



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

Application

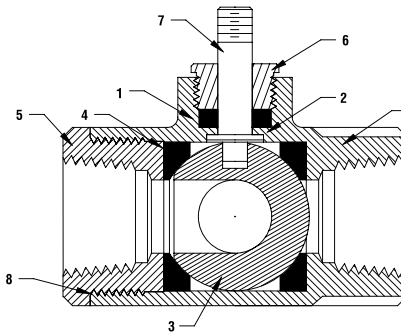
These threaded valves are designed to provide modulating or two position control of hot or chilled water and saturated steam systems under 50 psi.

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
- 1/2" - 2000 PSIG WOG, Cold Non-Shock.
- Federal Specification: WW-V-35C, Type II,
Composition: SS
Style: 3

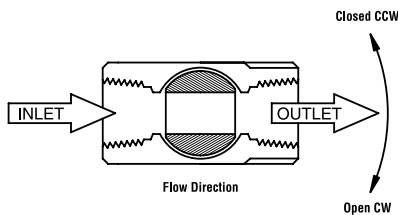
Technical Data	
Media	Chilled or hot water, glycol, 50# steam
Flow Characteristic	Modified equal percentage
Action	90° rotation valve open CW, valve closed CCW
Sizes	1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2"
Type of end fitting	SAE NPT (Female Connections)
Materials:	
1 Stem Packing	Reinforced PTFE
2 Stem Bearing	Reinforced PTFE
3 Ball	316 Stainless Steel
4 Seat (x2)	Reinforced PTFE w/ Durafill
5 Retainer	B16 (3/4" - 1") Brass B584 (1 1/4" - 3") Brass
6 Gland	A276-316
7 Stem	316 Stainless Steel
8 Jam Nut	Stainless Steel
9 Body Seal	PTFE (1 1/4" to 3")
10 Body	A351-CF8M 316 Stainless Steel

C _v	Valve Nominal Size		Type	Suitable Return Actuators	
	Inches	DN [mm]		Spring	Non-Spring
15	1/2	15	B2050VSS-15	LF Series	NM Series
30	3/4	20	B219VSS		
43	1	25	B224VSS	AF Series	AM Series
48	1 1/4	32	B232VSS		
84	1 1/2	40	B239VSS		
108	2	50	B249VSS		
503	2 1/2	65	B265VSS	GM Series	SY Series



Pressure rating	2000 psig WOG (1/2" - 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



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Models

SY1-24(P)
 SY2-24MFT
 SY3-24MFT
 SY4-24MFT
 SY5-24MFT

Technical Data	
Power supply	24 VAC 50/60Hz, single phase
Electrical Connection	½" Conduit Connector, screw terminals
Overload Protection	Thermally Protected 135°C cut-out
Motor Protection	SY1 H Class Insulation SY2... - SY5... F Class Insulation
Geartrain	High Alloy Steel gear sets, self locking
Operating Range	SY...-24 On/Off SY...-24MFT 2-10vdc, 4-20mA, 1-5vdc
Sensitivity	SY...-24MFT 0.2mA / 100mV
Feedback	SY...-24MFT 2-10vdc, 4-20mA
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
SY3-24MFT	3.0A
SY4-24MFT	6.0A
SY5-24MFT	6.5A
Torque	
SY1-24(P)	35 Nm / 310 in-lb
SY2-24MFT	90 Nm / 801 in-lb
SY3-24MFT	150 Nm / 1335 in-lb
SY4-24MFT	400 Nm / 3560 in-lb
SY5-24MFT	500 Nm / 4450 in-lb
Manual Override	
SY1-24(P)	8mm Wrench
SY2-24 - SY5-24	Hand Wheel
Running Time	
SY1-24(P)	15 seconds
SY2-24MFT	15 seconds
SY3-24MFT	22 seconds
SY4-24MFT	16 seconds
SY5-24MFT	22 seconds

