AR Series	
87	2	50	B350L			



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

* For hot only or cold only applications. Not for temperature changeover applications.

** 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 been operated, or as field condition dictates.

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 VDC/4...20 mA, or 3-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.

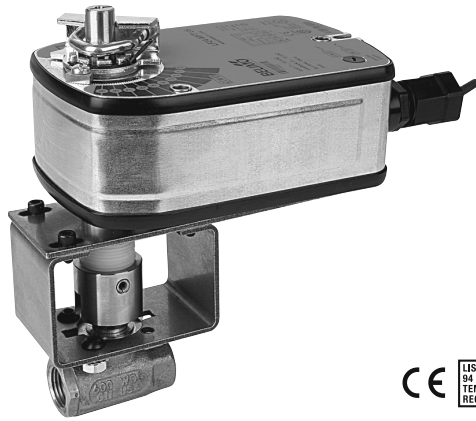
B3...L valves are for diverting applications and are not rated for steam.

Actuator Specifications

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

Valve Specifications

Service	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)
Media temp range	
B2..VS	-22°F to +280°F [-30°C to +138°C]
B2..VSS	-22°F to +298°F [-30°C to +148°C]
B3..L	0°F to 250°F [-18°C to +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 IV (B2..VS, VSS) 0% (B3..L)



Models

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

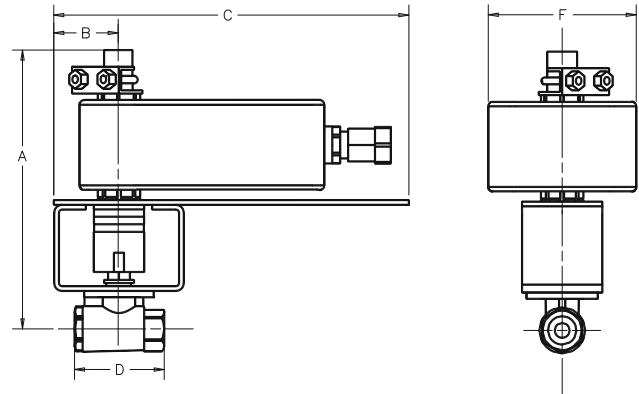
Technical Data	
Control	on/off, floating point
Power supply	
LF24(-S) US	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
LF120(-S) US	120 VAC ± 10% 50/60 Hz
Power consumption	
LF24(-S) US	running 5 W holding 2.5 W
LF120(-S) US	running 5.5 W holding 3.5 W
Transformer sizing	7 VA, class 2 power source
Electrical connection	½" conduit connector
(-S models have 2 cables)	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)
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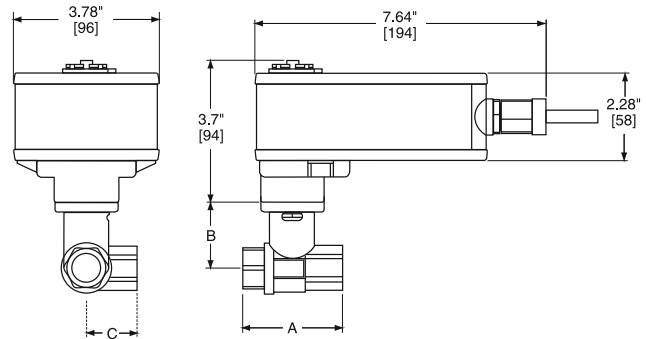
† Rated impulse voltage 800V (4kV for 120V model), Control pollution degree 3, Type of action 1.AA (1.AA.B for -S models)

Dimensions with 2-Way Valve



Valve Body	Valve Nominal Size			Dimensions (Inches)				
	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 Body	Valve Nominal Size			Dimensions (mm)		
	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.

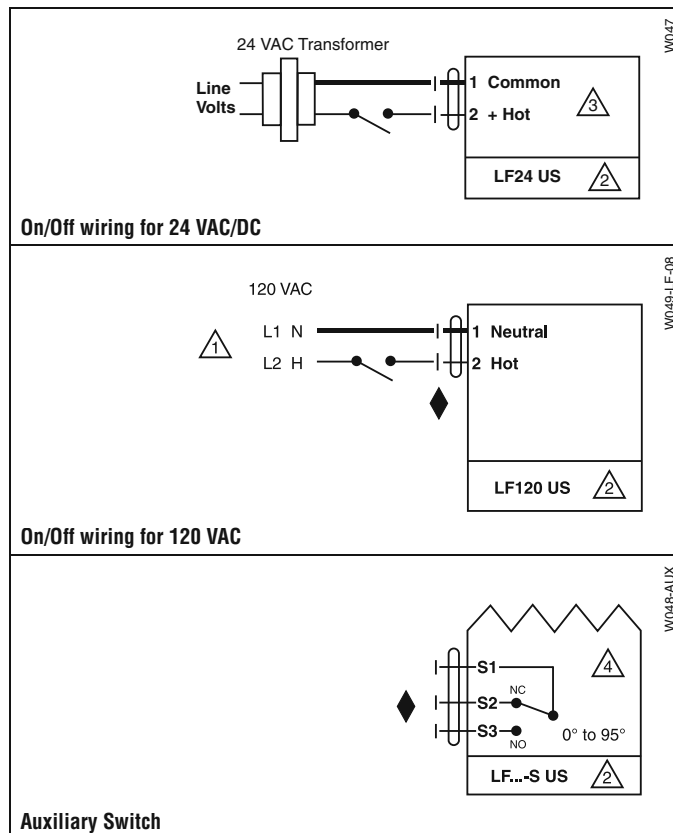
3 Actuator may also be powered by 24 VDC.

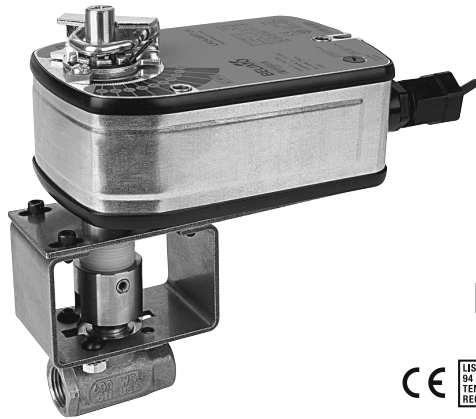
4 For end position indication, interlock control, fan startup, etc., LF24-S US and LF120-S US incorporates a built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @ 250 VAC, UL listed, adjustable 0° to 95°.

📄 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.





MFT

2
YEAR
WARRANTY

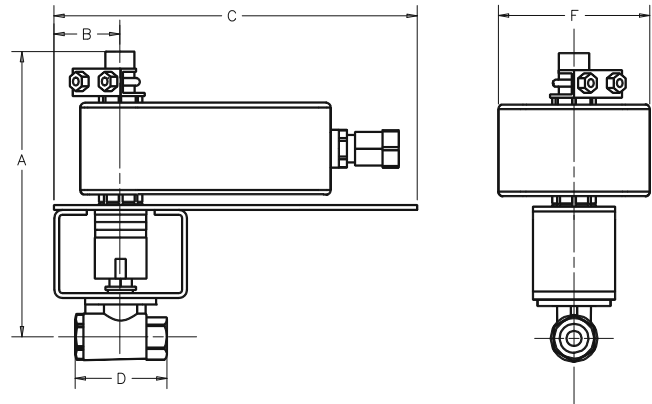


Models

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

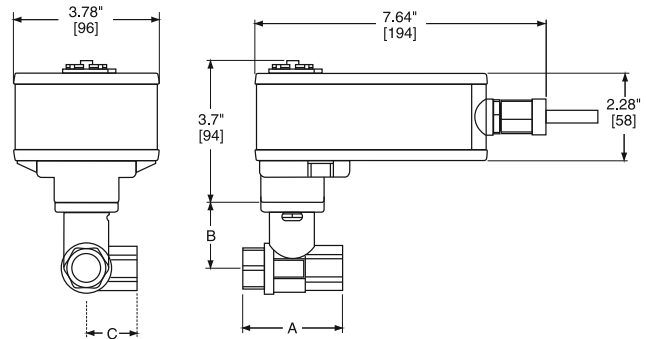
Technical Data	
Control	MFT
Control signal	2 to 10 VDC (4-20mA with 500 Ω resistor)
Power consumption	running 2.5 W holding 1 W
Transformer sizing	5 VA (class 2 power source)
Electrical connection	½" conduit connector
(-S models have 2 cables)	3 ft. [1m], 18 GA appliance cable
Overload protection	electronic 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 Body	COP	Valve Nominal Size		Dimensions (Inches)				
		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 Body	COP	Valve Nominal Size		Dimensions (mm)		
		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

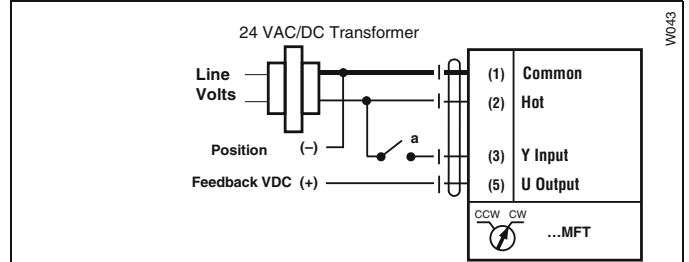
✂️ INSTALLATION NOTES

- 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

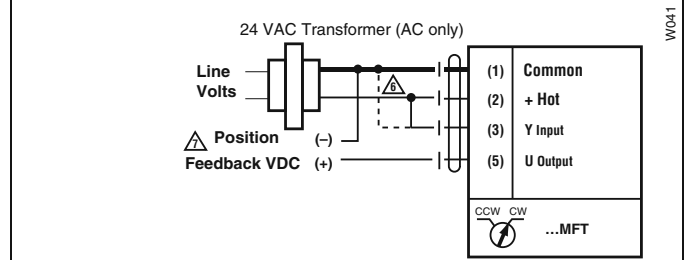
- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

⚠️ WARNING Live Electrical Components!
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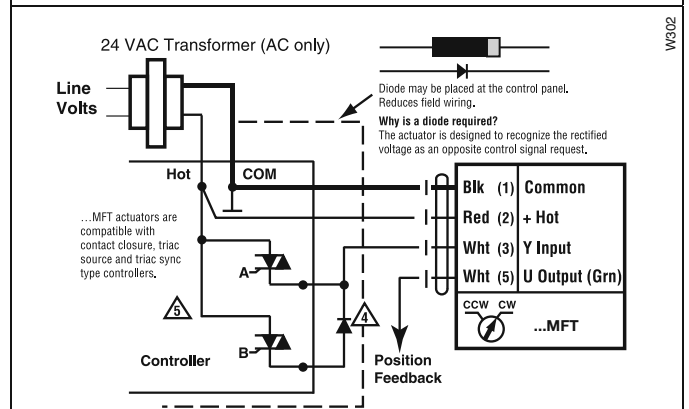
On/Off control

WD43



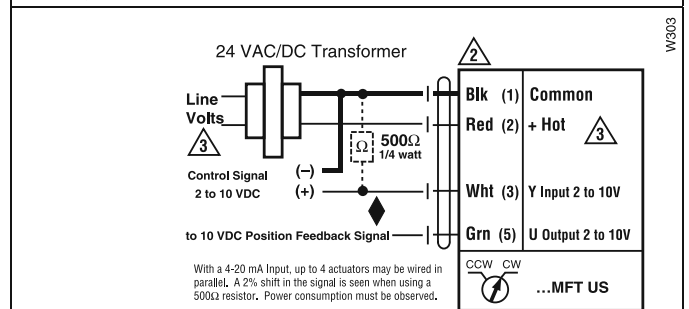
PWM, triac source and sink

WD41



Floating Point control

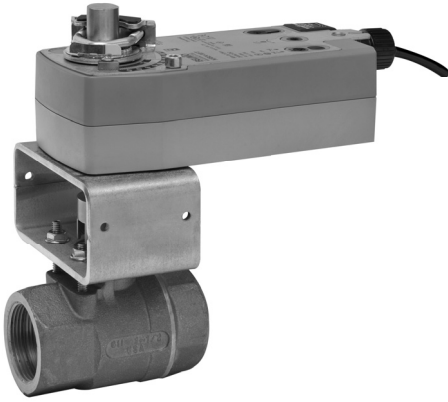
WS02



Proportional 2 to 10 or 4 to 20 mA control signal

WS03

NF Actuators, On/Off

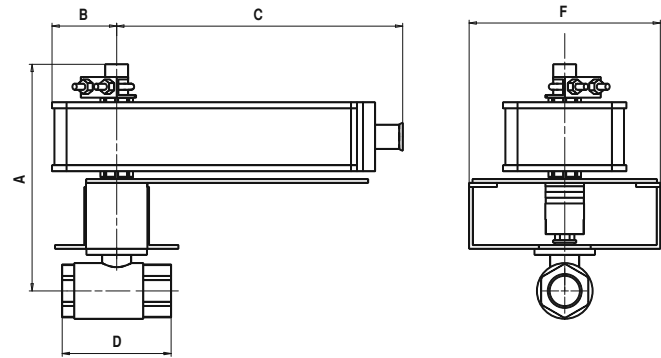


Models

- 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 power source)
		6.5 VA @ 120 VAC
		9.5 VA @ 240 VAC
Electrical connection		½" conduit connector
(-S model has 2 cables)		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 Body	COP	Valve Nominal Size		Dimensions (Inches)				
		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

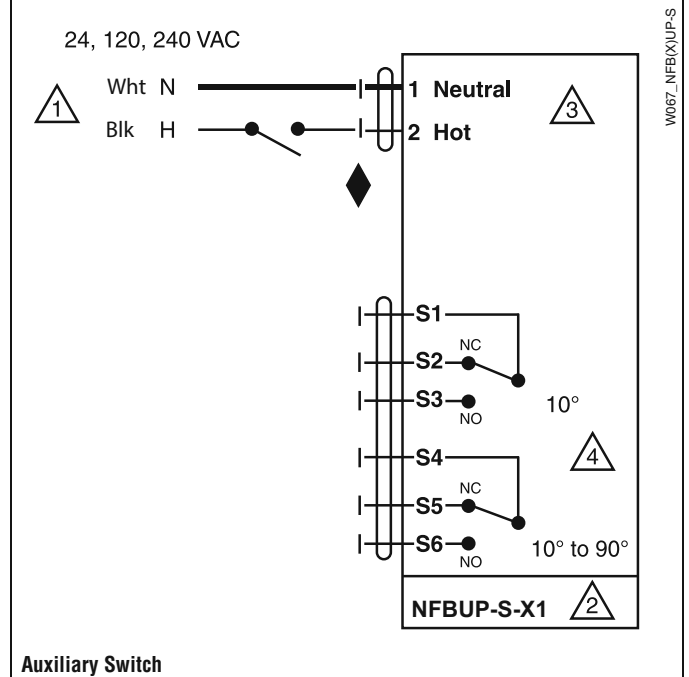
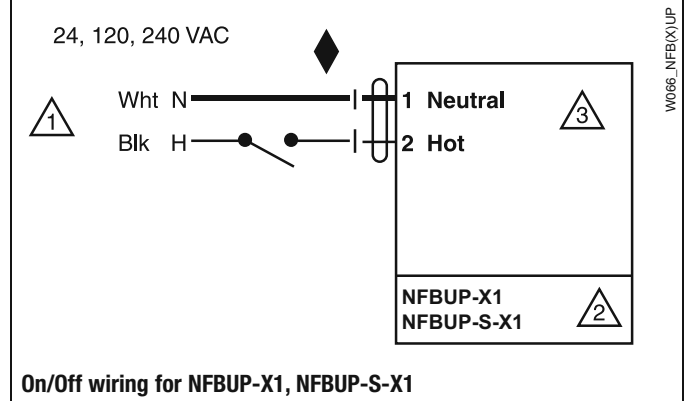
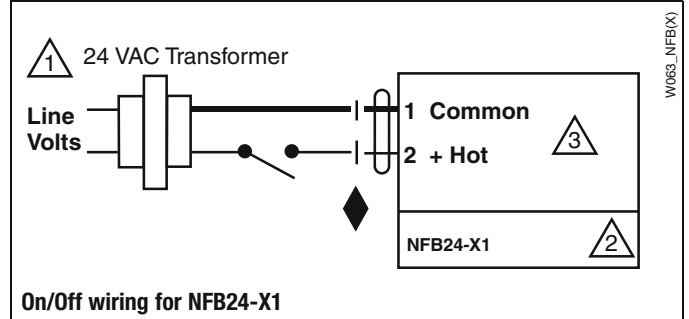
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc.,
NF24-S US incorporates a built-in auxiliary switch: 1 x SPDT, 7A (2.5A)
@ 250 VAC, UL listed, adjustable 5° to 85°.

