

F6 Series 2-Way, ANSI Class 150 Butterfly Valve Reinforced Teflon Seat, 316 Stainless Disc



- Bubble tight shut-off to ANSI Class 150 Standards
- Long stem design allows for 2" insulation minimum
- Valve Face-to-face dimensions comply with API 609 & MSS-SP-68
- Designed to be installed between ASME/ANSI B16.5 Flanges
- Completely assembled and tested, ready for installation

Application

These valves are designed to meet the needs of HVAC and Commercial applications requiring positive shut-off for liquids at higher pressures and temperatures. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C_v values provide for an economical control valve solution for larger flow applications.

Dead End Service

Utilizes larger retainer ring set screws to allow the valve to be placed at the end of the line without a down stream flange in either flow direction while still holding full pressure.

Technical Data	
Service	chilled, hot water, 60% glycol, steam to 50 psi
Flow characteristic	modified equal percentage, unidirectional
Controllable flow range	82°
Sizes	2" to 24"
Type of end fitting	for use with ASME/class 125/150 flange
Materials	
Body	carbon steel full lug
Disc	316 stainless steel
Seat	RPTFE
Shaft	17-4 PH stainless
Gland seal	PTFE
Bushings	glass backed PTFE
Media temperature range	-20°F to 400°F [-30°C to 204°C]
Body pressure rating	ANSI Class 150
Close-off pressure	285 psi
Rangeability	100:1 (for 30 deg to 70 deg range)
Maximum velocity	32 FPS
Leakage	bubble tight

		2-way Valves		Suitable Actuators					
		Valve Nominal Size	Type	Non Fail-Safe		Fail-Safe			
						Spring Return		Electronic	
C _v 90°	C _v 60°	Inches	ANSI 150 2-way	150	300	150	300	150	300
102	56	2	F650-150SHP	GM Series	PR Series	GM Series	PR Series	AF Series	AF Series
146	80	2½	F665-150SHP						
228	125	3	F680-150SHP						
451	248	4	F6100-150SHP						
714	392	5	F6125-150SHP	SY Series (2 Year Warranty)	SY (2 Year Warranty)	PKR	PKR	PKR	PKR
1103	607	6	F6150-150SHP						
2064	1135	8	F6200-150SHP						
3517	1934	10	F6250-150SHP						
4837	2660	12	F6300-150SHP						
6857	3592	14*	F6350-150SHP						
9287	4865	16*	F6400-150SHP						
11400	6270	18*	F6450-150SHP						
14420	7590	20*	F6500-150SHP						
22050	11550	24*	F6600-150SHP						

Valve	Size	C _v	MOD								ON/OFF
			10°	20°	30°	40°	50°	60°	70°	80°	90°
F650-150SHP	2"	102	1.50	6.10	14	26	39	56	77	99	102
F665-150SHP	2½"	146	2.20	8.80	20	37	55	80	110	142	146
F680-150SHP	3"	228	3.40	14	32	57	87	125	171	221	228
F6100-150SHP	4"	451	6.80	27	63	114	171	248	338	437	451
F6125-150SHP	5"	714	11	43	100	180	271	393	536	693	714
F6150-150SHP	6"	1103	17	66	154	278	419	607	827	1070	1103
F6200-150SHP	8"	2064	31	124	289	520	784	1135	1548	2002	2064
F6250-150SHP	10"	3517	53	211	492	886	1336	1934	2638	3411	3517
F6300-150SHP	12"	4837	73	290	677	1219	1838	2660	3628	4692	4837
F6350-150SHP	14"	6857	90	392	914	1646	2481	3592	4898	6530	6857
F6400-150SHP	16"	9287	132	531	1230	2229	3361	4865	6634	8845	9287
F6450-150SHP	18"	11400	171	684	1596	3873	4332	6270	8550	11270	11400
F6500-150SHP	20"	14420	207	828	1932	3478	5244	7590	10350	13800	14420
F6600-150SHP	24"	22050	315	1260	2940	5292	7890	11550	15750	21000	22050

Maximum Dimensions (Inches)

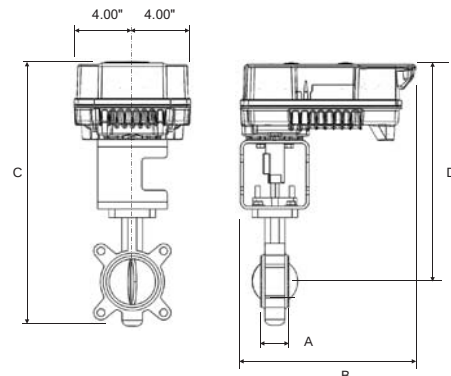
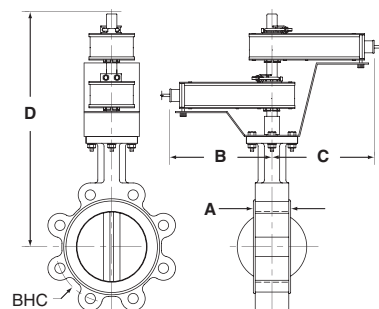
Valve	Size	C _v 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC	2*AF	150	Spring Return
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		150	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC		150	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		150	
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC	GK	285	Electronic Fail-Safe
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		150	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC	2*GK	285	Non-Spring Return Electronic Fail-Safe (K)
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC	GM	285	
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		150	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC	2*GM	285	
F650-150SHP	2"	102	1.75	10.00	15.00	14.00	4.75	4	5/8-11 UNC	PR/PK	285	
F665-150SHP	2½"	146	1.88	10.00	16.00	14.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	10.00	17.00	15.00	6.00	4	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	10.00	18.00	16.00	7.50	8	5/8-11 UNC		285	
F6125-150SHP	5"	714	2.25	10.00	19.00	16.00	8.50	8	3/4-10 UNC	SY4...	285	
F6150-150SHP	6"	1103	2.29	10.00	20.00	17.00	9.50	8	3/4-10 UNC		285	
F6200-150SHP	8"	2064	2.50	12.00	12.00	32.00	11.75	8	3/4-10 UNC		285	
F6250-150SHP	10"	3517	2.81	12.00	12.00	33.00	14.25	12	7/8-9 UNC		285	
F6300-150SHP	12"	4837	3.23	12.00	12.00	35.00	17.00	12	7/8-9 UNC	SY4...	150	
										SY5...	285	
										SY5...	150	
										SY7...	150	
F6350-150SHP	14"	6857	3.62	14.00	14.00	36.00	18.75	12	1-8 UNC	SY8...	285	
F6400-150SHP	16"	9287	4.00	14.00	14.00	37.50	21.25	16	1-8 UNC	SY7...	150	
F6450-150SHP	18"	11400	4.50	14.00	14.00	42.25	22.75	16	1 1/8-8 UNC	SY8...	285	
F6500-150SHP	20"	14420	5.00	14.00	14.00	49.50	25.00	20	1 1/8-8 UNC	SY8...	150	
										SY10...	285	
F6600-150SHP	24"	22050	6.06	14.00	14.00	56.25	29.50	20	1 1/4-8 UNC	SY10...	150	