Wiring Diagrams

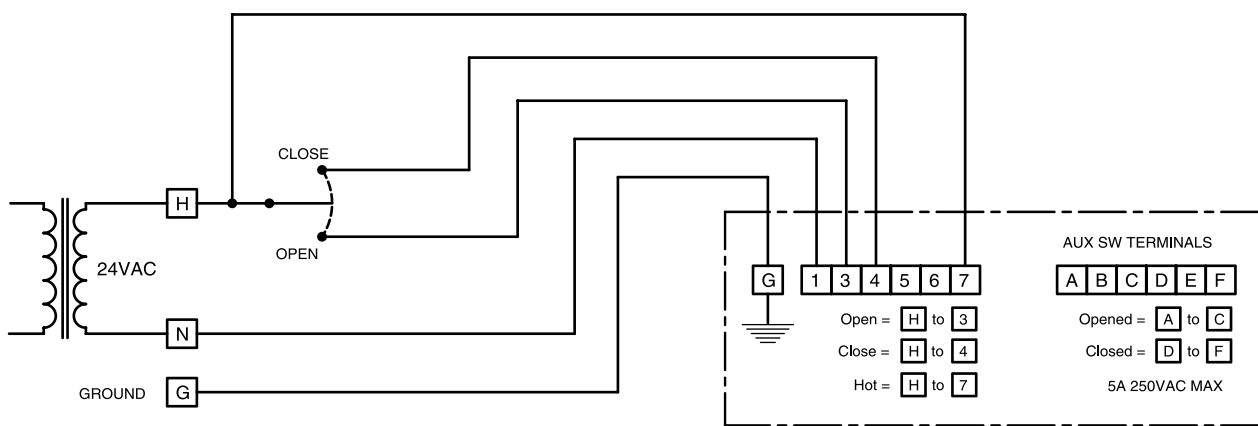
✂️ INSTALLATION NOTES

- T** 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.
- 1** 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.
- 2** Do not change sensitivity or dip switch settings with power applied.

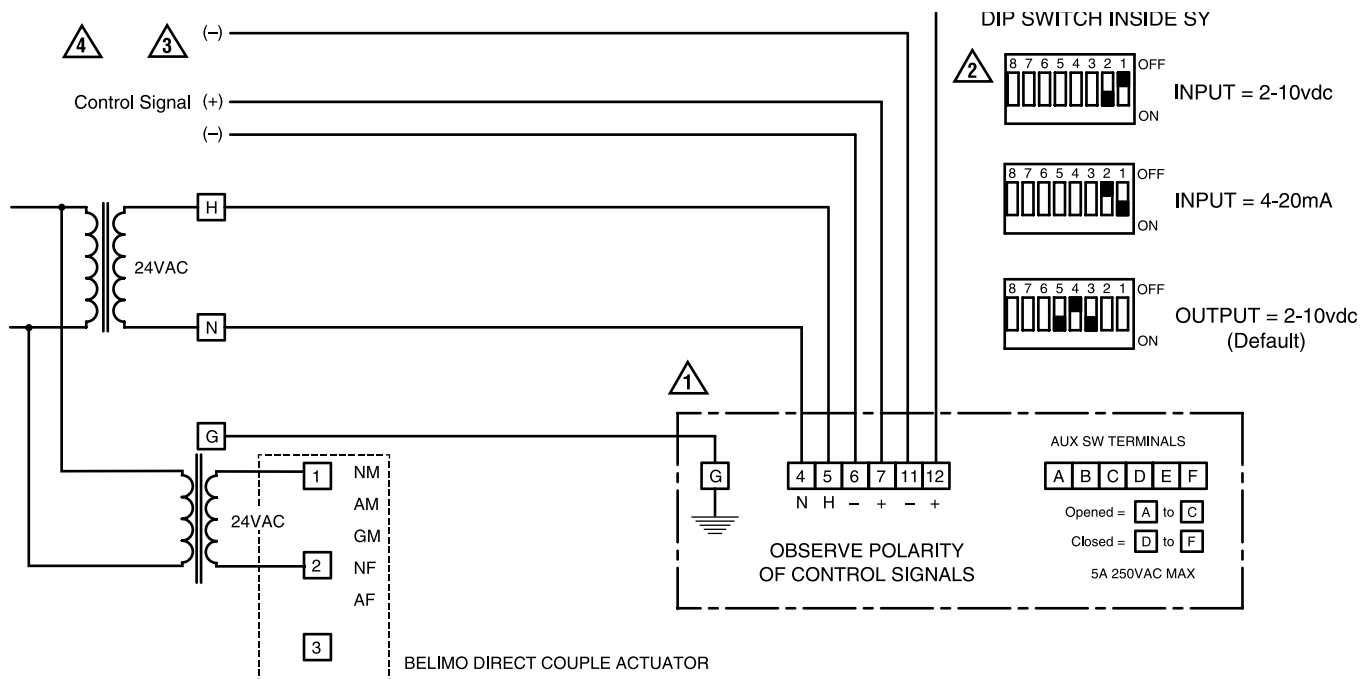
- 3** Terminals 6 & 11 can be common when control and feedback signals are both set for 2-10VDC operation.
- 4** Use of feedback is optional.