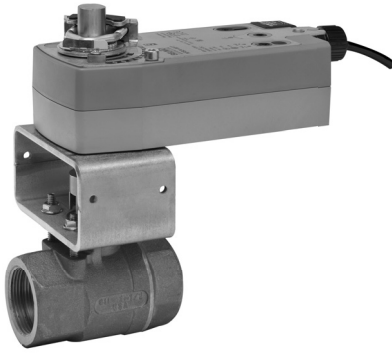
📄 APPLICATION NOTES

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

⚠️ WARNING Live Electrical Components!

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MFT



Models

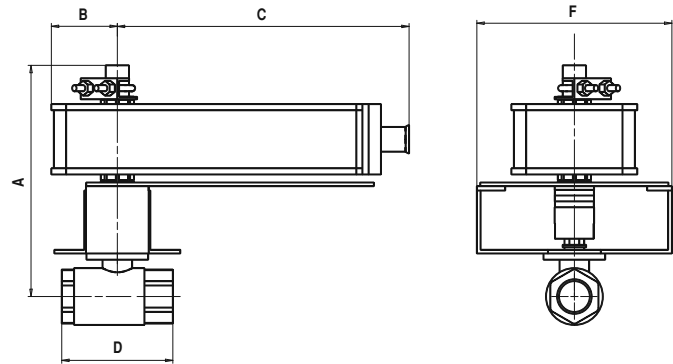
NFX24-MFT-X1
NFX24-MFT-S-X1

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°
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Dimensions with 2-Way Valve



Valve Body	COP	Valve Nominal Size		Dimensions (Inches)				
		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

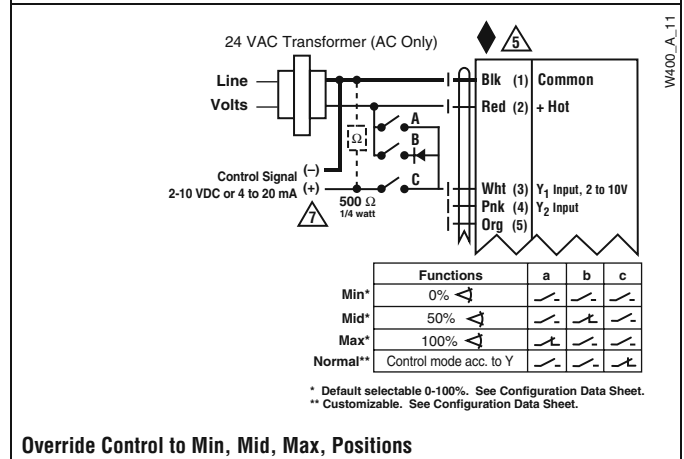
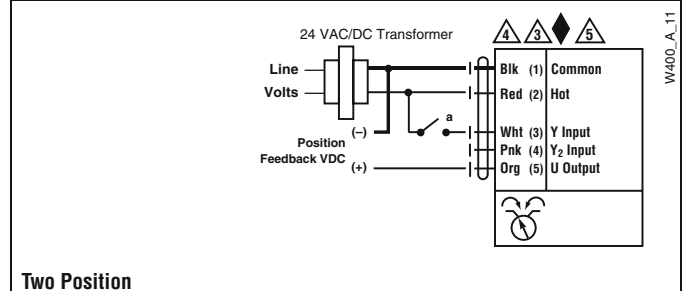
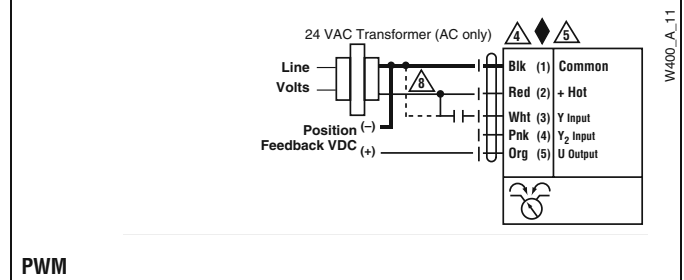
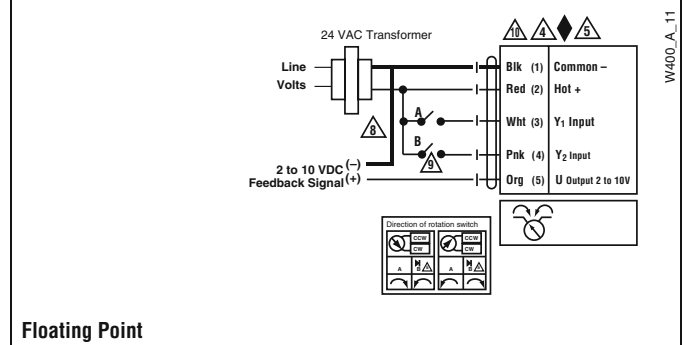
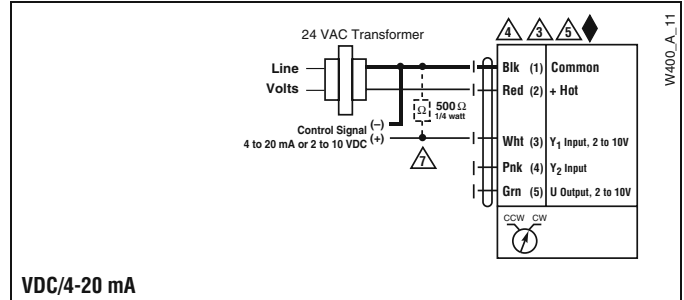
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac 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!
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Tech.Doc - 07/17 - Subject to change. © Belimo Aircontrols (USA), Inc.



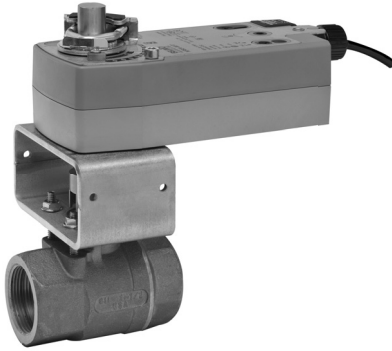
W400_A_11

W400_A_11

W400_A_11

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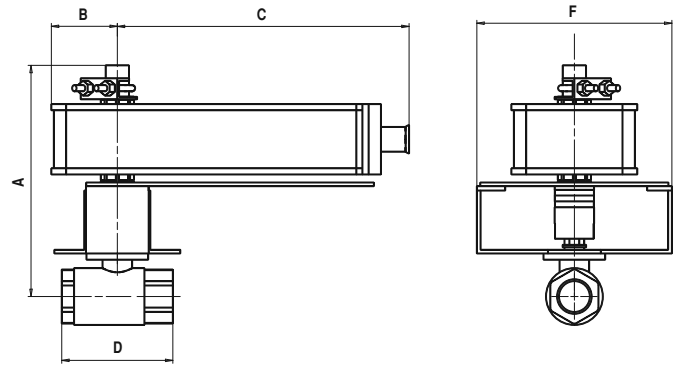
W400_A_11



MFT



Dimensions with 2-Way Valve



Models

NFX24-MFT95-X1

Technical Data		
Control		MFT
Control signal		0-135 Ω
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° (adjustable with mechanical end stop, 35° to 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	control	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

Valve Body	COP	Valve Nominal Size		Dimensions (Inches)				
		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	2.25	6.25



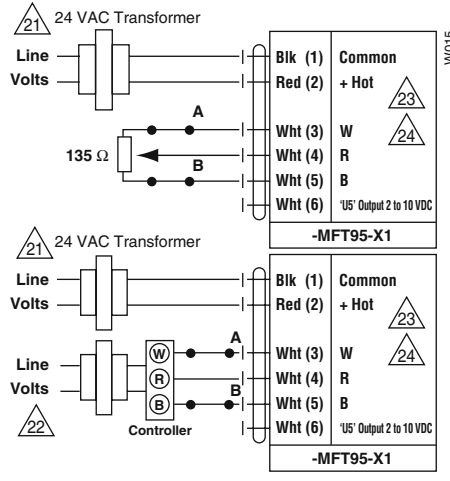
INSTALLATION NOTES

- 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.

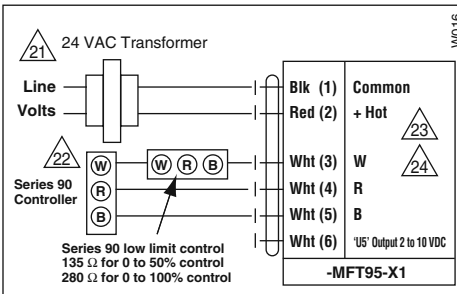
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

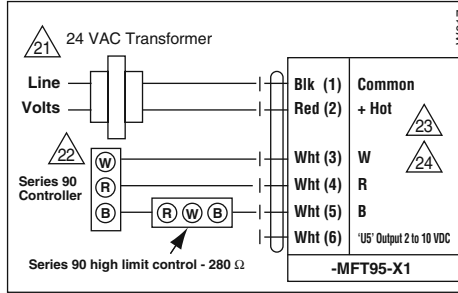
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



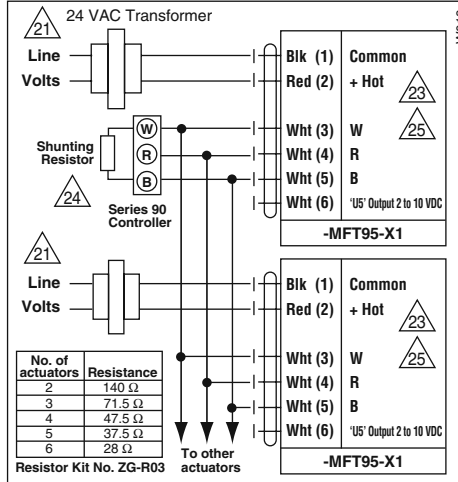
Low Limit Control



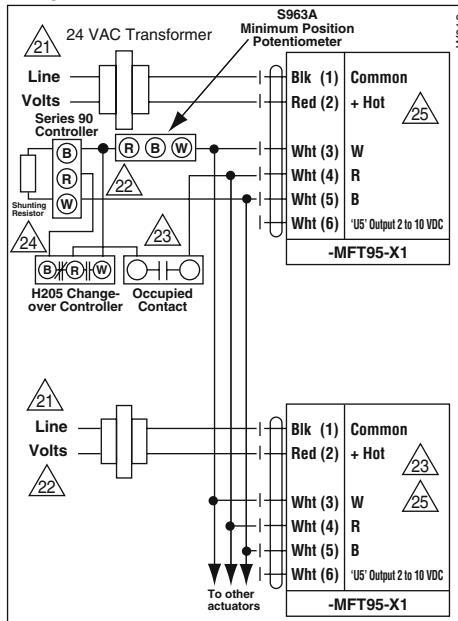
High Limit Control



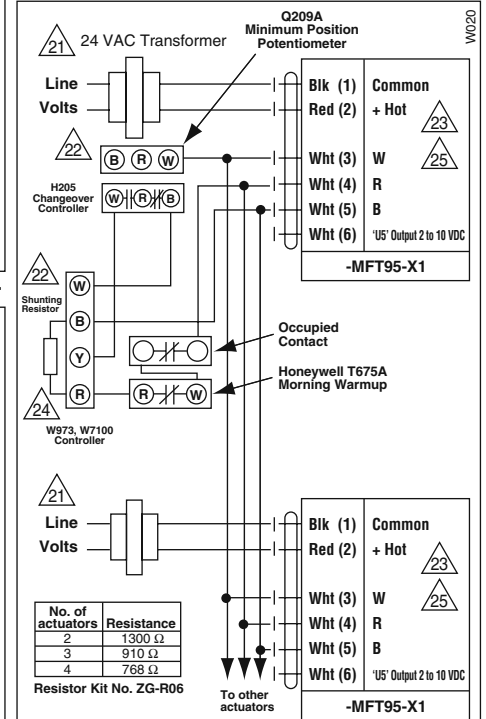
Wiring Multiple Actuators to a Series 90 Controller



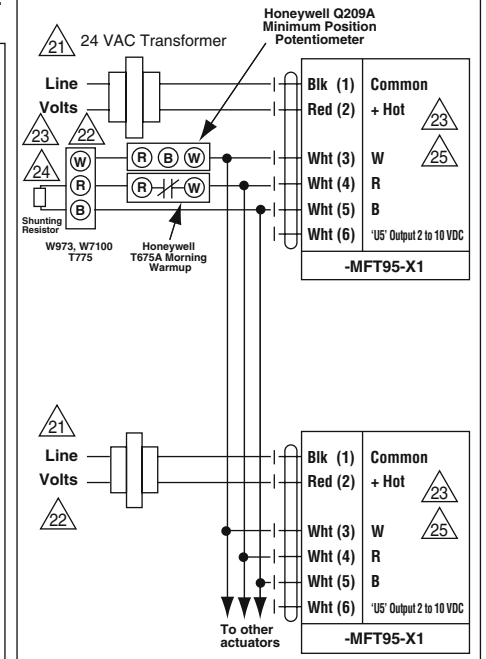
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer

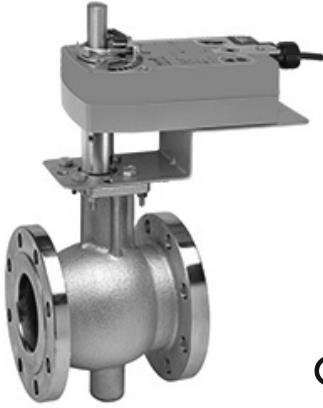


Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers





Models

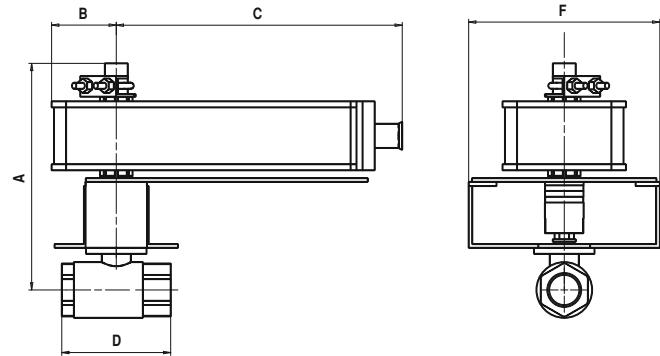
- AFB24-X1
- AFBUP-X1
- AFBUP-S-X1 w/built-in Aux. Switches
- AFRB24-3
- AFRX24-3

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		½" conduit connector
(-S model has 2 cables)		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)

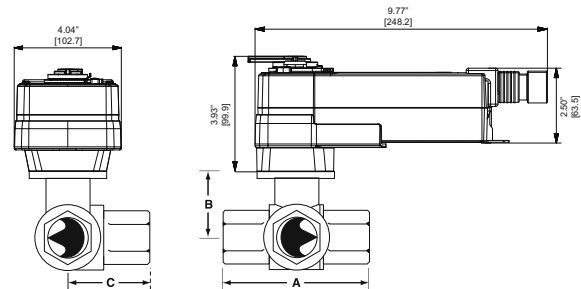
* Dual Mounted Actuators

Dimensions with 2-Way Valve



Valve Body	COP	Valve Nominal Size		Dimensions (Inches)					
		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 Body	COP	Valve Nominal Size		Dimensions (mm)		
		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

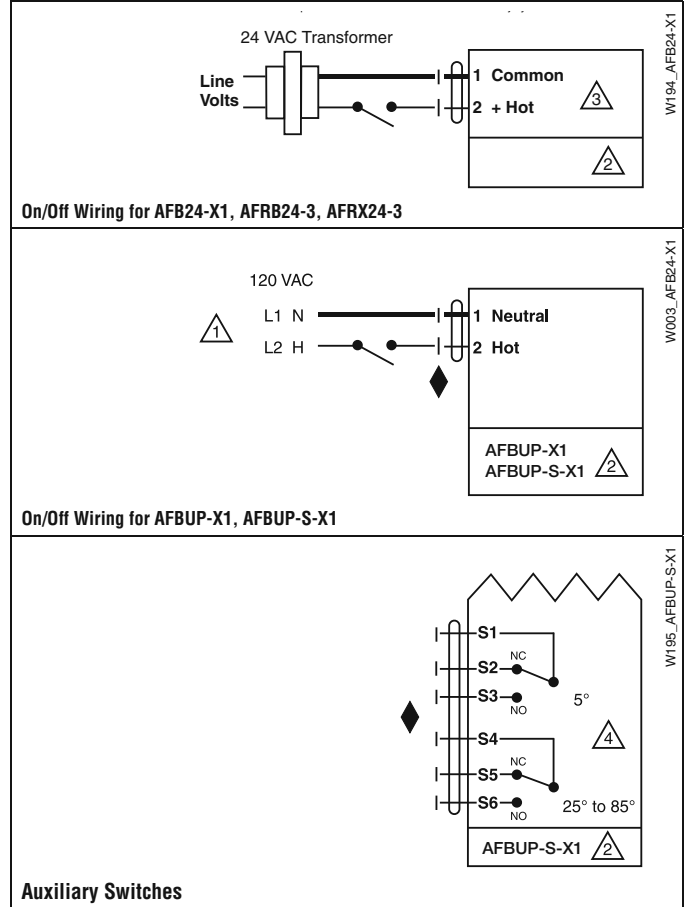
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc., AF24-S US incorporates 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.

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MFT

2
YEAR
WARRANTY



Models

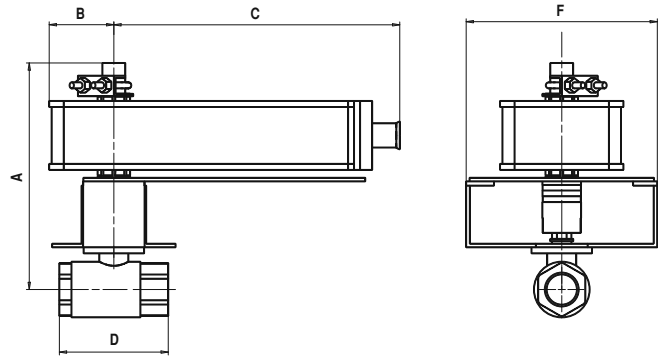
AFX24-MFT-X1
 AFX24-MFT-S-X1 w/built-in Aux. Switches
 AFX24-MFT95-X1
 AFRX24-MFT

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)

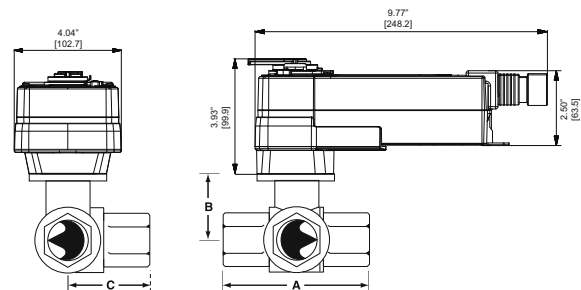
* Dual Mounted Actuators

Dimensions with 2-Way Valve



Valve Body	COP	Valve Nominal Size		Dimensions (Inches)				
		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 Body	COP	Valve Nominal Size		Dimensions (mm)		
		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]

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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.

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WD43

WD41

W302_AFBX2+MFT

W303

W195-AFX24-MFTS-X1

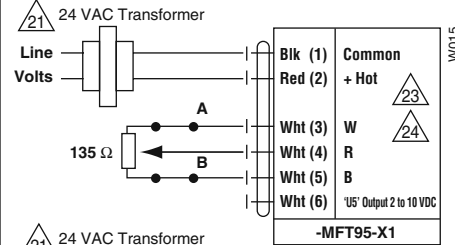
INSTALLATION NOTES

- 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. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

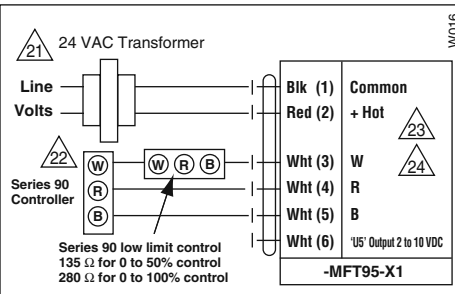
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

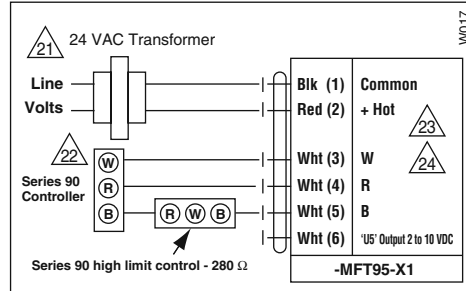
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



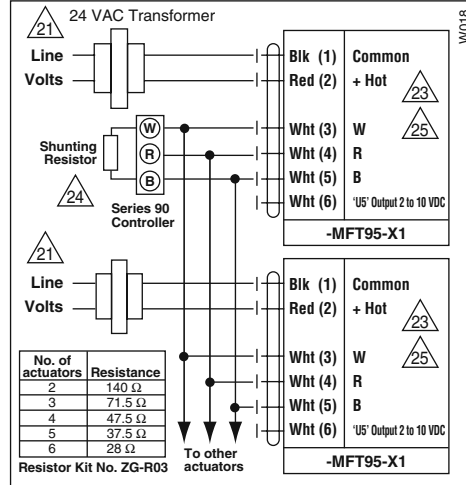
Low Limit Control



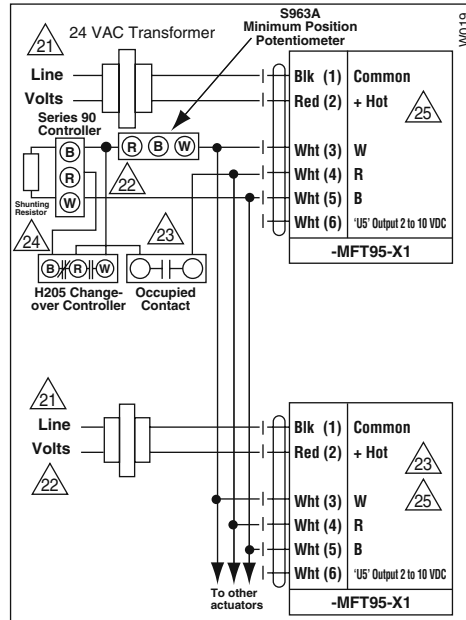
High Limit Control



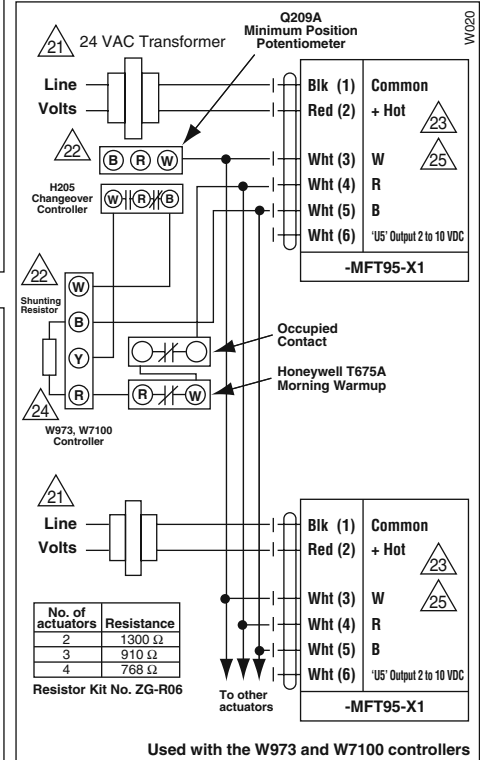
Wiring Multiple Actuators to a Series 90 Controller



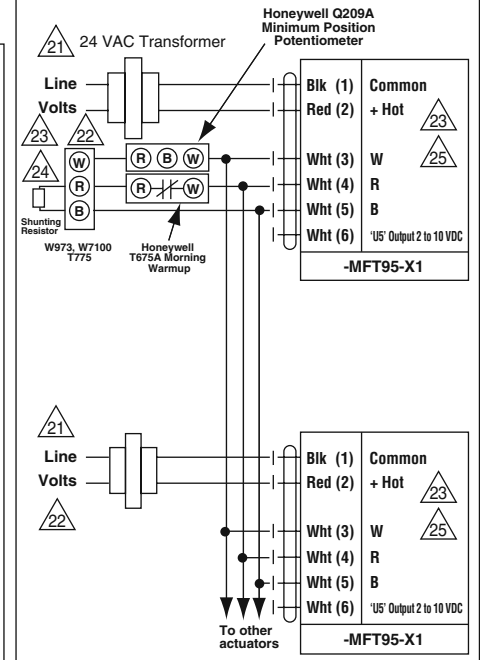
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer

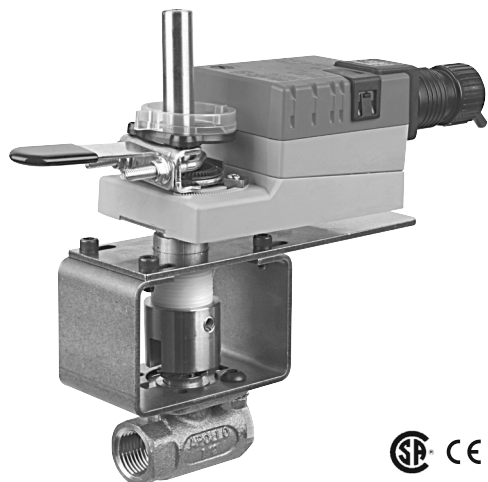


Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers



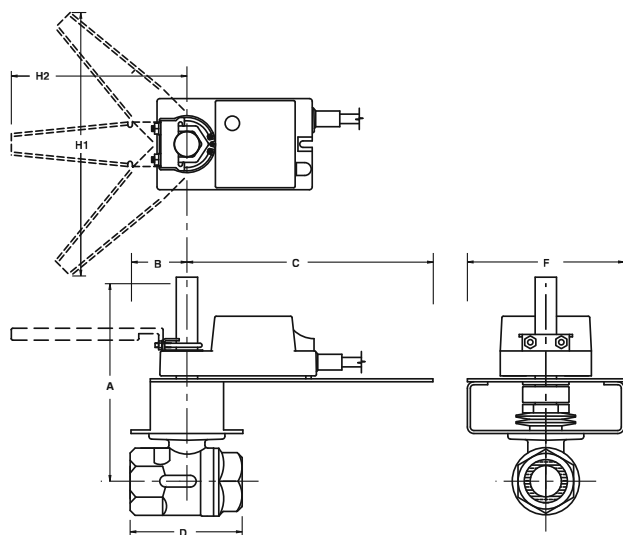


Models

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	½" conduit connector LMB24-3-X1 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

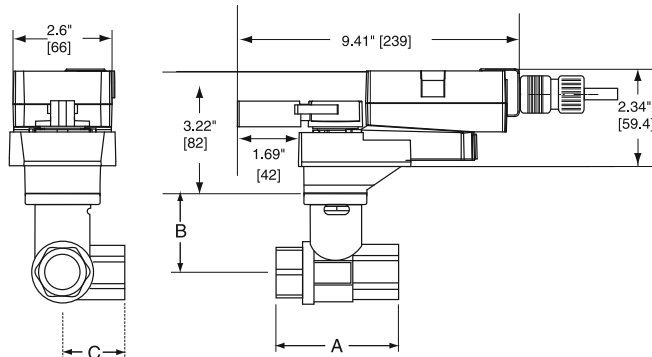
Dimensions with 2-Way Valve



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Valve Body	COP	Valve Nominal Size		Dimensions (Inches)							
		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 Body	COP	Valve Nominal Size		Dimensions (mm)		
		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

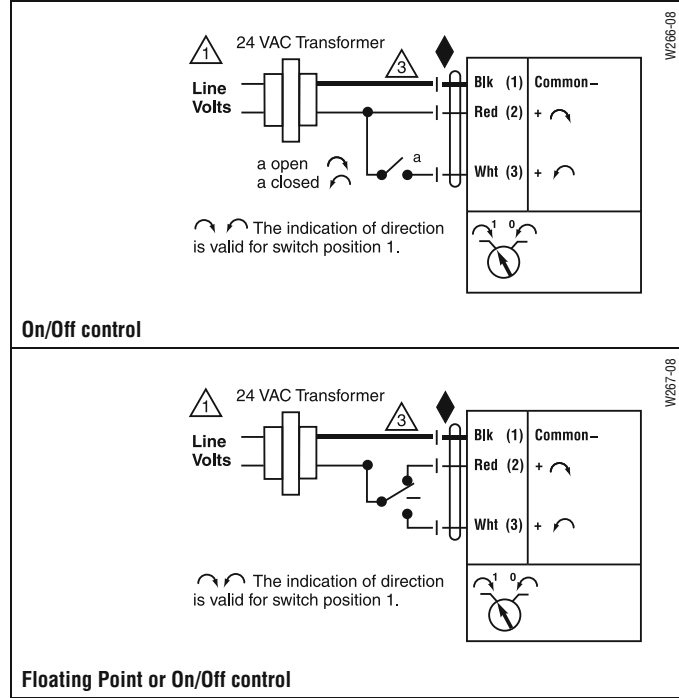
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.