Dimension "A" does not include flange gaskets. (2 required per valve)

Application Notes

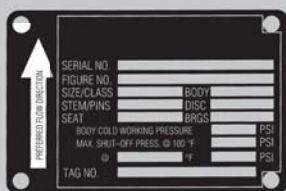
- Valves are rated at 285 psi differential pressure in the closed position @ 100°F media temperature.
- Valves are furnished with lugs tapped for use between ANSI Class 125/150 flanges conforming to ANSI B16.5 Standards.
- 2-way assemblies are furnished assembled, calibrated and tested, ready for installation.
- Dimension "D" allows for actuator(s) removal without the need to remove the valve from the pipe.
- Weather shields are available, dimensional data furnished upon request.
- Flange gaskets (2 required, not provided with valve) MUST be used between valve and ANSI flange.
- Flange bolts are not included with the valve. These are furnished by others.

Dimensions



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SHP series valves have a preferred flow direction.



Preferred Flowrate

F7 Series 3-Way, ANSI Class 150 Butterfly Valve Reinforced Teflon Seat, 316 Stainless Disc



- Bubble tight shut-off to ANSI Class 150 Standards
- Long stem design allows for 2" insulation minimum
- Valve Face-to-face dimensions comply with API 609 & MSS-SP-68
- Designed to be installed between ASME/ANSI B16.5 Flanges
- Completely assembled and tested, ready for installation
- Tees comply with ASME/ANSI B16.1 Class 125 Flanges

Application

These valves are designed to meet the needs of HVAC and Commercial applications requiring positive shut-off for liquids at higher pressures and temperatures. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C_v values provide for an economical control valve solution for larger flow applications.

Dead End Service

Utilizes larger retainer ring set screws to allow the valve to be placed at the end of the line without a down stream flange in either flow direction while still holding full pressure.

Technical Data

Service	chilled, hot water, 60% glycol, steam to 50 psi
Flow characteristic	modified equal percentage, unidirectional
Controllable flow range	82°
Sizes	2" to 18"
Type of end fitting	for use with ASME/class 125/150 flanges
Materials	
Body	carbon steel full lug
Disc	316 stainless steel
Seat	RPTFE
Shaft	17-4 PH stainless
Gland seal	PTFE
Bushings	glass backed PTFE
Media temperature range	-20°F to 400°F [-30°C to 204°C]
Body pressure rating	ANSI Class 150
Close-off pressure	285 psi
Rangeability	100:1 (for 30 deg to 70 deg range)
Maximum velocity	32 FPS
Leakage	bubble tight

		3-way Valves		Suitable Actuators			
		Valve Nominal Size	Type	Non Fail-Safe		Electronic Fail-Safe	
C _v 90°	C _v 60°	Inches	ANSI 150 3-way	150	300	150	300
102	56	2	F750-150SHP	GM Series	PR Series	GM Series	PR Series
146	80	2½	F765-150SHP				
228	125	3	F780-150SHP				
451	248	4	F7100-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	GK Series	PKR
714	393	5	F7125-150SHP				
1103	607	6	F7150-150SHP				
2064	1135	8	F7200-150SHP				
3517	1934	10	F7250-150SHP				
4837	2660	12	F7300-150SHP				
6857	3592	14*	F7350-150SHP				
9287	4865	16*	F7400-150SHP				
11400	6270	18*	F7450-150SHP				

Valve	Size	C _v	MOD								ON/OFF
			10°	20°	30°	40°	50°	60°	70°	80°	90°
F750-150SHP	2"	102	1.50	6.10	14	26	39	56	77	99	102
F765-150SHP	2½"	146	2.20	8.80	20	37	55	80	110	142	146
F780-150SHP	3"	228	3.40	14	32	57	87	125	171	221	228
F7100-150SHP	4"	451	6.80	27	63	114	171	248	338	437	451
F7125-150SHP	5"	714	11	43	100	180	271	393	536	693	714
F7150-150SHP	6"	1103	17	66	154	278	419	607	827	1070	1103
F7200-150SHP	8"	2064	31	124	289	520	784	1135	1548	2002	2064
F7250-150SHP	10"	3517	53	211	492	886	1336	1934	2638	3411	3517
F7300-150SHP	12"	4837	73	290	677	1219	1838	2660	3628	4692	4837
F7350-150SHP	14"	6857	103	411	960	1728	2606	3592	5143	6651	6857
F7400-150SHP	16"	9287	139	557	1300	2340	3529	4865	6965	9008	9287
F7450-150SHP	18"	11400	171	684	1596	2873	4332	6270	8550	11058	11400

Maximum Dimensions (Inches)

Valve	Size	C _v 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	GK	150	Electronic Fail-Safe
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		150	
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		150	
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	2*GK	285	Electronic Fail-Safe
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		285	
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		285	
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	GM	150	Electronic Fail-Safe
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		150	
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		150	
F7100-150SHP	4"	451	6.50	8.63	8.63	18.00	7.50	8	5/8-11 UNC	2*GM	150	Electronic Fail-Safe
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC		285	
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		285	
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC	PR/PK	285	Non-Spring Return Electronic Fail-Safe (K)
F750-150SHP	2"	102	4.50	6.38	6.38	14.00	4.75	4	5/8-11 UNC		285	
F765-150SHP	2½"	146	5.00	6.88	6.88	14.50	5.50	4	5/8-11 UNC		285	
F780-150SHP	3"	228	5.50	7.56	7.56	15.00	6.00	4	5/8-11 UNC	SY4...	285	Non-Spring Return Electronic Fail-Safe (K)
F7100-150SHP	4"	451	6.50	8.63	8.63	16.00	7.50	8	5/8-11 UNC		285	
F7125-150SHP	5"	714	7.50	9.75	9.75	24.25	8.50	8	3/4-10 UNC		285	
F7150-150SHP	6"	1103	8.00	10.25	10.25	24.75	9.50	8	3/4-10 UNC	SY4...	285	Non-Spring Return Electronic Fail-Safe (K)
F7200-150SHP	8"	2064	9.00	11.50	11.50	32.00	11.75	8	3/4-10 UNC		150	
F7250-150SHP	10"	3517	11.00	13.81	13.81	33.00	14.25	12	7/8-9 UNC		150	
F7300-150SHP	12"	4837	12.00	15.81	15.81	35.00	17.00	12	7/8-9 UNC	SY5...	285	Non-Spring Return Electronic Fail-Safe (K)
										SY5...	150	
										SY7...	285	
F7350-150SHP	14"	6857	14.00	17.62	17.62	36.00	18.75	12	1-8 UNC	SY7...	285	Non-Spring Return Electronic Fail-Safe (K)
										SY7...	150	
										SY9...	285	
F7400-150SHP	16"	9287	15.00	19.00	19.00	37.50	21.25	16	1-8 UNC	SY8...	150	Non-Spring Return Electronic Fail-Safe (K)
										SY8...	285	
										SY10...	285	
F7450-150SHP	18"	11400	16.50	21.00	21.00	42.25	22.75	16	1 1/8-8 UNC			