⚠️ 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.

OBSERVE WIRE SIZING GUIDELINES FOR 24VAC OPERATION OVER DISTANCES.



On/Off control for SY(2-5)-24



2 to 10 vdc or 4 to 20 mA control signal for SY1-24P

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Models

- SY1-110(P)
- SY2-120MFT
- SY3-120MFT
- SY4-120MFT
- SY5-120MFT
- SY6-120MFT
- SY7-120MFT
- SY8-120MFT

Technical Data		
Power supply		120 VAC 50/60Hz, single phase
Electrical Connection		1/2" Conduit Connector, screw terminals
Overload Protection		Thermally Protected 135°C cut-out
Motor Protection	SY1	H Class Insulation
	SY2... - SY8...	F Class Insulation
Geartrain		High Alloy Steel gear sets, self locking
Operating Range	SY...-110	On/Off, Floating Point
	SY...-120MFT	2-10VDC 4-20mA, 1-5vdc
Sensitivity	SY...-120MFT	0.2mA / 100mV
Feedback	SY...120MFT	2-10VDC, 4-20mA
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

Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on the HSU and HS 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
SY3-120MFT		1.0A
SY4-120MFT		1.3A
SY5-120MFT		1.5A
SY6-120MFT		1.8A
SY7-120MFT		3.2A
SY8-120MFT		4.0A
Torque		
SY1-110(P)		35 Nm / 310 in-lb
SY2-120MFT		90 Nm / 801 in-lb
SY3-120MFT		150 Nm / 1335 in-lb
SY4-120MFT		400 Nm / 3560 in-lb
SY5-120MFT		500 Nm / 4450 in-lb
SY6-120MFT		650 Nm / 5785 in-lb
SY7-120MFT		1000 Nm / 8900 in-lb
SY8-120MFT		1500 Nm / 13350 in-lb
Manual Override		
SY1-110(P)		8mm Wrench
SY2-120MFT – SY8-120MFT		Hand Wheel
Running Time		
	50hz	60hz
SY1-110(P)	13 seconds	12 seconds
SY2-120MFT	17 seconds	15 seconds
SY3-120MFT	26 seconds	22 seconds
SY4-120MFT	18 seconds	16 seconds
SY5-120MFT	25 seconds	22 seconds
SY6-120MFT	31 seconds	28 seconds
SY7-120MFT	55 seconds	46 seconds
SY8-120MFT	55 seconds	46 seconds

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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.