📄 APPLICATION NOTES

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

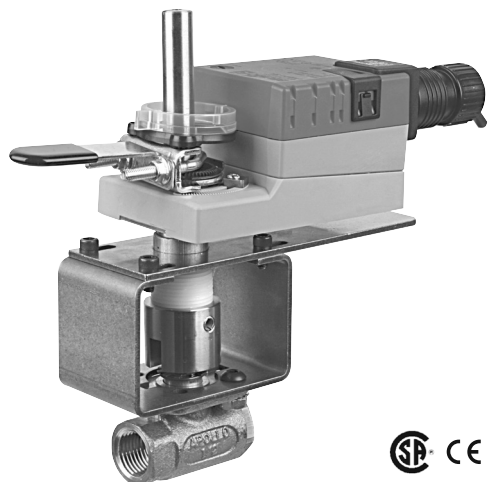
⚠️ WARNING Live Electrical Components!

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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.

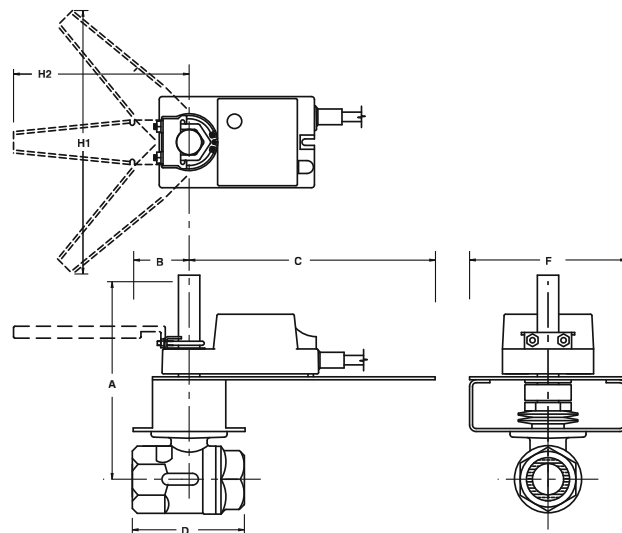


Models

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

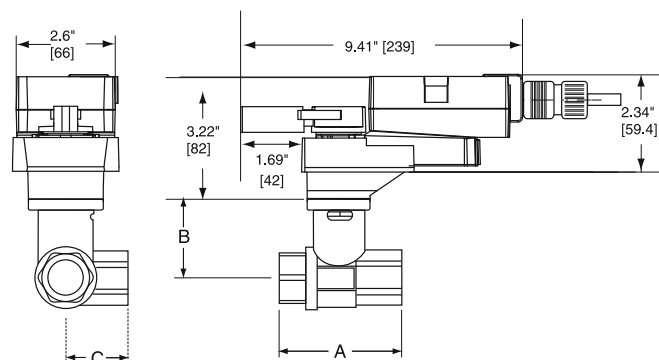


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Valve Nominal Size Dimensions (Inches)

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

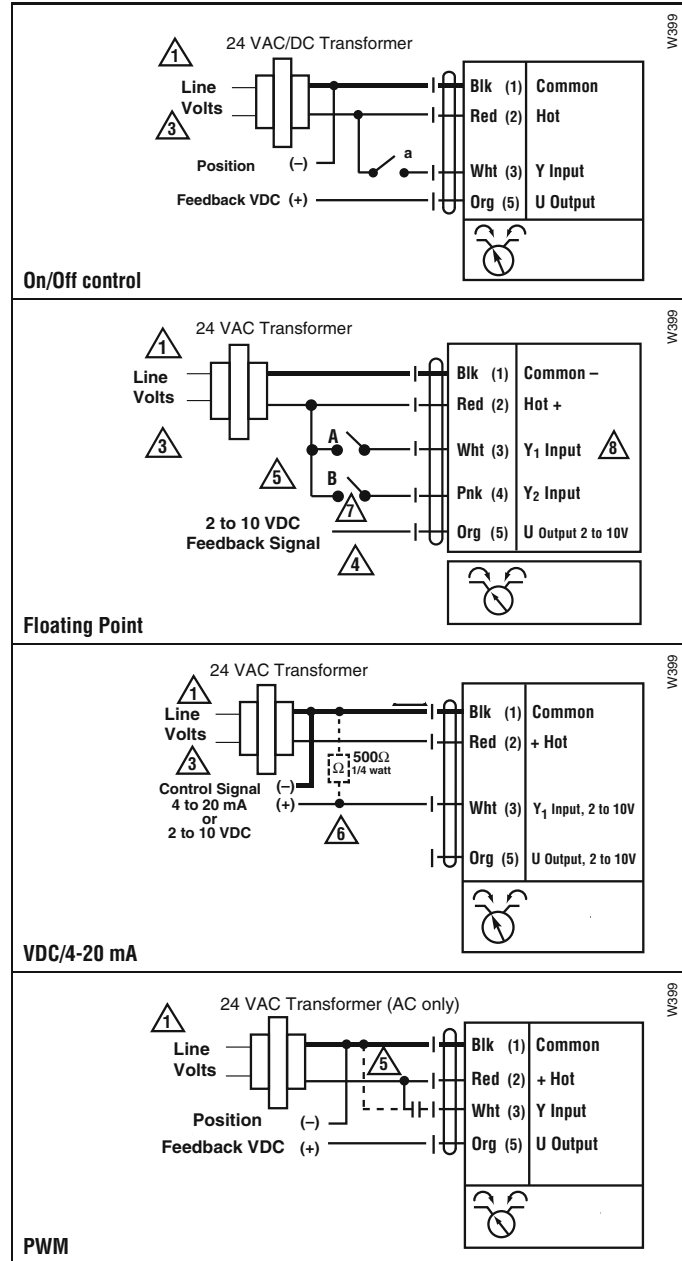


Valve Nominal Size Dimensions (mm)

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.



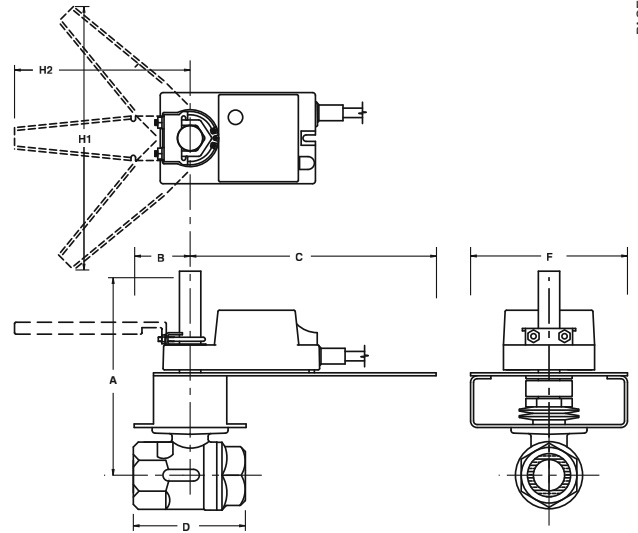


Models

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

Technical Data		
Control		on/off, floating point
Power supply		24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running	2.0 W
	holding	0.2 W
Transformer sizing		4 VA (class 2 power source)
Electrical connection		3 ft., 18 GA plenum rated cable NMB24-3-X1 1/2" 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



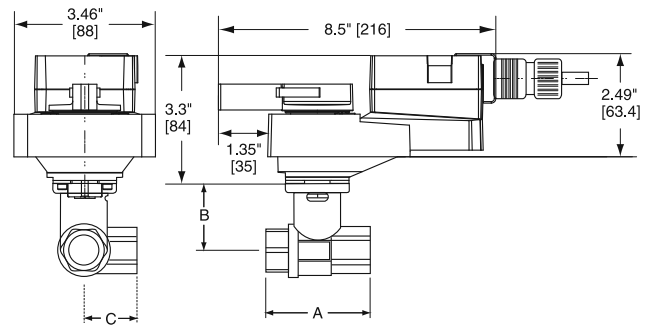
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Valve Nominal Size

Dimensions (Inches)

Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B219VS	400	3/4	20	6.70	2.00	8.00	3.00	6.25	9.75	8.50
B220VS	400	3/4	20	6.70	2.00	8.00	3.12	6.25	9.75	8.50
B2050VSS-15	1000	1/2	15	6.70	2.00	8.00	2.25	6.25	9.75	8.50
B219VSS	1000	3/4	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	1 1/4	32	4.13" [105]	2.00" [51]	2.19" [56]

Wiring Diagrams

✂️ INSTALLATION NOTES

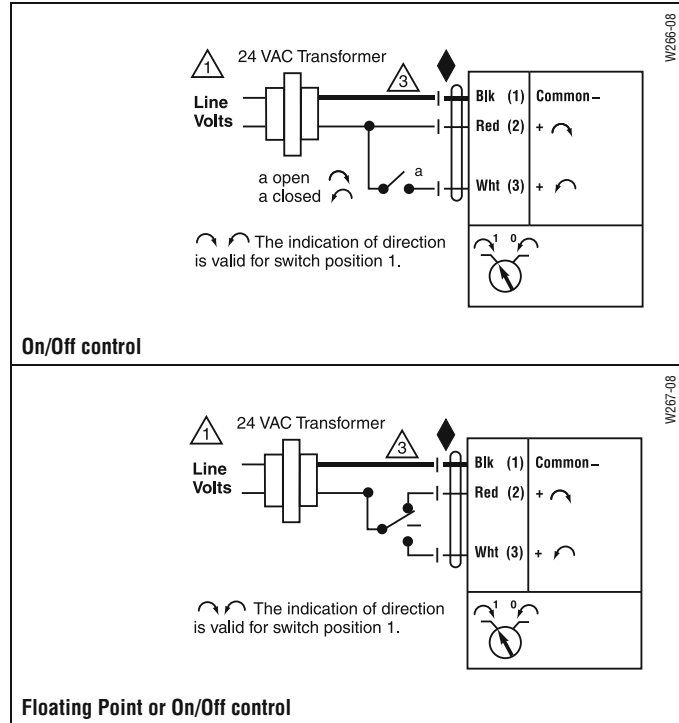
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.

📄 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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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.

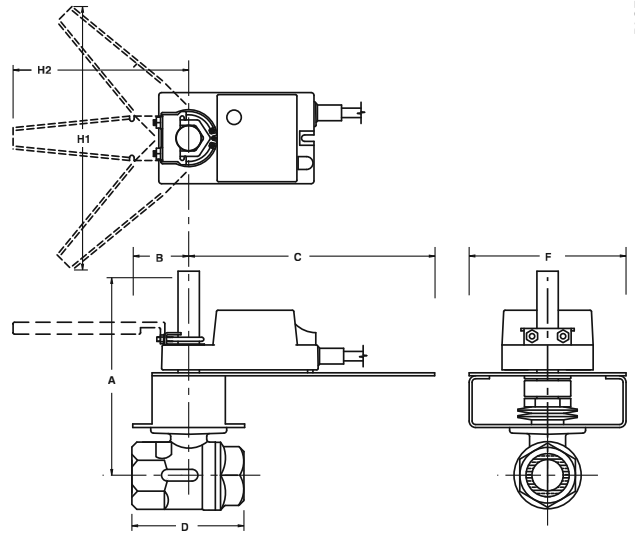


Models

NMX24-MFT-X1
NRX24-MFT

Technical Data	
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 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 k 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	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 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

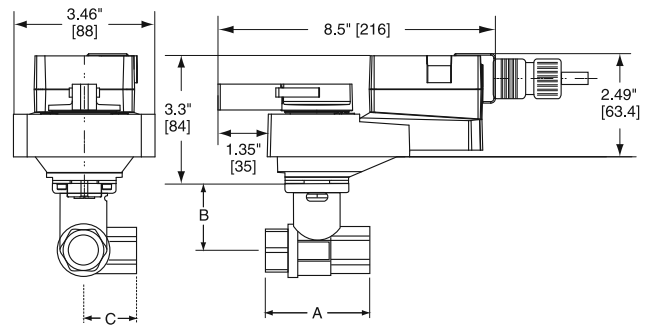


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Valve Nominal Size Dimensions (Inches)

Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
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

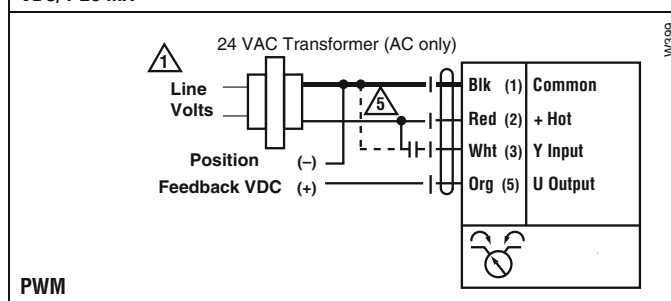
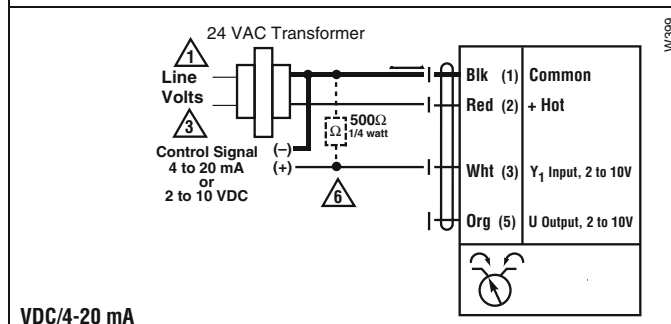
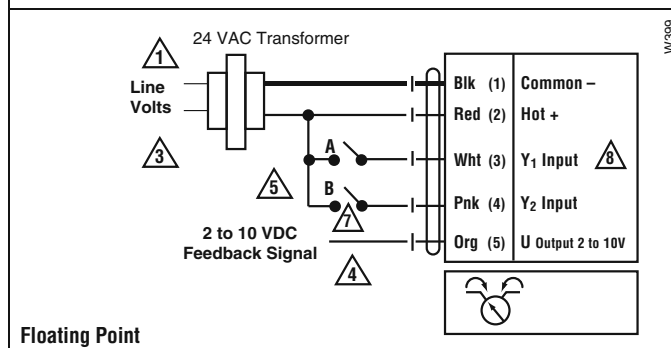
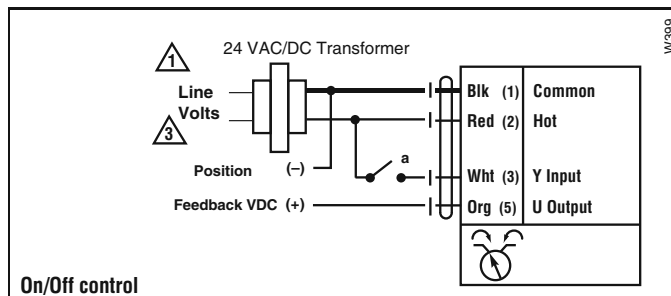


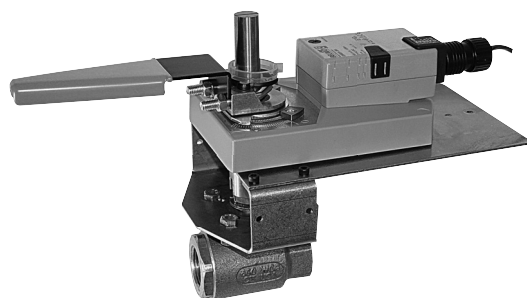
Valve Nominal Size Dimensions (mm)

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.