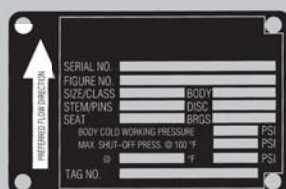
Dimensions "A, B and C" do not include flange gaskets. (3 required per valve)

Application Notes

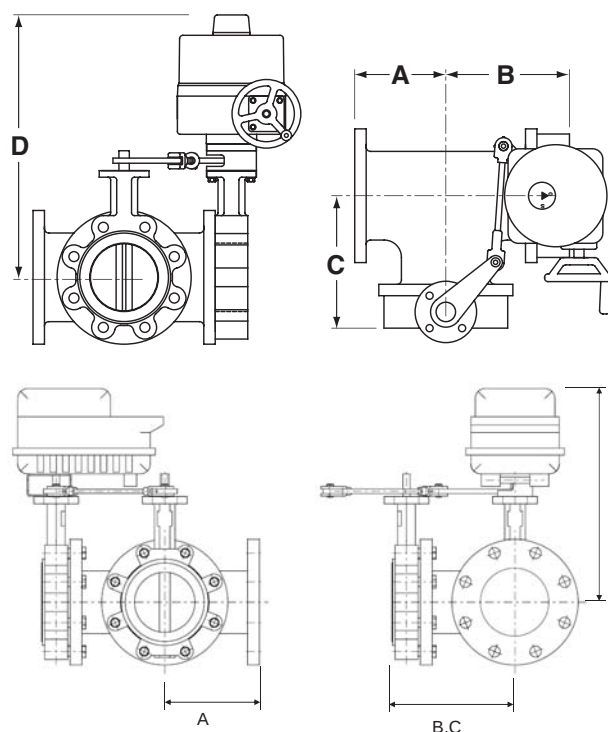
- Valves are rated at 285 psi differential pressure in the closed position @ 100°F media temperature.
- Valves are furnished with lugs tapped for use between ANSI Class 125/150 flanges conforming to ANSI B16.5 Standards.
- 3-way assemblies are furnished assembled with Tee, calibrated and tested, ready for installation. All 3-way assemblies require the customer to specify the 3-way configuration code prior to order entry to guarantee correct placement of valves and actuator(s) on the assembly.
- Dimension "D" allows for actuator(s) removal without the need to remove the valve from the pipe.
- Weather shields are available, dimensional data furnished upon request.
- Dual actuated valves have single actuators mounted on each valve shaft.
- Flange gaskets (3 required, not provided with valve) MUST be used between valve and ANSI flange.
- Flange bolts are not included with the valve. These are furnished by others.

Note: For tee configuration, please refer to page 5.

SHP series valves have a preferred flow direction.



Dimensions



D104



Application:

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

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...5)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-24) on/off, floating point (SY...24MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...24MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...24MFT) 1.0 mA/500mV
Feedback	(SY...24MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
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

Power Supply

24 VAC/VDC 50/60Hz, single phase

Model	Torque	Speed	Power Consumption	Duty Cycle		Override	Weight
				On/Off	MFT		
SY4-24(MFT)	400Nm/3560 in-lbs	20s	9.4A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-24(MFT)	500Nm/4450 in-lbs	26s	8.9A	30%	75%	Hand Wheel	22kg/48.5 lb.

SY...120V Series Non-Spring Return Actuator

Technical Data - 120 VAC



Application:

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

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-110) on/off, floating point (SY...120MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...120MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...120MFT) 1.0 mA/500mV
Feedback	(SY...120MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
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

Note: Leakage current is possible (<3.5 mA).
Connect ground before applying voltage.

Power Supply 120 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz		Power Consumption	Duty Cycle		Override	Weight
					On/Off	Proportional		
SY4-120(MFT)	400Nm/3560 in-lbs	24s		2.1A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-120(MFT)	500Nm/4450 in-lbs	28s		1.9A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-120(MFT)	650Nm/5785 in-lbs	36s		2A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-120(MFT)	1000Nm/8900 in-lbs	59s		2A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-120(MFT)	1500Nm/13350 in-lbs	79s		2.8A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-120(MFT)	2000Nm/17800 in-lbs	65s		2.7A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-120(MFT)	2500Nm/22250 in-lbs	76s		3A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-120(MFT)	3000Nm/26700 in-lbs	71s		4.3A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-120(MFT)	3500Nm/31150 in-lbs	76s		4.5A	30%	50%	Hand Wheel	56kg/123.5 lb.



Application:

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

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-220) on/off, floating point (SY...230MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...230MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...230MFT) 1.0 mA/500mV
Feedback	(SY...230MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
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

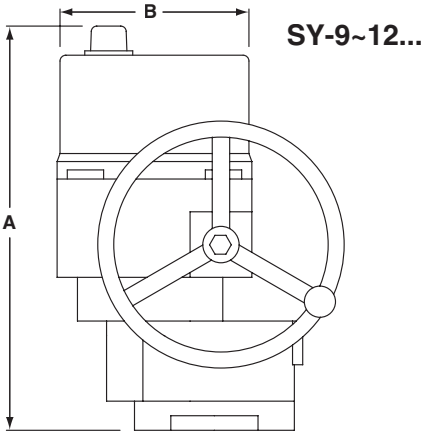
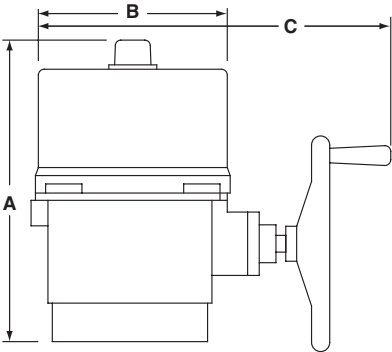
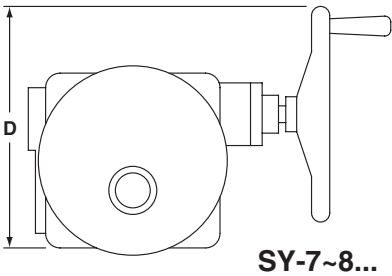
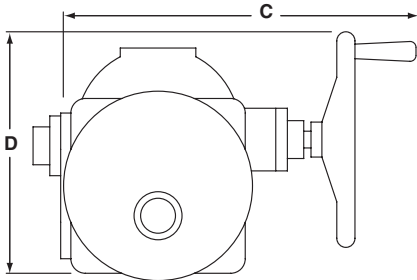
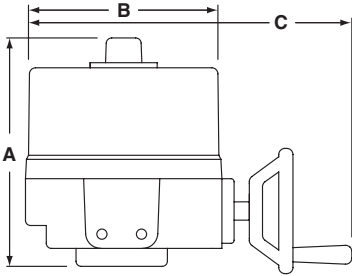
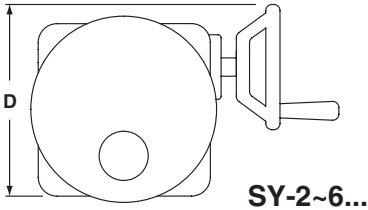
Power Supply