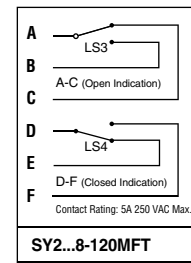
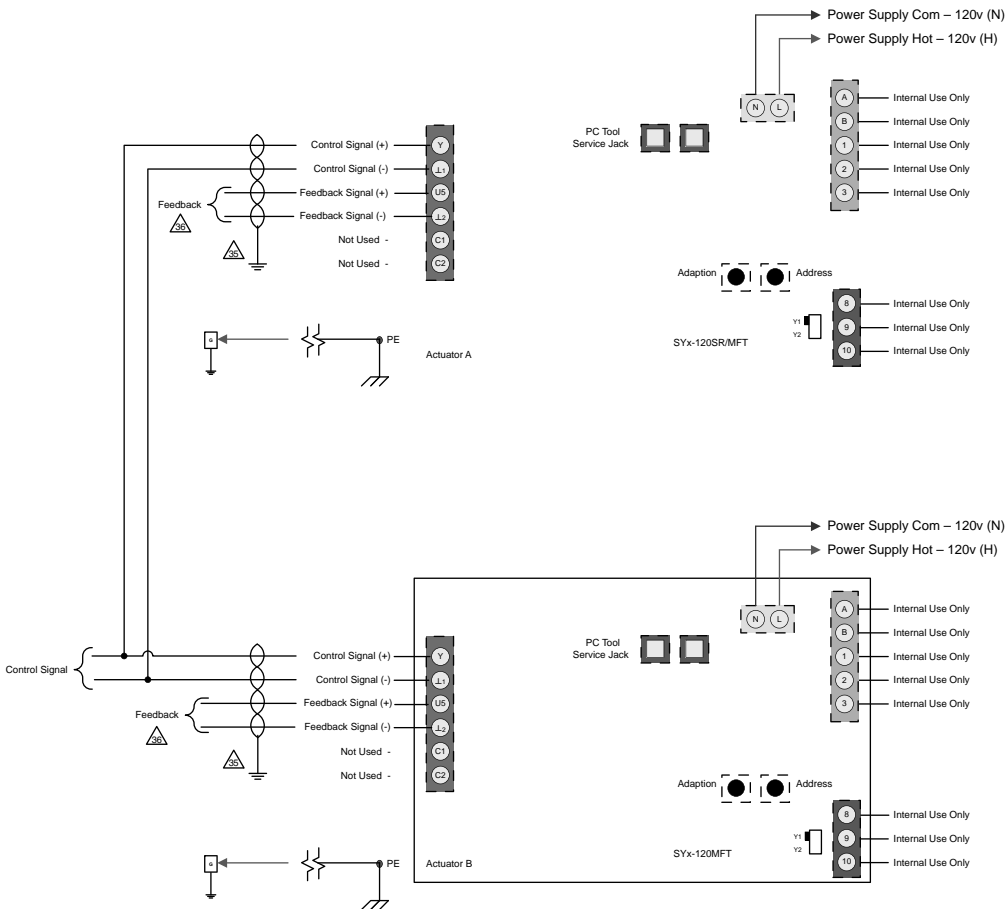
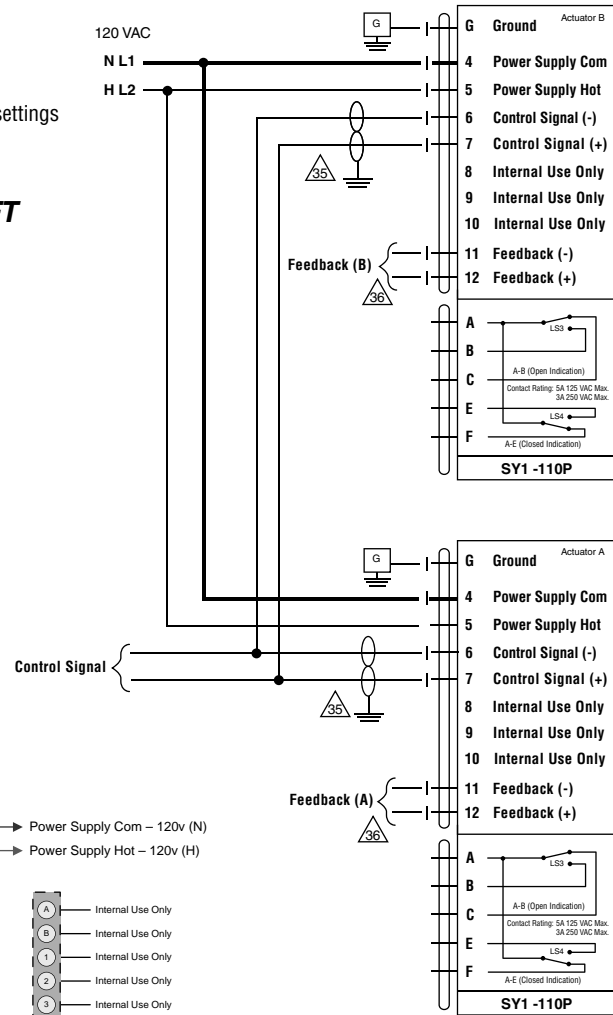
NOTES SY1-110P