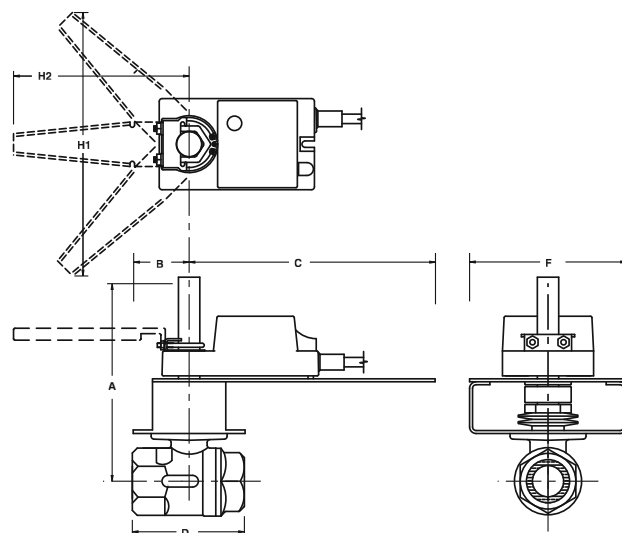


Models

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	½" conduit connector AMB24-3-X1 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

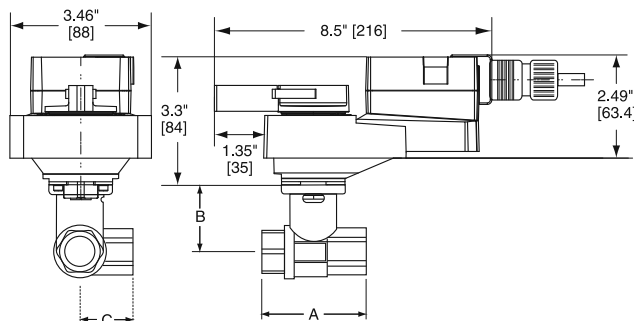


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Valve Nominal Size Dimensions (Inches)

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

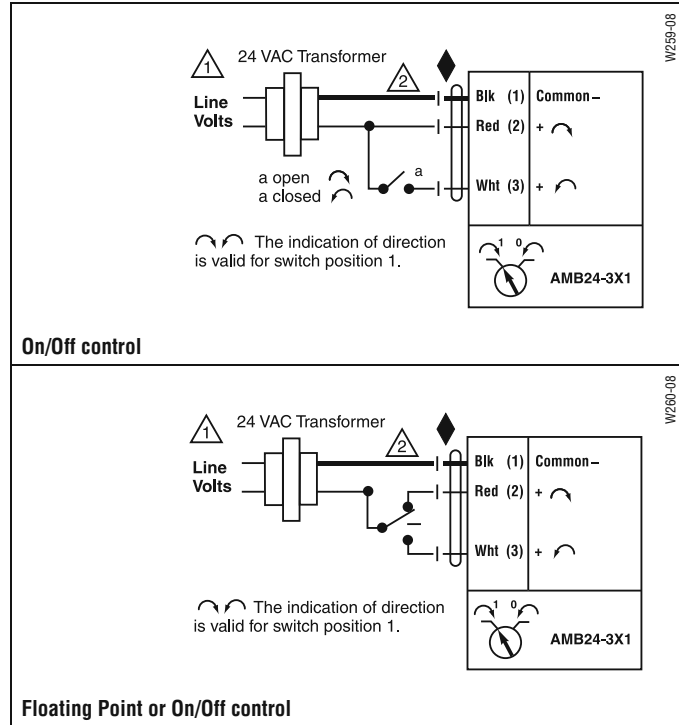
INSTALLATION NOTES

- 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

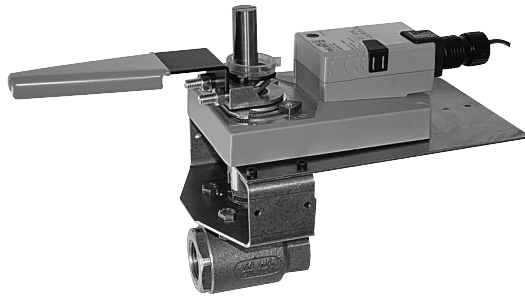
- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

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.



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.

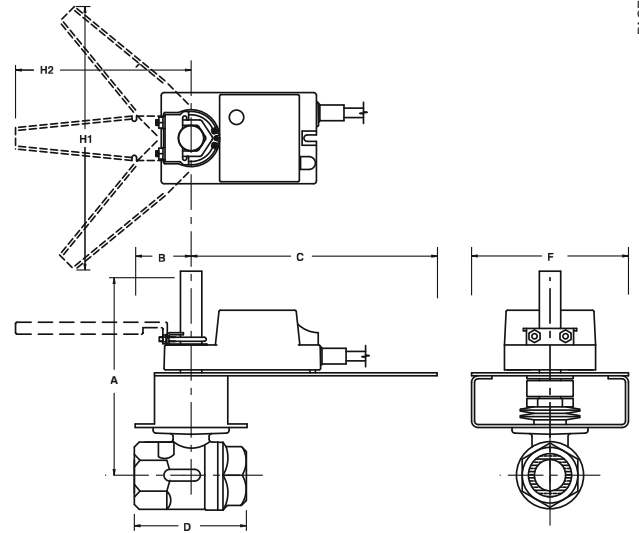


Models

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

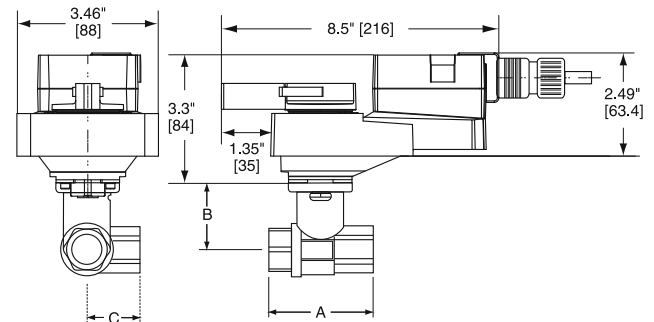


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Valve Nominal Size Dimensions (Inches)

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



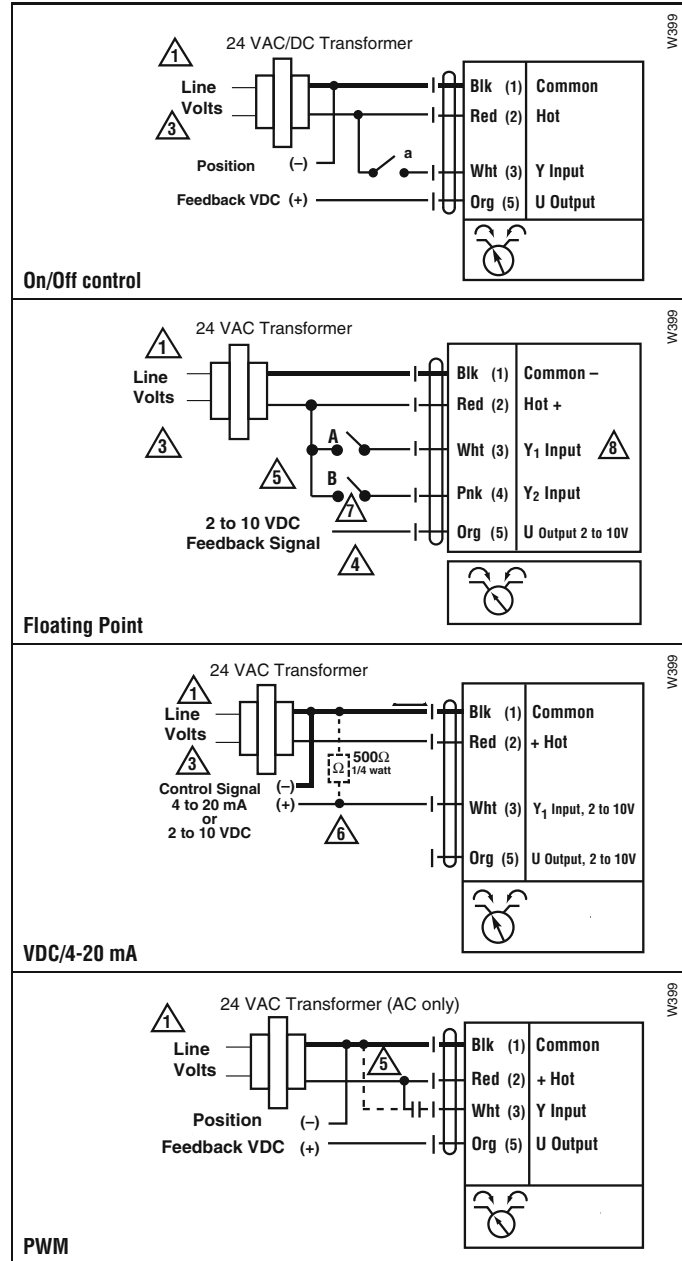
Valve Nominal Size Dimensions (mm)

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]

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





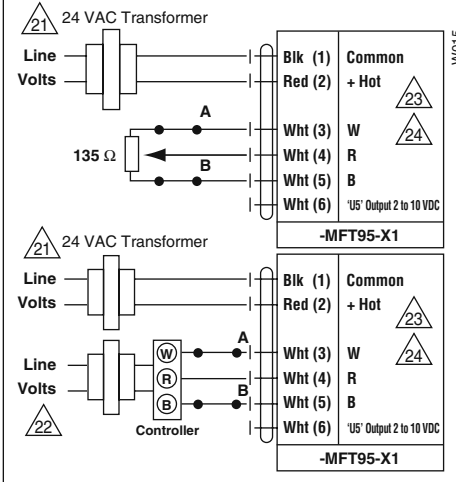
INSTALLATION NOTES

- 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.

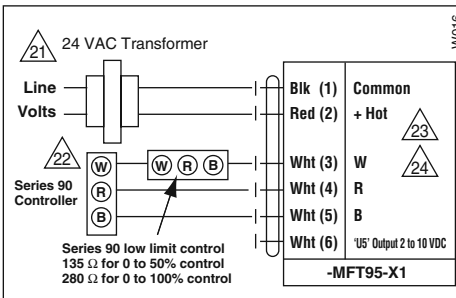
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

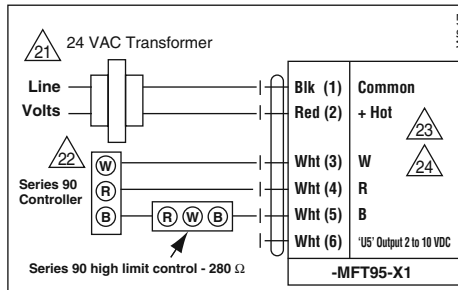
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



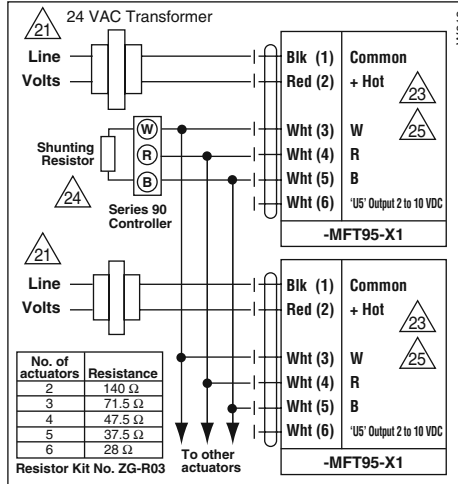
Low Limit Control



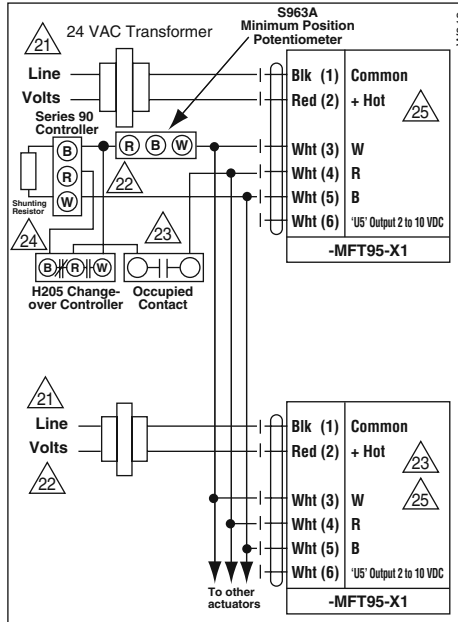
High Limit Control



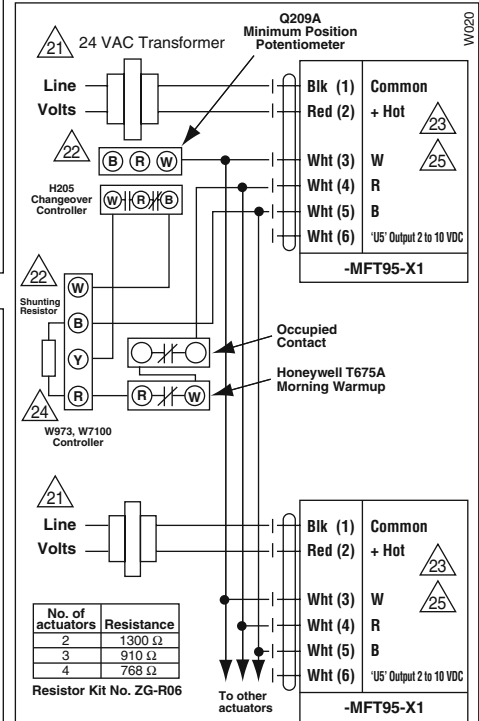
Wiring Multiple Actuators to a Series 90 Controller