230 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz		Power Consumption	Duty Cycle		Override	Weight
					On/Off	MFT		
SY4-230(MFT)	400Nm/3560 in-lbs	22s		1.1A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-230(MFT)	500Nm/4450 in-lbs	25s		1A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-230(MFT)	650Nm/5785 in-lbs	35s		1A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-230(MFT)	1000Nm/8900 in-lbs	59s		1.2A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-230(MFT)	1500Nm/13350 in-lbs	79s		1.6A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-230(MFT)	2000Nm/17800 in-lbs	72s		1.1A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-230(MFT)	2500Nm/22250 in-lbs	85s		1.4A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-230(MFT)	3000Nm/26700 in-lbs	61s		2.2A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-230(MFT)	3500Nm/31150 in-lbs	65s		2.5A	30%	50%	Hand Wheel	56kg/123.5 lb.

SY... Series Non-Spring Return Actuator

Dimensions



MODEL	DIM A (MAX)	Add to Dim A for cover removal	DIM B	DIM C (MAX)	DIM D
	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]
SY4~6	12.40 [315]	8.86 [225]	9.21 [234]	14.96 [380]	11.81 [300]
SY7~8	16.54 [420]	8.86 [225]	9.21 [234]	17.72 [450]	13.39 [340]
SY9~12	23.23 [590]	8.86 [225]	10.24 [260]	18.50 [470]	13.78 [350]

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W546_12

SY Actuator Wiring Diagram, SY1...5-24V – On/Off
SY1...12-120V or 230V On/Off

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.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

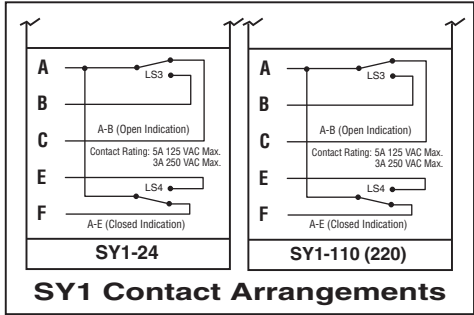
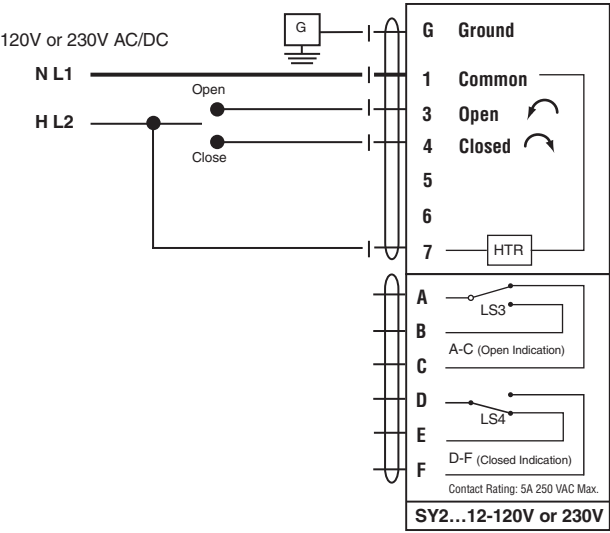
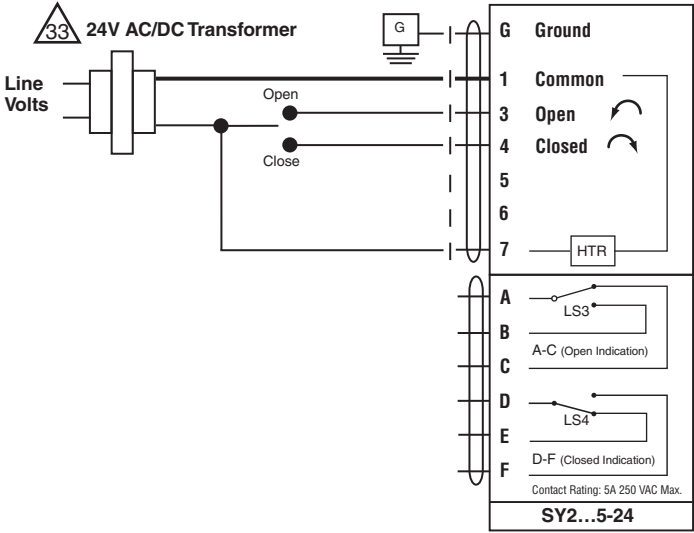
NOTES SY1...12-120V or 230V

- **Caution:** Power Supply Voltage
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.

NOTES SY1...5-24

Each actuator should be powered by a single, isolated control transformer.

- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" cannot be connected to terminal #3 and #4 simultaneously.



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W547_2_11

Actuator: SY2...5-24MFT SY2...12-120MFT SY2...12-230MFT

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.

NOTES SY2...5-24MFT

- Each actuator should be powered by a single, isolated control transformer.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited.

INSTALLATION NOTES

Observe Class 1 and Class 2 wiring restrictions.