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



NOTES SY2...8-120MFT

- **Caution:** Power supply voltage.





Models

SY1-220(P)
 SY2-230MFT
 SY3-230MFT
 SY4-230MFT
 SY5-230MFT
 SY6-230MFT

Technical Data	
Power supply	230 VAC 50/60Hz, single phase
Electrical Connection	1/2" Conduit Connector, screw terminals
Overload Protection	Thermally Protected 135°C cut-out
Motor Protection	SY1 H Class Insulation SY2... - SY6... F Class Insulation
Geartrain	High Alloy Steel gear sets, self locking
Operating Range	SY...-220 On/Off, Floating Point SY...-230MFT 2-10vdc, 4-20mA, 1-5vdc
Sensitivity	SY...-230MFT 0.2mA / 200mV
Feedback	SY...-230MFT 2-10vdc, 4-20mA
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	
SY3-230MFT	0.5A	
SY4-230MFT	0.6A	
SY5-230MFT	0.7A	
SY6-230MFT	0.8A	
Torque		
SY1-220(P)	35 Nm / 310 in-lb	
SY2-230MFT	90 Nm / 801 in-lb	
SY3-230MFT	150 Nm / 1335 in-lb	
SY4-230MFT	400 Nm / 3560 in-lb	
SY5-230MFT	500 Nm / 4450 in-lb	
SY6-230MFT	650 Nm / 5785 in-lb	
Manual Override		
SY1-220(P)	8mm Wrench	
SY2-230MFT – SY6-230MFT	Hand Wheel	
Running Time	50hz	60hz
SY1-220(P)	13 seconds	12 seconds
SY2-230MFT	17 seconds	15 seconds
SY3-230MFT	26 seconds	22 seconds
SY4-230MFT	18 seconds	16 seconds
SY5-230MFT	25 seconds	22 seconds
SY6-230MFT	31 seconds	28 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.