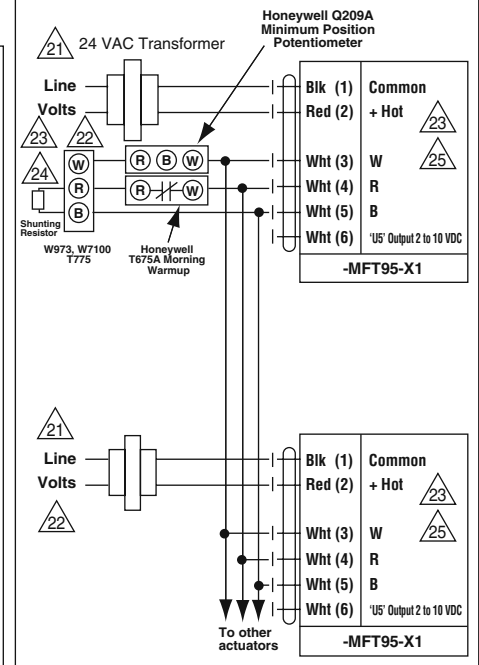
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



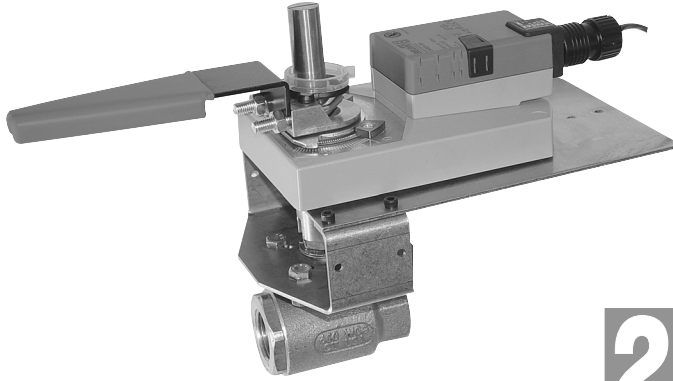
Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers



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

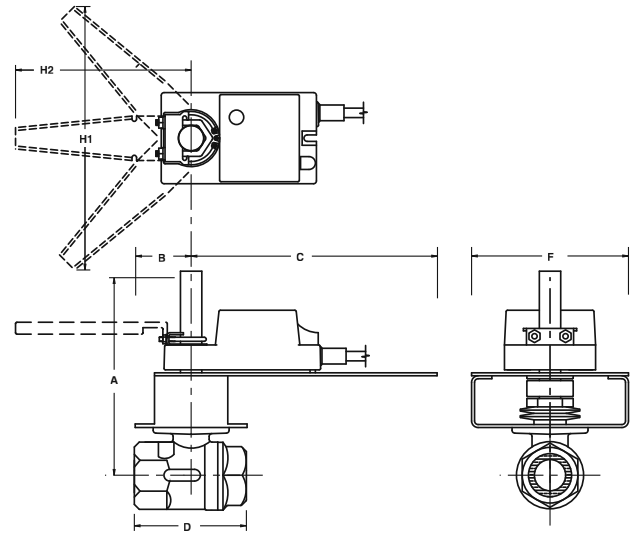


Models

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 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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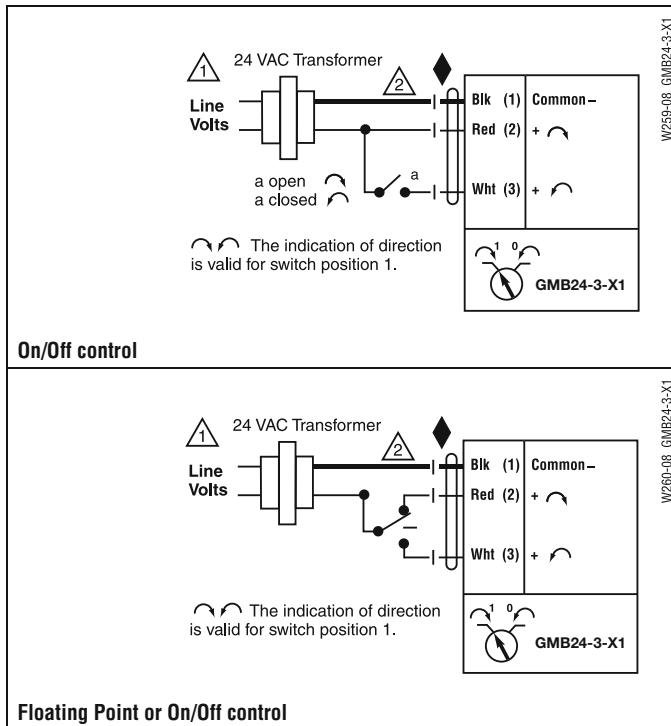
Valve Nominal Size

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

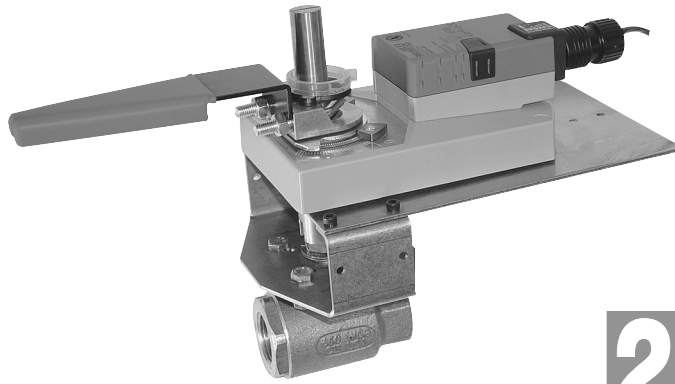
Wiring Diagrams

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



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.

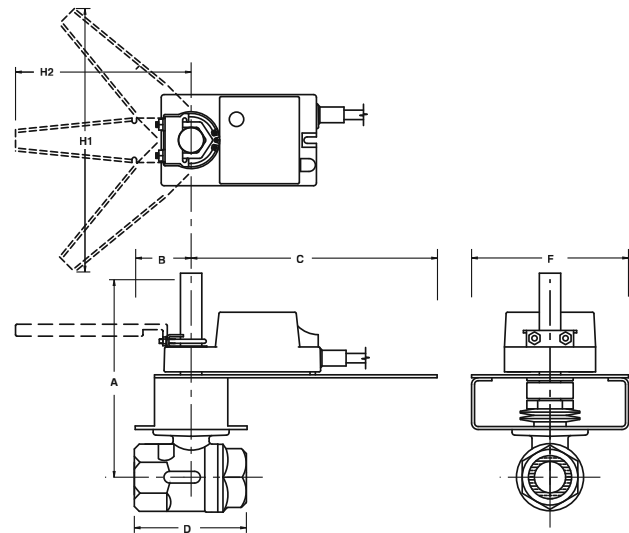


Models

GMX24-MFT-X1
GMX24-MFT95-X1

Technical Data	
Control	on/off, floating point, 2 to 10 VDC
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 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 1/2" conduit connector
Overload protection	electronic throughout stroke
Input impedance	100 k 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°
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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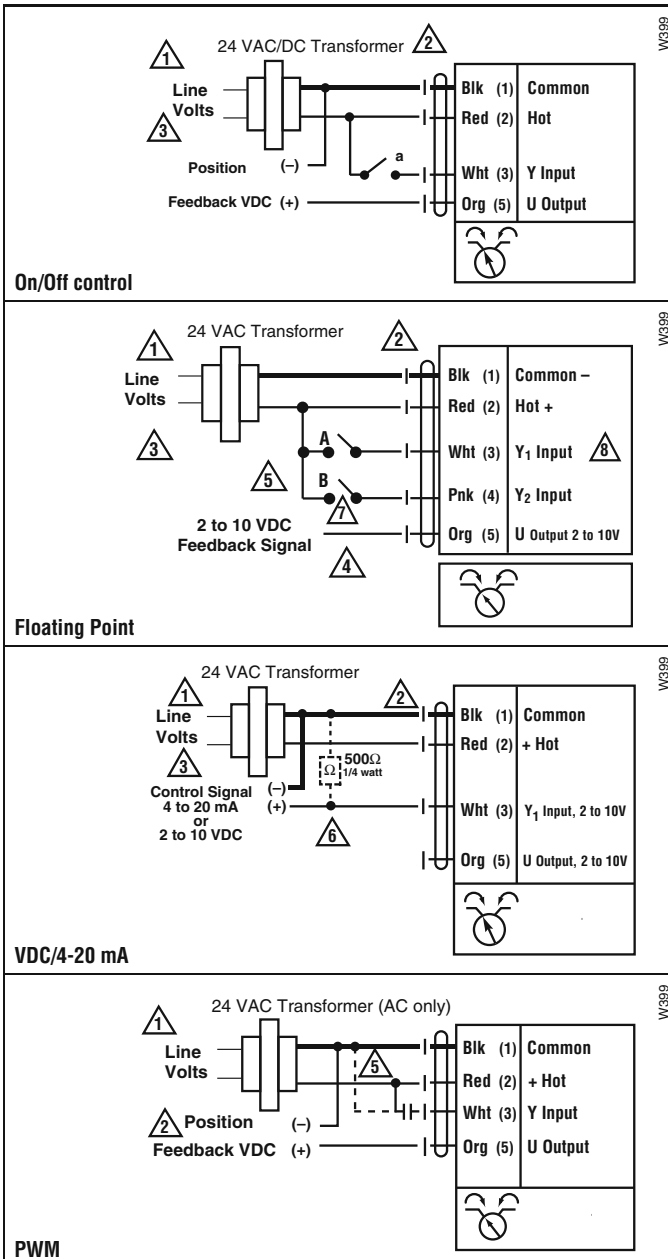
Valve Nominal Size

Dimensions (Inches)

Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B239VS	400	1 1/2	40	7.50	3.00	8.00	4.37	6.25	9.75	8.50
B240VS	400	1 1/2	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.
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- 6 ZG-R01 may be used.
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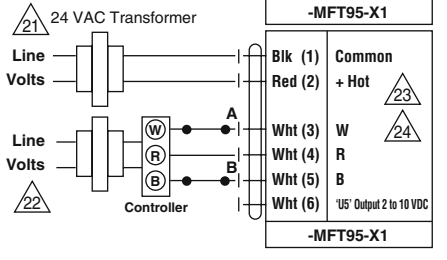
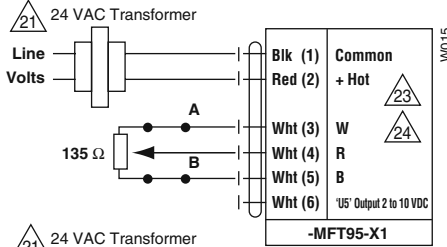
INSTALLATION NOTES

- 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. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

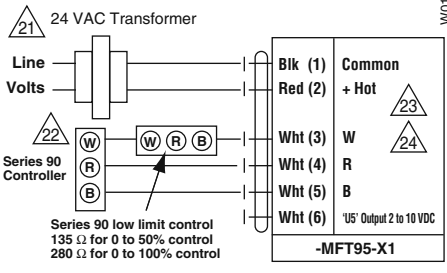
Override

Switch A	Switch B	Damper Position
		Damper Open
		Damper Closed

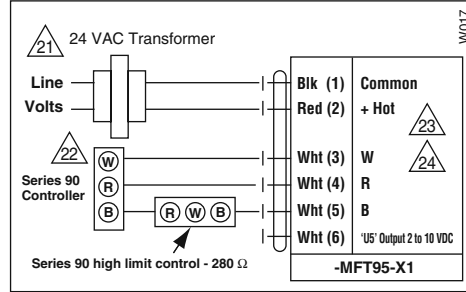
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



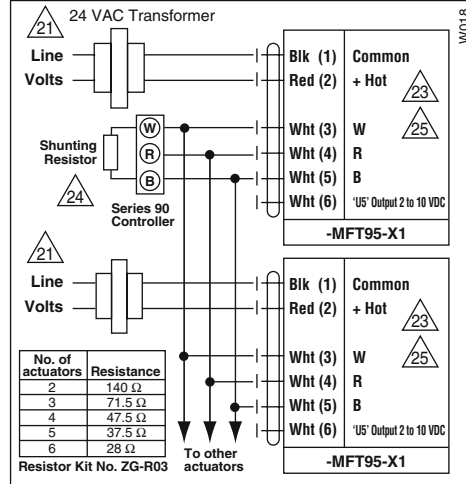
Low Limit Control



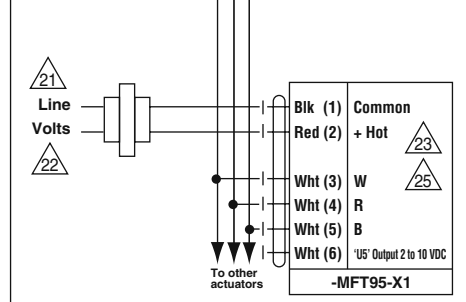
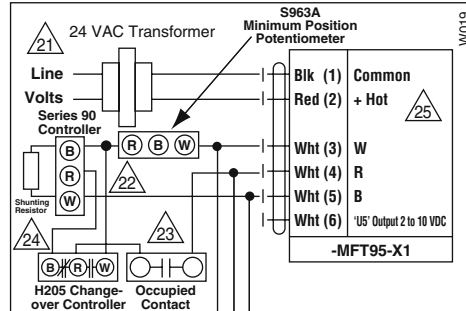
High Limit Control



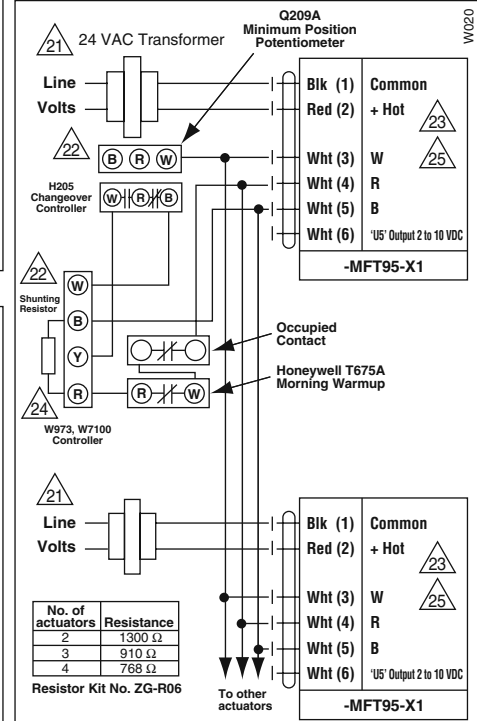
Wiring Multiple Actuators to a Series 90 Controller



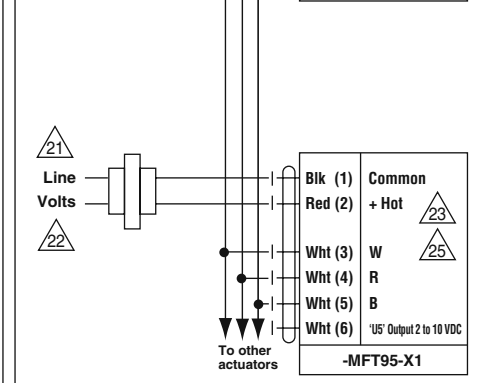
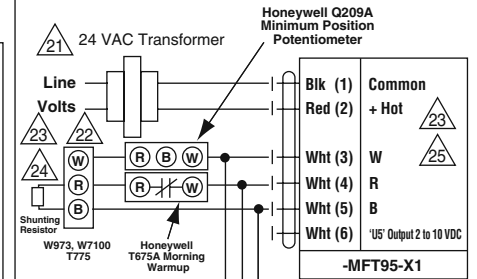
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



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



Used with the W973 and W7100 controllers





Models

SY1-24(P)
SY2-24MFT

Technical Data	
Power supply	24 VAC 50/60 Hz, single phase
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	SY1 H class insulation SY2... F class insulation
Geartrain	high alloy steel gear sets, self locking
Operating range	SY...-24 on/off SY...-24MFT 2-10 VDC, 4-20mA, 1-5 VDC
Sensitivity	SY...-24MFT 0.2 mA / 100mV
Feedback	SY...-24MFT 2-10 VDC, 4-20 mA
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	(2) SPDT, 10A 250VAC factory set for 3° and 87° change of state
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Attention

SY Series actuators are fractional horsepower devices, and utilize **full-wave power supplies**. Observe wire sizing and transformer sizing requirements. Proportional models CANNOT be connected to Belimo direct coupled (AF, AM, GM...etc) actuator power supplies or any type of half-wave device. You **MUST** use a separate, dedicated transformer or power supply to power the SY actuator. Please do not connect other automation equipment to the dedicated SY supply source. You **MUST** use four wires (plus a ground) to control a proportional control SY actuator (**See SY Wiring Section**).