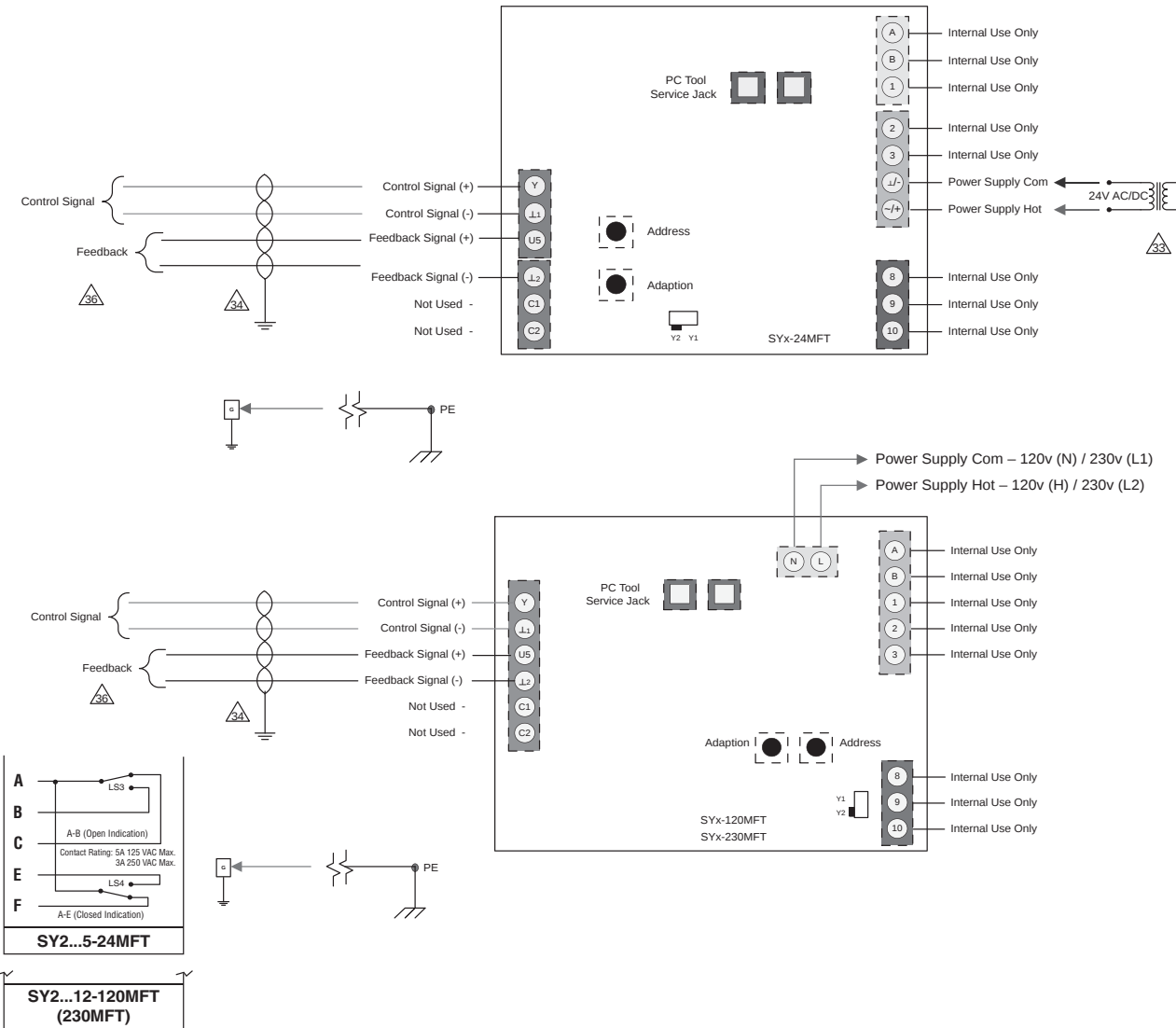
Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer)

APPLICATION NOTES

- Ground shielded wire at control panel chassis. Tape back ground at actuator.
- Use of feedback is optional.

NOTES SY2...12-120MFT (230MFT)

- Caution: Power supply voltage.



W549_11

SY Actuator Wiring Diagram, SY1...5-24 – Multiple Wiring
SY1...12-110 (220) – Multiple Wiring

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.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.



INSTALLATION NOTES

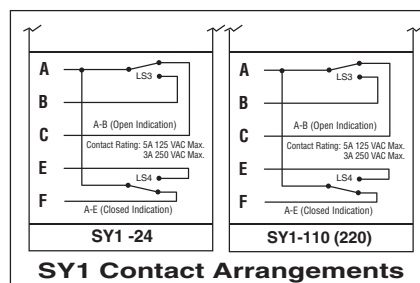
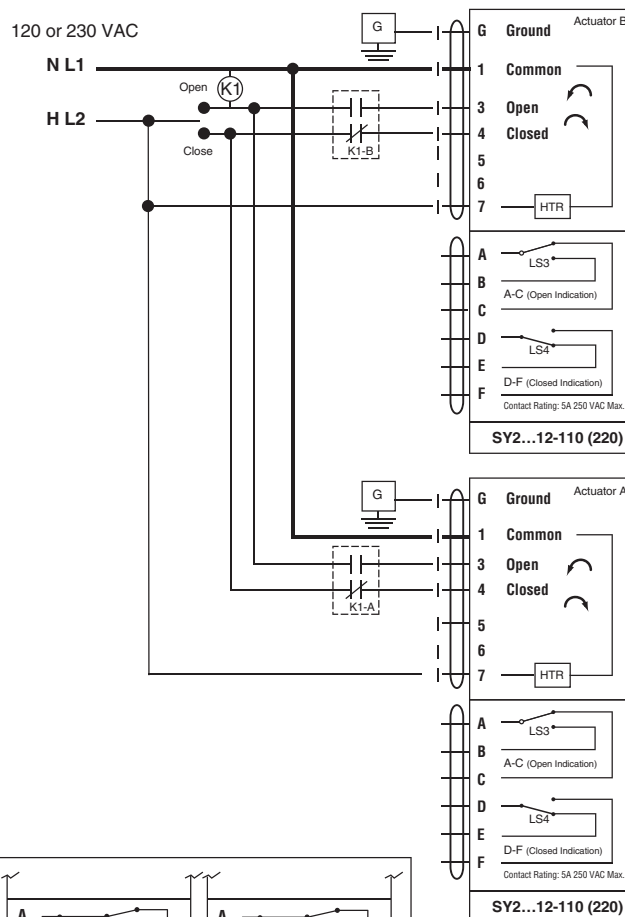
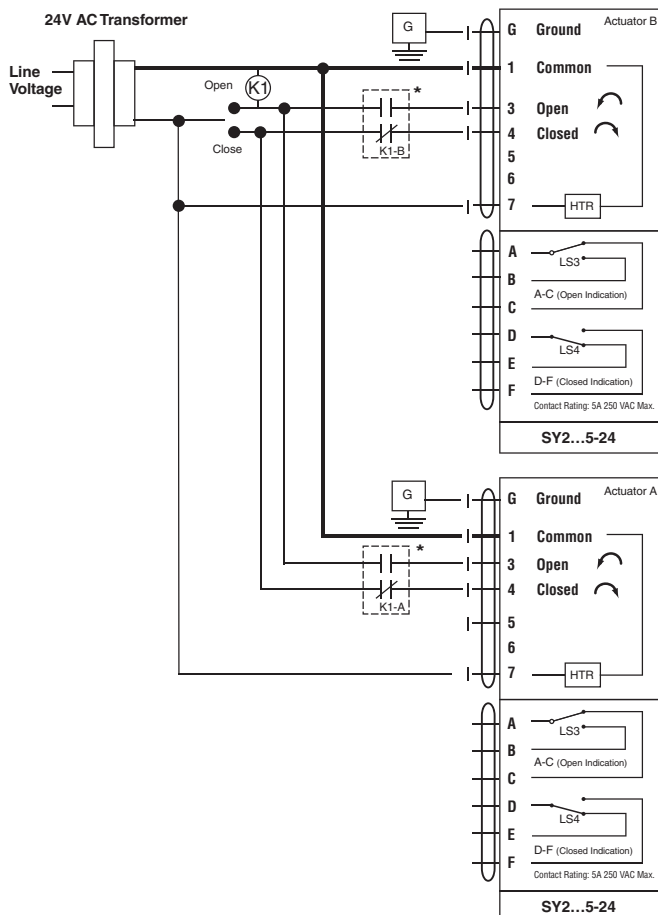
Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).