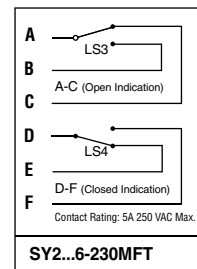
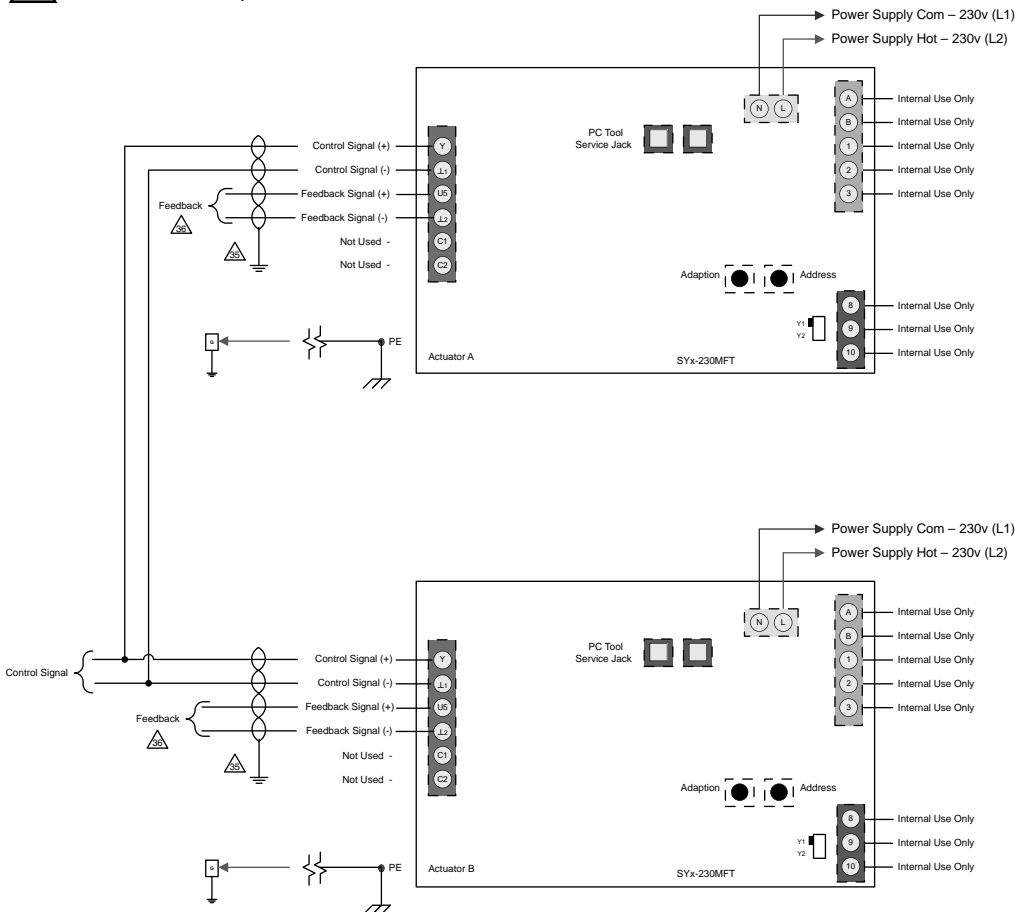
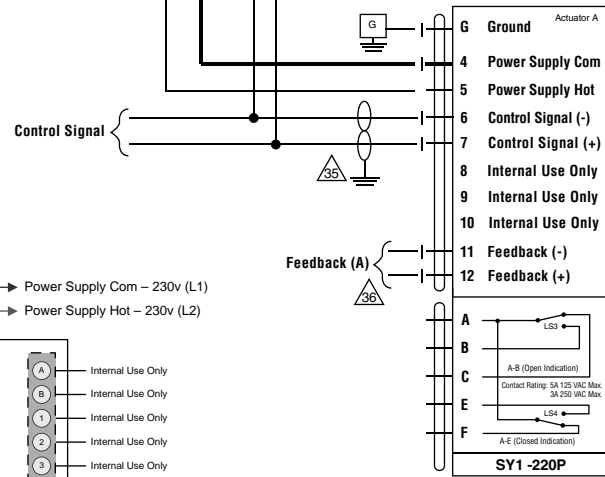
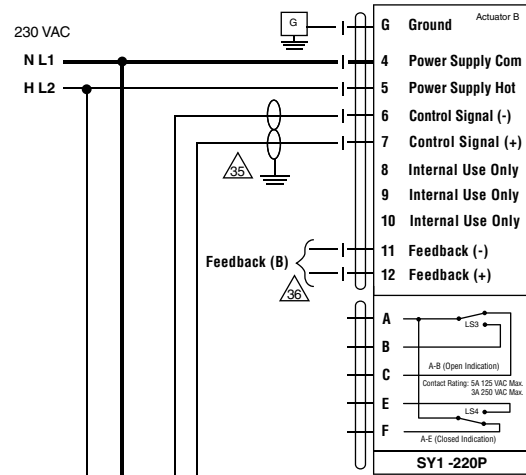
Use of feedback is optional.