Technical Data - continued

Power Consumption	
SY1-24(P)	1.8A
SY2-24MFT	3.0A
Torque	
SY1-24(P)	35 Nm / 310 in-lbs
SY2-24MFT	90 Nm / 801 in-lbs
Manual Override	
SY1-24(P)	8mm wrench
SY2-24	hand wheel
Running Time	
SY1-24(P)	15 seconds
SY2-24MFT	15 seconds

Wiring Diagrams

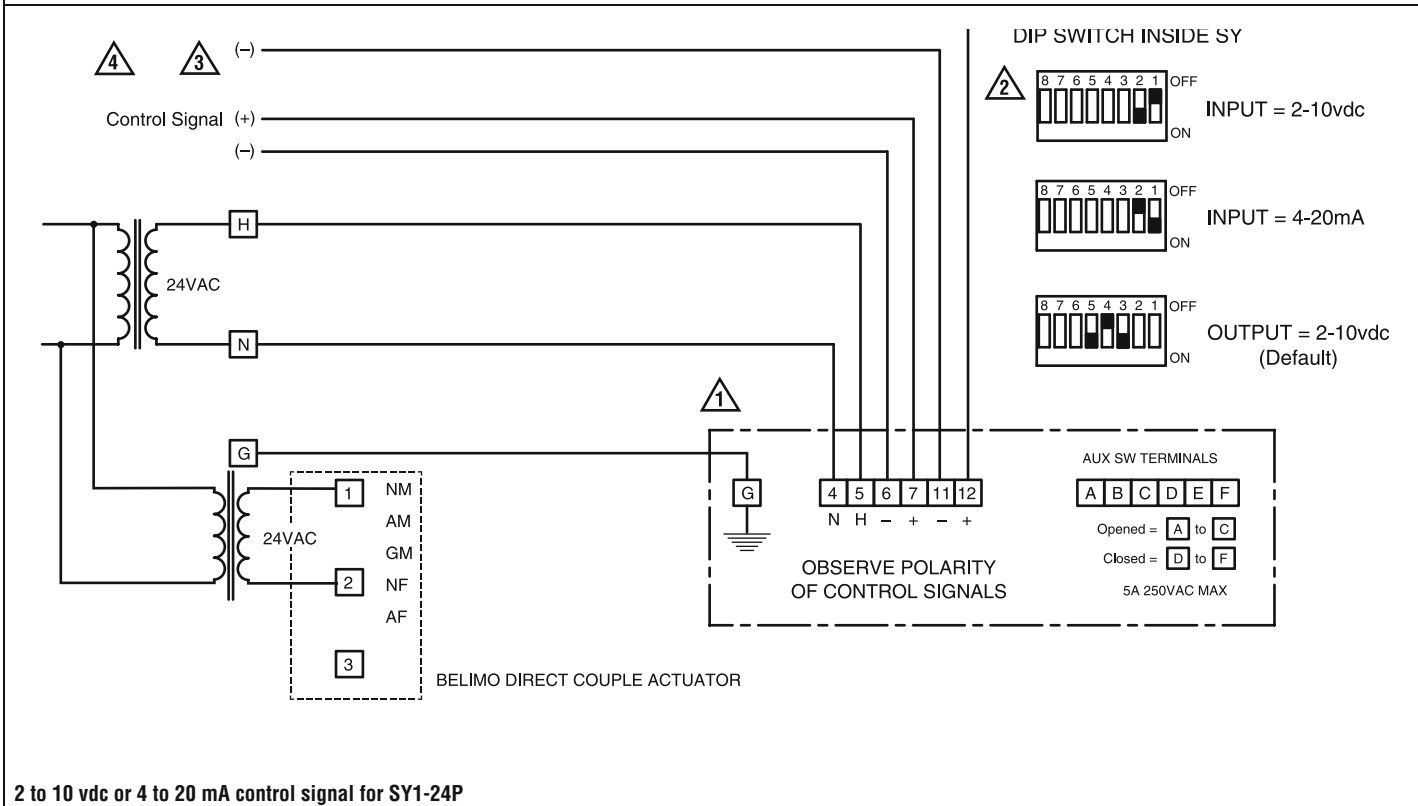
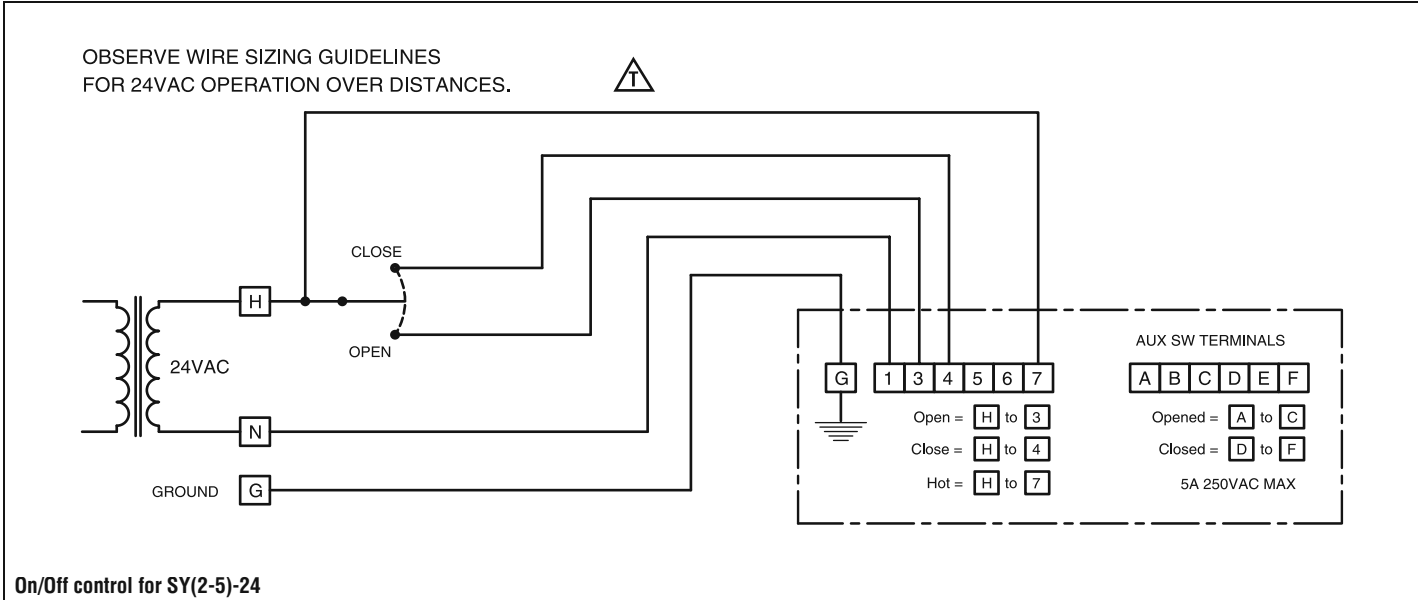
✂️ INSTALLATION NOTES

- Transformer sizing = SY actuator draw X 1.25 (safety margin)
EXAMPLE: SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer.
- There can be no connection (internal to automation controller, external wiring, or otherwise) between actuator supply neutral & control signal reference. These actuators are full wave devices. Any connection to half wave equipment will result in equipment damage.
- Do not change sensitivity or dip switch settings with power applied.

Terminals 6 & 11 can be common when control and feedback signals are both set for 2-10VDC operation.

Use of feedback is optional.

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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Models

SY1-110(P)
SY2-110
SY2-120MFT

Technical Data	
Power supply	120 VAC 50/60 Hz, single phase
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	SY1 H class insulation SY2... F class insulation
Geartrain	high alloy steel gear sets, self locking
Operating range	SY...-110 on/off, floating point SY...-120MFT 2-10 VDC 4-20 mA, 1-5 VDC
Sensitivity	SY...-120MFT 0.2 mA / 100mV
Feedback	SY...120MFT 2-10 VDC, 4-20 mA
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	(2) SPDT, 5A 250 VAC factory set for 5° and 85° change of state
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on the HDU and HD butterfly valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC, 120 VAC and 230 VAC.

Technical Data - <i>continued</i>	
Power Consumption	
SY1-110(P)	0.5A
SY2-120MFT	1.0A
SY2-110	1.1A
Torque	
SY1-110(P)	35 Nm / 310 in-lbs
SY2-120MFT	90 Nm / 801 in-lbs
SY2-110	90 Nm / 801 in-lbs
Manual Override	
SY1-110(P)	8mm wrench
SY2-120MFT	hand wheel
SY2-110	hand wheel
Running Time	
	50 Hz 60 Hz
SY1-110(P)	13 seconds 12 seconds
SY2-120MFT	17 seconds 15 seconds
SY2-110	19 seconds 16 seconds

Wiring Diagrams

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



Recommended twisted shielded pair for control wiring. Ground shielded wire at control panel chassis. Tape back ground at actuator.



Use of feedback is optional.



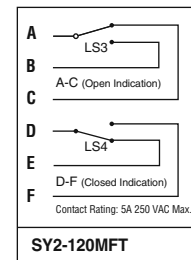
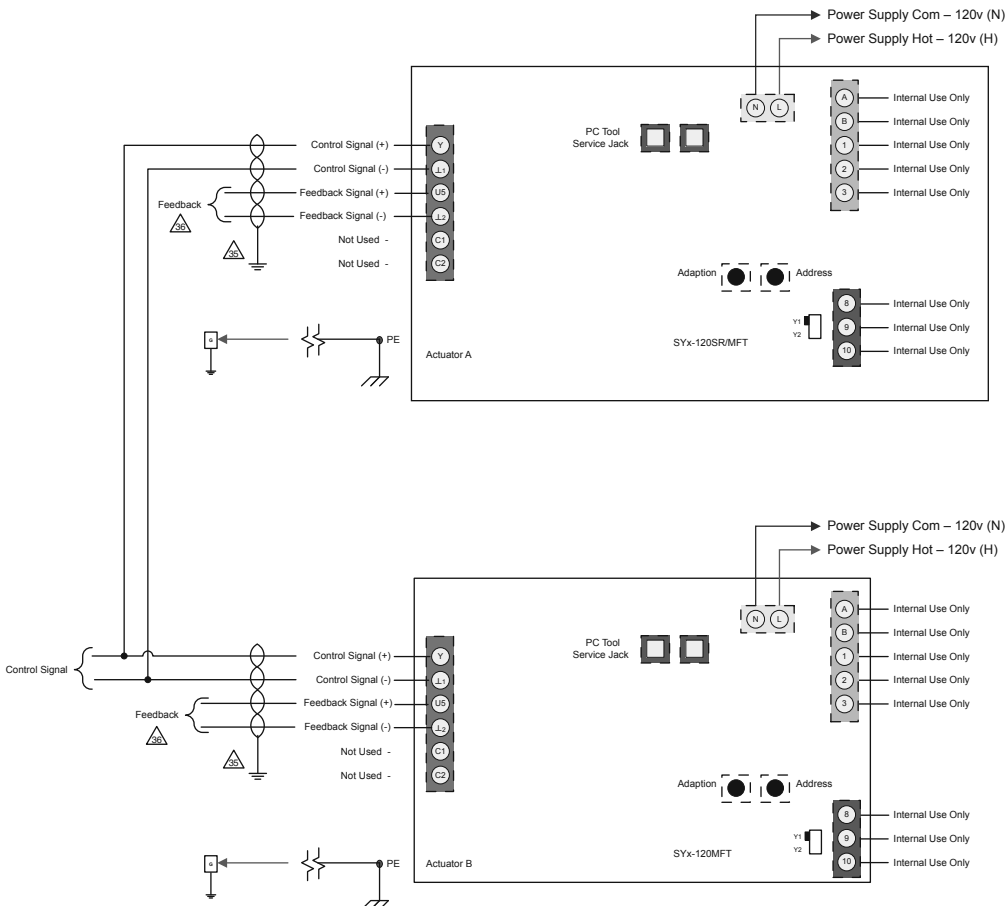
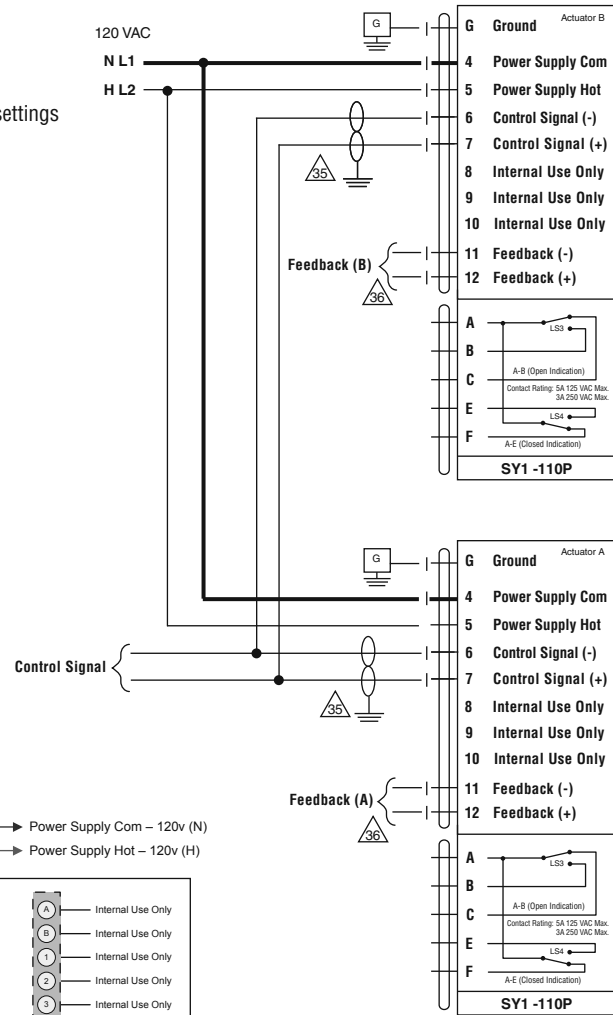
NOTES SY1-110P

- **Caution:** Power supply voltage.
- Do not change sensitivity or dip switch settings with power applied.