NOTES

- **Caution:** Power Supply Voltage.
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input. Should be DPDT.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



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

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.

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

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.

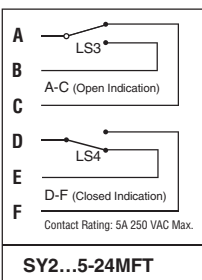
Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

33 Each actuator should be powered by a single, isolated control transformer.

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

36 Use of feedback is optional.



Actuators: SY2...12-120MFT SY2...12-230MFT

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.

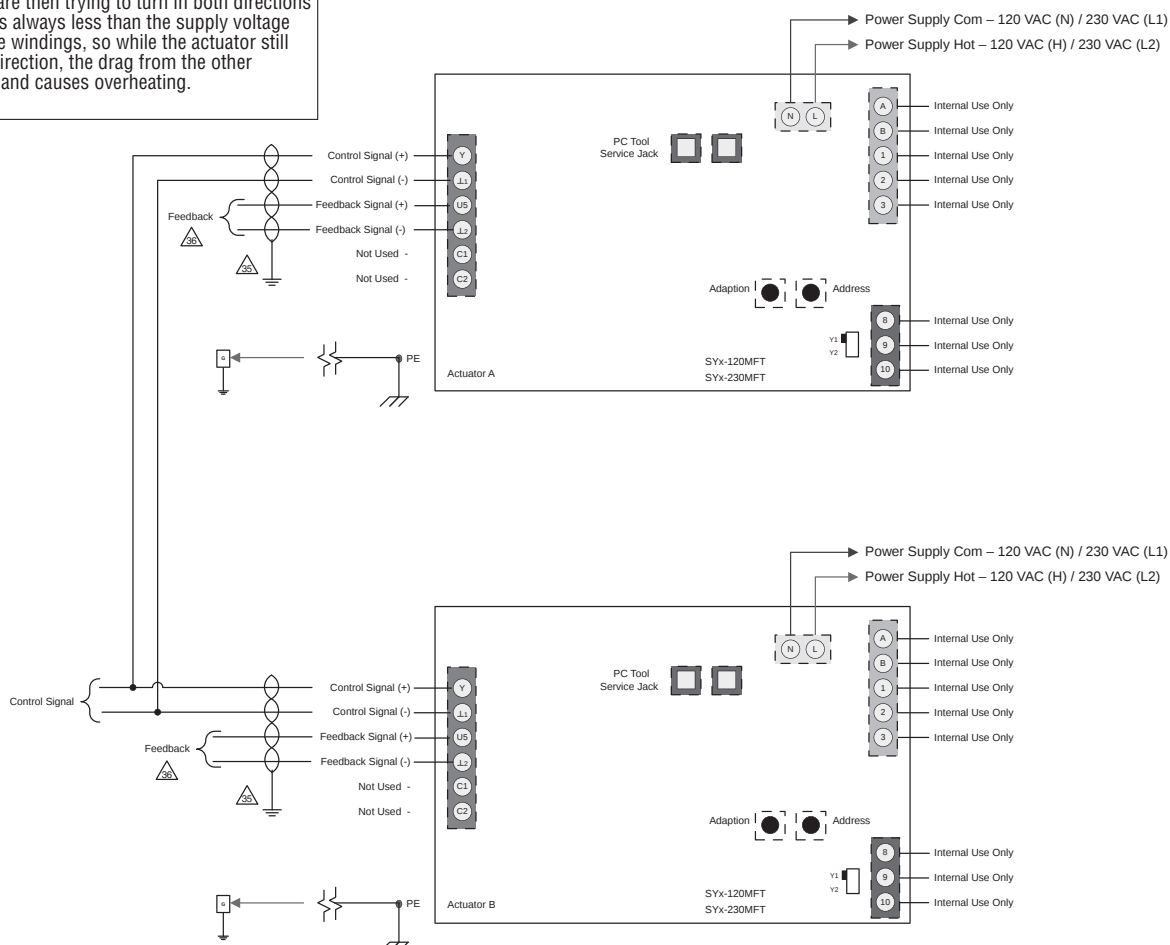
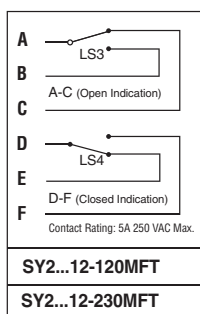
Equipment damage!
Power consumption and input impedance must
be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

 APPLICATION NOTES

- 35 Recommended twisted shielded pair for control wiring.
Ground shielded wire at control panel chassis.
Tape back ground at actuator.
- 36 Use of feedback is optional.

⚠ NOTES SY2...12-120MFT (230MFT)

- **Caution:** Power supply voltage.

AFBUP(-S)-X1, AFXUP(-S)-X1 Actuators, On/Off



Models

AFBUP-X1
AFBUP-S-X1
AFXUP-X1
AFXUP-S-X1

Technical Data	
Power supply	24...240 VAC -20% / +10%, 50/60 Hz 24...125 VDC ±10%
Power consumption	running 7 W
	holding 3.5 W
Transformer sizing	7 VA @ 24 VAC (class 2 power source) 8.5 VA @ 120 VAC 18 VA @ 240 VAC
Electrical connection	
AFBUP...	3 ft, 18 GA appliance cable, 1/2" conduit connector -S models: Two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
AFXUP...	3 ft [1m], 10 ft [3m] or 16 ft [5m] 18 GA appliance cable, with or without 1/2" conduit connector -S models: Two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection	Electronic throughout 0 to 95° rotation
Control	On/Off
Torque	180 in-lb [20 Nm] minimum
Direction of rotation	spring reversible with CW/CCW mounting
Mechanical angle of rotation	95° (adjustable with mechanical end stop, 35° to 95°)
Running time	motor < 75 sec
	spring 20 sec @ -4°F to 122°F [-20°C to 50°C]; < 60 sec @ -22°F [-30°C]
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Humidity	max. 95% RH non-condensing
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 2, IP54, Enclosure Type2
Housing material	Zinc coated metal and plastic casing
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	<50dB(A) motor @ 75 seconds ≤62dB(A) spring return
Servicing	maintenance free
Quality standard	ISO 9001
Weight	4.6 lbs (2.1 kg), 4.9 lbs (2.25 kg) with switches
† Rated Impulse Voltage 4kV, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.	
AFBUP-S-X1, AFXUP-S-X1	
Auxiliary switches	2 x SPDT 3A (0.5A) @ 250 VAC, UL Approved one set at +10°, one adjustable 10° to 90°