NOTES SY1-220P

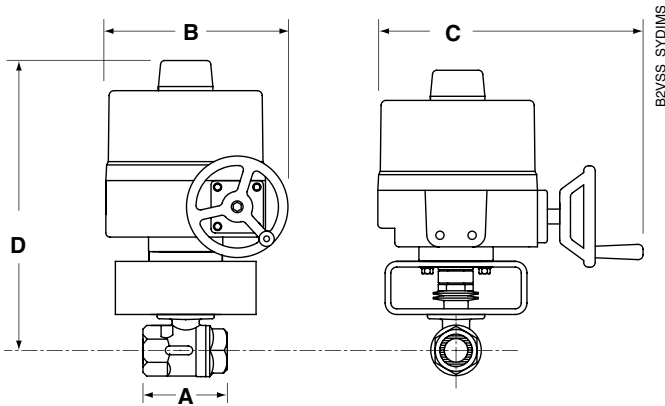
- **Caution:** Power supply voltage.
- Do not change sensitivity or dip switch settings with power applied.

NOTES SY2...6-230MFT

- **Caution:** Power supply voltage.



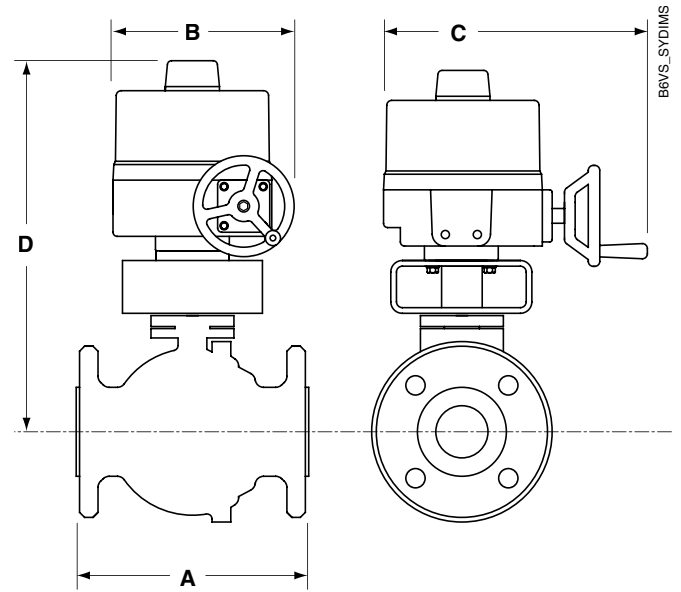
Dimensions with 2-Way Valves



Valve Nominal Size Dimensions (Inches)

	Valve Body	COP	Inches	DN [mm]	A	B	C	D
	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
	B219VS	600	¾"	20	3.00	4.00	6.25	8.00
SY1	B2050VSS-15	1000	½"	15	2.25	8.00	13.00	16.00
	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
	B239VS	600	1½"	40	4.37	4.00	6.25	17.50
	B220VS	600	¾"	20	3.12	8.00	13.00	8.00
	B225VS	600	1"	25	3.62	8.00	13.00	17.00
	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
SY3	B280VS	600	3"	80	6.75	8.00	13.00	21.00
	B219VSS	1000	¾"	20	3.00	8.00	13.00	18.00
SY1	B224VSS	1000	1"	25	3.37	8.00	13.00	17.00
	B232VSS	1000	1¼"	32	3.97	8.00	13.00	3.97
	B239VSS	1000	1½"	40	4.37	8.00	13.00	18.50
	B249VSS	1000	2"	50	4.68	8.00	13.00	19.50
	B265VSS	1000	2½"	65	6.25	8.00	13.00	20.00
SY3	B280VSS	600	3"	80	6.75	8.00	13.00	21.00

Dimensions with Flanged Valves



Valve Nominal Size Dimensions (Inches)

	Valve Body	COP	Inches	DN [mm]	A	B	C	D
SY2	B650VS	200	2"	50	7.00	8.00	13.00	22.00
	B665VS	200	2½"	65	7.50	8.00	13.00	22.00
SY3	B680VS	200	3"	80	8.00	8.00	13.00	23.00
SY4	B6100VS	200	4"	100	9.00	12.00	15.00	27.00
SY5	B6150VS	200	6"	150	10.50	12.00	15.00	29.00
SY8	B6200VS	200	8"	203	11.50	14.00	21.00	39.00
	B6250VS	200	10"	254	13.00	14.00	21.00	43.00