NOTES SY2-120MFT

- **Caution:** Power supply voltage.





Models

SY1-220(P)
SY2-230MFT

Technical Data	
Power supply	230 VAC 50/60 Hz, single phase
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	SY1 H class insulation SY2... F class insulation
Geartrain	high alloy steel gear sets, self locking
Operating range	SY...-220 on/off, floating point SY...-230MFT 2-10 VDC, 4-20 mA, 1-5 VDC
Sensitivity	SY...-230MFT 0.2 mA / 200mV
Feedback	SY...-230MFT 2-10 VDC, 4-20 mA
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	(2) SPDT, 5A 250VAC factory set for 5° and 85° change of state
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Attention

SY Series actuators are fractional horsepower devices, and utilize **full-wave power supplies**. Observe wire sizing and transformer sizing requirements. Proportional models CANNOT be connected to Belimo direct coupled (AF, AM, GM...etc) actuator power supplies or any type of half-wave device. You **MUST** use a separate, dedicated transformer or power supply to power the SY actuator. Please do not connect other automation equipment to the dedicated SY supply source. You **MUST** use four wires (plus a ground) to control a proportional control SY actuator (**See SY Wiring Section**).

Technical Data - Continued		
Power consumption		
SY1-220(P)	0.3A	
SY2-230MFT	0.5A	
Torque		
SY1-220(P)	35 Nm / 310 in-lbs	
SY2-230MFT	90 Nm / 801 in-lbs	
Manual Override		
SY1-220(P)	8mm wrench	
SY2-230MFT	hand wheel	
Running Time		
	50 Hz	60 Hz
SY1-220(P)	13 seconds	12 seconds
SY2-230MFT	17 seconds	15 seconds

Wiring Diagrams

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



Recommended twisted shielded pair for control wiring. Ground shielded wire at control panel chassis. Tape back ground at actuator.



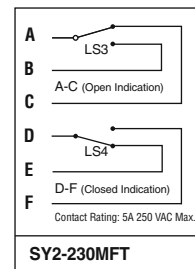
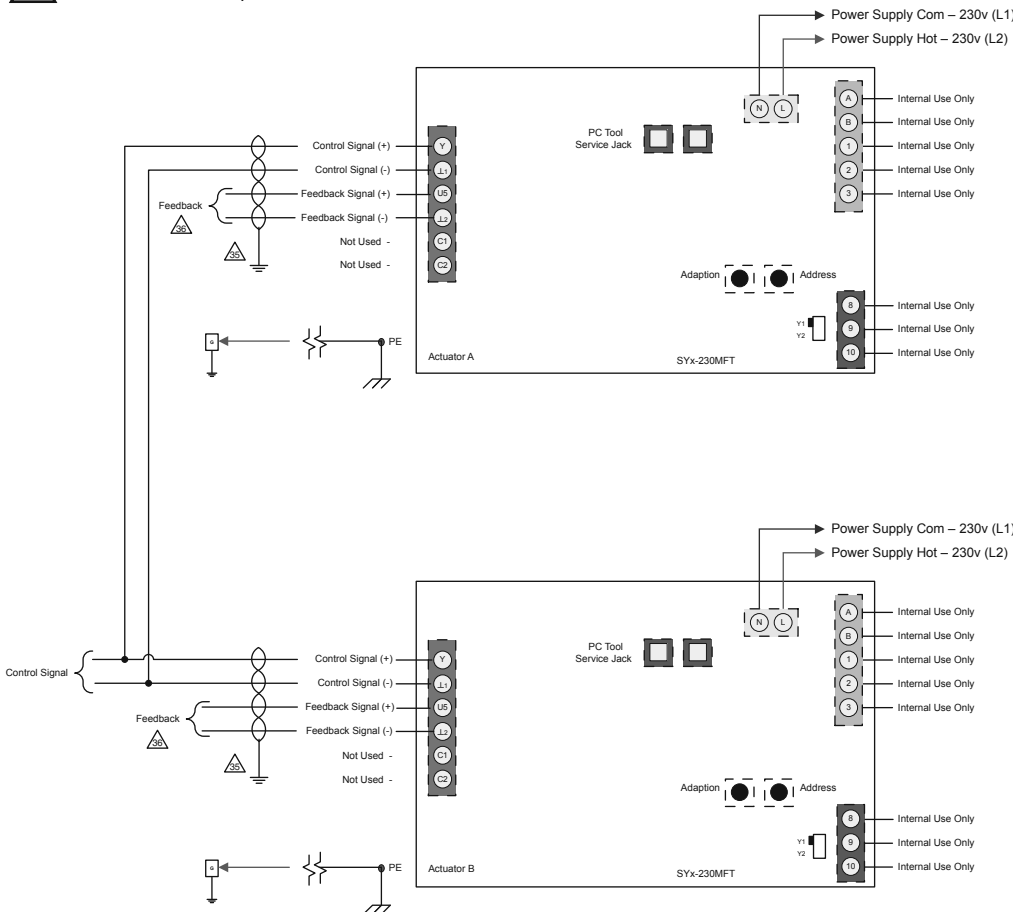
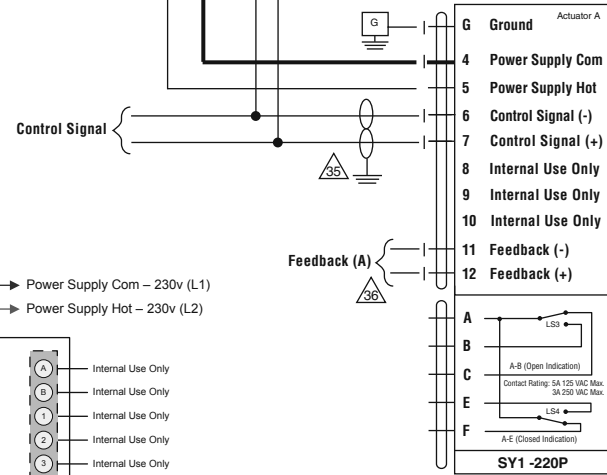
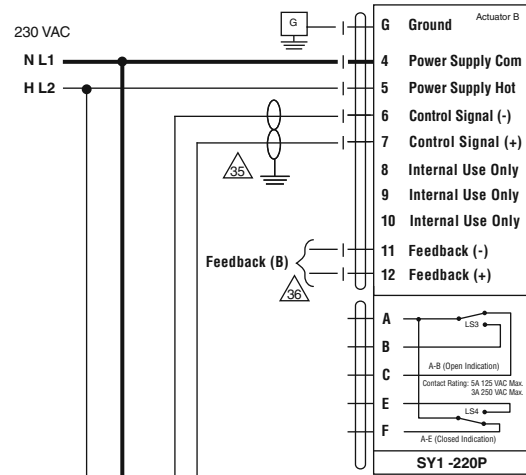
Use of feedback is optional.

NOTES SY1-220P

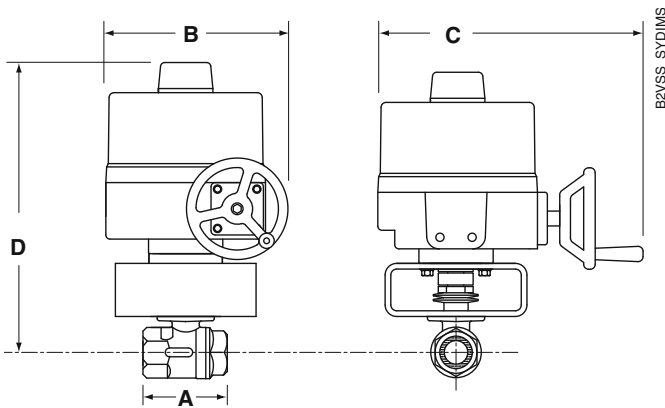
- **Caution:** Power supply voltage.
- Do not change sensitivity or dip switch settings with power applied.

NOTES SY2-230MFT

- **Caution:** Power supply voltage.



Dimensions with 2-Way Valves



Valve Nominal Size Dimensions (Inches)




	Valve Body	COP	Inches	DN [mm]	A	B	C	D
SY1	B2050VS-01	600	½"	15	2.25	4.00	6.25	8.00
	B2050VS-02	600	½"	15	2.25	4.00	6.25	8.00
	B2050VS-04	600	½"	15	2.25	4.00	6.25	8.00
	B2050VS-15	600	½"	15	2.25	4.00	6.25	8.00
SY1 & SY2	B219VS	600	¾"	20	3.00	4.00	6.25	8.00
	B220VS	600	¾"	20	3.12	4.00	6.25	3.12
	B224VS	600	1"	25	3.37	4.00	6.25	16.00
	B225VS	600	1"	25	3.62	4.00	6.25	9.00
	B232VS	600	1¼"	32	3.97	4.00	6.25	9.50
SY2	B239VS	600	1½"	40	4.37	4.00	6.25	17.50
	B240VS	600	1½"	40	4.75	8.00	13.00	19.00
	B249VS	600	2"	50	4.68	8.00	13.00	19.50
	B250VS	600	2"	50	5.37	8.00	13.00	20.00
	B265VS	600	2½"	65	6.25	8.00	13.00	20.00

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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						•		•	•		•	•	•
		Butterfly Valves						•			•				
	ZS-BVVS-0002 For LM actuator series on VS/VSS models	Ball Valves										•			
	ZS-BVVS-0003 For LF actuator series on VS/VSS models	Ball Valves							•						


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	<i>Available for all MFT Actuators</i>								
	ZK6-GEN Cable for use with ZTH US to connect to SY actuator via RJ11 port	Ball Valves								•
		Butterfly Valves								•

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BATTERY BACKUP		VALVES	LM/LR	NM/NR	AM	GM	AR	GR/DR	EV	RV	PR	SY	
	NSV24 US Battery backup module	Ball Valves	•	•	•	•							
		Globe Valves							•	•			
		Butterfly Valves						•	•			•	
	NSV-BAT 12VDC 1.2 AH battery (2 required)	Ball Valves	•	•	•	•							
		Globe Valves							•	•			
		Butterfly Valves						•	•			•	
	EXT-NSV-B01-120* Battery backup system for SY1 - SY3 120 VAC, on/off actuators	Ball Valves										•	
		Butterfly Valves										•	
	EXT-NSV-B02-120* Battery backup system for SY1 - SY3 120 VAC, MFT actuators	Ball Valves											•
		Butterfly Valves											•
	EXT-NSV-B11-24* Battery backup system for SY1 24 VAC, on/off actuators	Ball Valves											•
		Butterfly Valves											•
	EXT-NSV-B12-24* Battery backup system for SY1 24 VAC, MFT actuators	Ball Valves											•
		Butterfly Valves											•
	EXT-NSV-B21-230* Battery backup system for SY1 - SY3 230 VAC, on/off actuators	Ball Valves											•
		Butterfly Valves											•
	EXT-NSV-B22-230* Battery backup system for SY1 - SY3 230 VAC, MFT actuators	Ball Valves											•
	EXT-NSV-B03-120* Battery backup system for SY4 - SY6 120 VAC, on/off actuators	Butterfly Valves											•
	EXT-NSV-B04-120* Battery backup system for SY4 - SY6 120 VAC, MFT actuators												•
	EXT-NSV-B05-120* Battery backup system for SY7 - SY12 120 VAC, on/off actuators												•
	EXT-NSV-B06-120* Battery backup system for SY7 - SY12 120 VAC, MFT actuators												•
	EXT-NSV-B13-24* Battery backup system for SY2 - SY5 24 VAC, on/off actuators												•
EXT-NSV-B14-24* Battery backup system for SY2 - SY5 24 VAC, MFT actuators												•	
EXT-NSV-B23-230* Battery backup system for SY4 - SY6 230 VAC, on/off actuators												•	
EXT-NSV-B24-230* Battery backup system for SY4 - SY6 230 VAC, MFT actuators												•	
EXT-NSV-B25-230* Battery backup system for SY7 - SY12 230 VAC, on/off actuators												•	
EXT-NSV-B26-230* Battery backup system for SY7 - SY12 230 VAC, MFT actuators												•	


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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		•	•	•	•	•	•
		VALVES	LV/SV	EV	RV	LVK/SVK	AVK	SY
	S2A-GV Auxiliary switch 2x SPDT, 3A (0.5A inductive) @ 250 VAC for LV, SV, EV, and AVK series actuators.	Energy Valves		•			•	
		ePIV		•			•	
		Globe Valves	•	•	•	•	•	
SY-1000-FB01 Feedback potentiometer 1000 Ω, 2 position, factory installed option only	Ball Valves							•
	Butterfly Valves							•
SY-1000-FB02 Feedback potentiometer 1000 Ω, modulating (models Syx...P, -SR or MFT), factory installed option only	Ball Valves							•
	Butterfly Valves							•

ELECTRIC DISCONNECT		VALVES	SY
	HOA-120V Local electric disconnect for SY2-SY12 110/230V - 2 position	Ball Valves	•
		Butterfly Valves	•
	HOA-120VMFT Local electric disconnect for SY2-SY12 110/230V - modulating	Ball Valves	•
		Butterfly Valves	•
	HOA-24V Local electric disconnect for SY2-SY12 24V - 2 position	Ball Valves	•
		Butterfly Valves	•
	HOA-24VMFT Local electric disconnect for SY2-SY12 24V - modulating	Ball Valves	•
		Butterfly Valves	•

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PROGRAMMING TOOLS		
	<p>Near Field Communication (NFC) App Allows fast programming, commissioning, and troubleshooting even when the actuator is not powered. Available through Google Play</p>	<p><i>Where Available on NFC Labeled Actuators Only</i></p>
	<p>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</p>	<p><i>Available for all MFT Actuators</i></p>
	<p>ZTH US Handheld interface module that allows field programming. Includes ZK1-GEN, ZK2-GEN, and ZK6-GEN cables</p>	<p><i>Available for all MFT Actuators</i></p>

COVERS		
	<p>ZS-T Terminal cover for NEMA 2, -T models</p>	<p><i>Available for all -T Model Actuators (except TR)</i></p>



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