Wiring Diagrams

✂ INSTALLATION NOTES

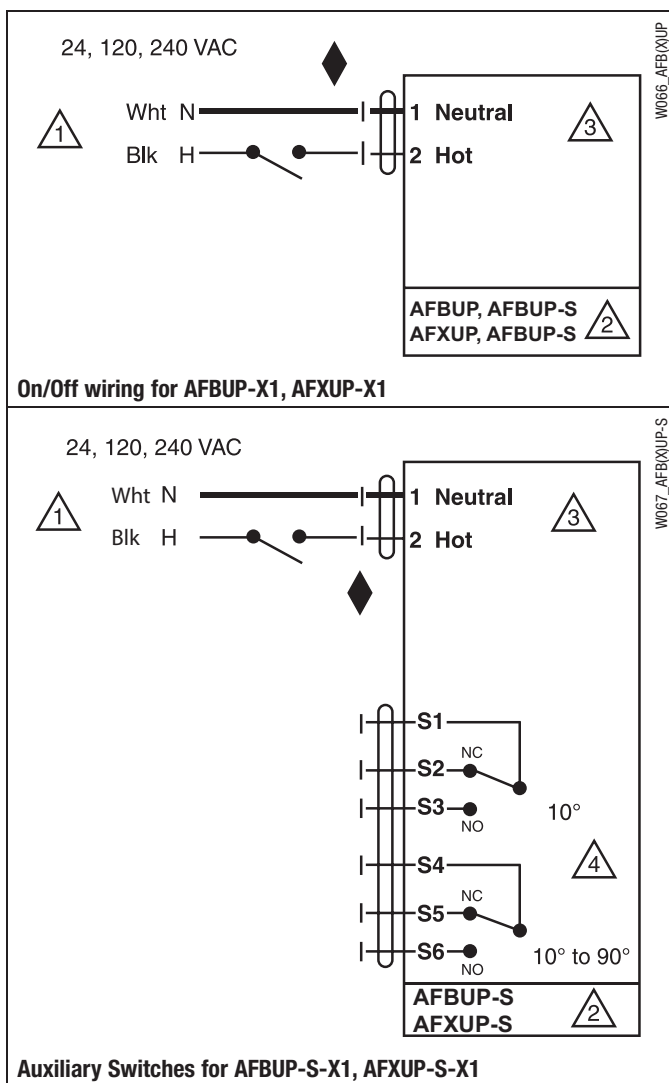
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 No ground connection is required.
- 4 For end position indication, interlock control, fan startup, etc.,
AFBUP-S-X1 and AFXUP-S-X1 incorporates two built-in auxiliary switches:
2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°,
one is adjustable 10° to 90°.

📄 APPLICATION NOTES

- ◆ Meets cULus 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.



AF Actuators, Multi-Function Technology



MFT



LISTED
94-05
TEMP. IND. & C
RES. EQUIP.



Models

AFX24-MFT-X1

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

2* AFX24-MFT-X1

2* AFX24-MFT-S-X1

Technical Data

Power supply	24 VAC, +/- 20%, 50/60 Hz 24 VDC, +20% / -10%
Power consumption♦	running 7.5 W holding 3 W
Transformer sizing	10 VA (Class 2 power source)
Electrical connection AFX...	3 ft [1m] default, 10 ft [3m] or 16 ft [5m] 18 GA appliance or plenum cables, with or without 1/2" conduit connector -S models: two 3 ft [1m] default, 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection	electronic throughout 0 to 95° rotation
Operating range Y*	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, PWM, floating point, on/off)
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for PWM, floating point and on/off control
Feedback output U*	2 to 10 VDC, 0.5 mA max
Torque	minimum 180 in-lb (20 Nm)
Direction of rotation*	spring reversible with cw/ccw mounting motor reversible with built-in switch
Mechanical angle of rotation*	95° (adjustable with mechanical end stop, 35° to 95°)
Running time	spring <20 sec @ -4°F to 122°F [-20° C to 50° C]; <60 sec @ -22°F [-30° C] motor* 150 seconds (default), variable (70 to 220 seconds)
Angle of rotation adaptation	off (default)
Override control*	min position = 0% mid. position = 50% max. position = 100%
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Humidity	max. 95% RH, non-condensing
Ambient temperature	-22 to 122° F (-30 to 50° C)
Storage temperature	-40 to 176° F (-40 to 80° C)
Housing	NEMA 2, IP54, Enclosure Type 2
Housing material	zinc coated metal and plastic casing
Noise level	≤40dB(A) motor @ 150 seconds, run time dependent ≤62dB(A) spring return
Agency listings †	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730- 1:02, CE acc. to 2004/108/EC & 2006/95/EC
Quality standard	ISO 9001
Servicing	maintenance free
Weight	4.6 lbs. (1.9 kg), 4.9 lbs. (2 kg) with switch

* Variable when configured with MFT options

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

♦ Programmed for 70 sec motor run time. At 150 sec motor run time, transformer sizing is 8.5 VA and power consumption is 6 W running / 3 W holding.

AFX24-MFT-S-X1

Auxiliary switches	2 x SPDT 3A (0.5A) @ 250 VAC, UL approved one set at +10°, one adjustable 10° to 90°
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800-543-9038 USA