	Configuration (Substitute 'V' for 'P' for NV(F) actuators)	Code	Control		Motion			List Price
			Input Range	Position Feedback	Running Time†	Torque %	Adaptation	
Voltage	P-10001	A01	2.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10002	A02	0.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10003	A03	2.0 to 10.0 VDC	0.0 to 5.0 VDC	150	100	Manual	●
	P-10004	A04	4.0 to 7.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10005	A05	6.0 to 9.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10006	A06	10.5 to 13.5 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10007	A07	0.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10009	A09	5.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10010	A10	5.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10013	A13	0.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10015	A15	2.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10016	A16	2.0 to 6.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10017	A17	6.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10018	A18	14.0 to 17.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10020	A20	9.0 to 12.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10028	A28	0.0 to 10.0 VDC	0.0 to 10.0 VDC	100	100	Manual	●
P-10031	A31	0.0 to 4.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●	
P-10063	A63	0.5 to 4.5 VDC	0.5 to 4.5 VDC	150	100	Manual	●	
P-10064	A64	5.5 to 10.0 VDC	5.5 to 10.0 VDC	150	100	Manual	●	
PWM	P-20001	W01	0.59 to 2.93 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20002	W02	0.02 to 5.00 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20003	W03	0.10 to 25.50 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20004	W04	0.10 to 25.60 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20005	W05	0.10 to 5.20 sec.	0.0 to 5.0 VDC	150	100	Manual	●
Floating Point	P-30001	F01	Floating point	2.0 to 10.0 VDC	150	100	Manual	●
	P-30002	F02	Floating point	0.0 to 10.0 VDC	150	100	Manual	●
	P-30003	F03	Floating point	2.0 to 10.0 VDC	100	100	Manual	●
	P-30004	F04	Floating point	0.0 to 5.0 VDC	100	100	Manual	●
	P-30005	F05	Floating point	0.0 to 10.0 VDC	100	100	Manual	●
	P-30006	F06	Floating point	0.0 to 5.0 VDC	150	100	Manual	●
On/Off	P-40001	J01	On/Off	2.0 to 10.0 VDC	75	100	Manual	●
	P-40002	J02	On/Off	2.0 to 10.0 VDC	150	100	Manual	●
	P-40003	J03	On/Off	2.0 to 10.0 VDC	75	100	Manual	●
	P-40004	J04	On/Off	0.0 to 5.0 VDC	100	100	Manual	●
	P-40005	J05	On/Off	0.0 to 10.0 VDC	100	100	Manual	●

*P-10001 is the default configuration.

Example: AF24-MFT US is the basic model. Add the P... pre-set MFT configuration number and list price to the actuator when ordering, as needed.

Note: V-codes used for NV...Series actuator. All other MFT actuators use P-codes.

Note: Most popular configurations available at no additional cost.

Note: If the configuration needed is not listed, please fill in pg 239 or call Customer Service.

Note: For Non-Spring Return Actuators the 3-digit code can be used in place of the P... pre-set MFT configuration number.

SY MULTI-FUNCTION TECHNOLOGY						
Description	Code	Control Input	Built-in Feedback	Loss of Signal	Running Time	
MFT	ACE	2-10 VDC	2-10 VDC	stop	actuator(s) constant	
MFT	ACF	0.5-10 VDC	0.5-10 VDC	stop	actuator(s) constant	
MFT	ACH	4-20 mA	2-10 VDC	stop	actuator(s) constant	
MFT	ACJ	2-10 VDC	2-10 VDC	open	actuator(s) constant	
MFT	ACK	0.5-10 VDC	0.5-10 VDC	open	actuator(s) constant	
MFT	ACM	4-20 mA	2-10 VDC	open	actuator(s) constant	
MFT	ACN	2-10 VDC	2-10 VDC	close	actuator(s) constant	
MFT	ACP	0.5-10 VDC	0.5-10 VDC	close	actuator(s) constant	
MFT	ACS	4-20 mA	2-10 VDC	close	actuator(s) constant	