866-805-7089 CANADA

203-791-8396 LATIN AMERICA / CARIBBEAN

Wiring Diagrams

INSTALLATION NOTES

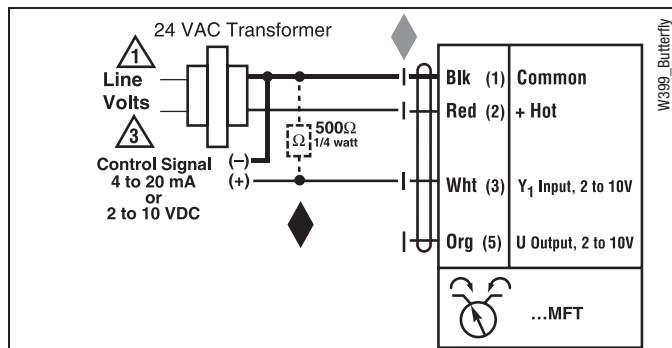
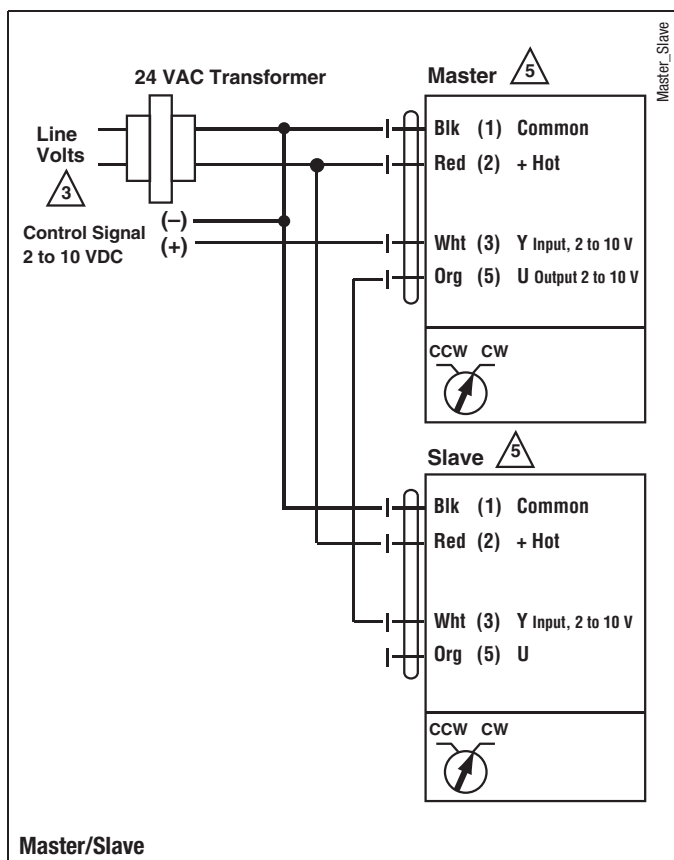
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac sink controller. The actuators internal common reference is not compatible.

APPLICATION NOTES

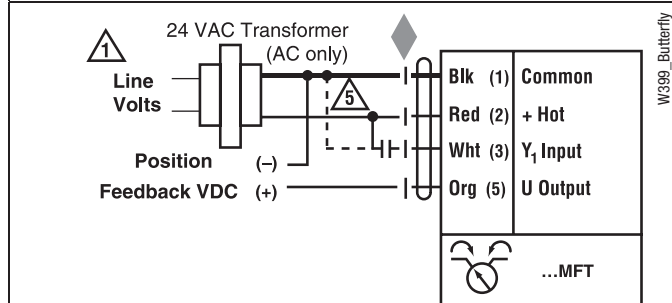
- The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.
- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

WARNING Live Electrical Components!

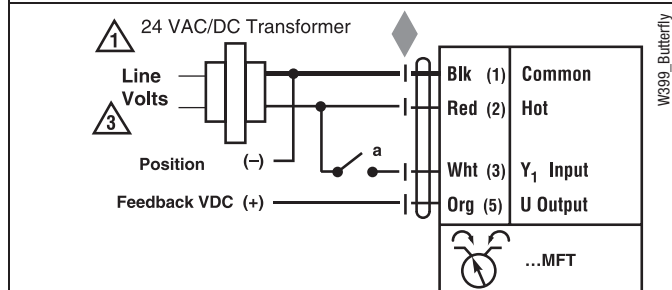
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



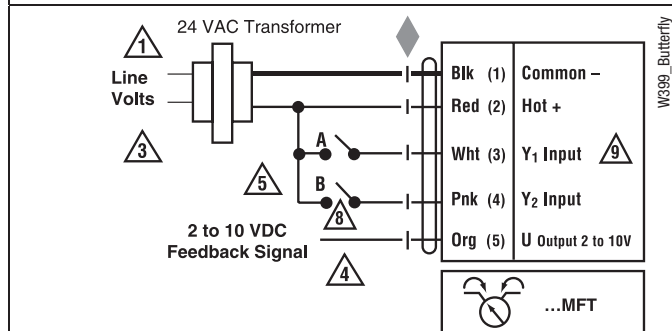
VDC/4-20 mA



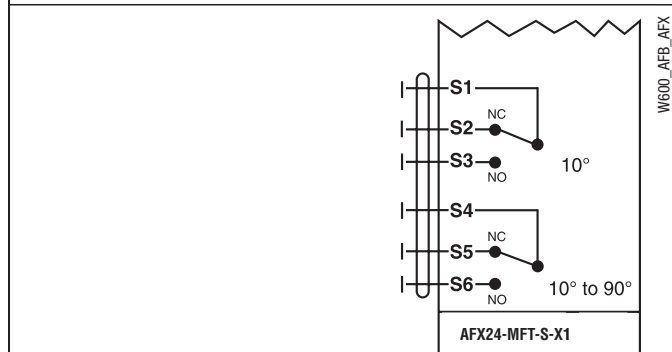
PWM



On/Off control

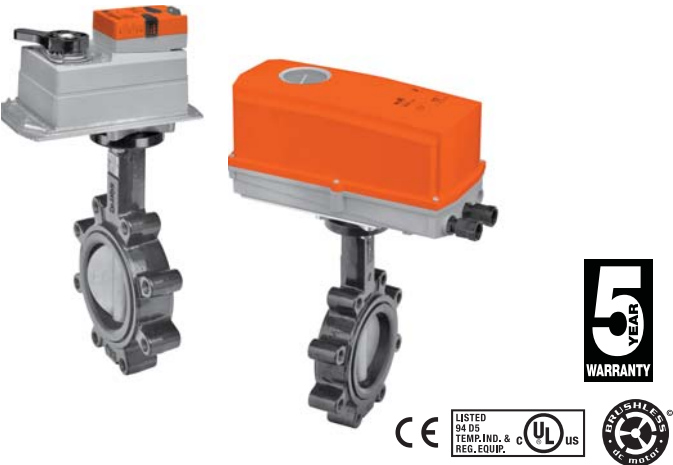


Floating Point control



Auxiliary Switches for AFX24-MFT-S-X1

DKRX24-3-T, DKRX(B)24-3-T N4(H)
NEMA 2/NEMA 4X Actuators, On/Off, Floating Point



Models

DKRX24-3-T	w/terminal block
DKRX24-3-T N4	w/terminal block
DKRB24-3-T N4H	w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20/-10% 50/60 Hz
Power consumption	running 12W / heater 33W
	holding 3W
Transformer sizing	21 VA (class 2 power source) / heater 36 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 Ω at control input
	1500 Ω floating point
Angle of rotation	90°
Position indication	visual pointer (N4)
Manual override	internal push button (UL Type 4)
	external push button (UL Type 2)
Running time	150 seconds (default)
Fail-Safe	35 seconds
Humidity	5 to 100% RH (UL Type 4)
	5 to 95% RH non condensation (UL Type 2)
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 type	UL Type 4/NEMA 4X/IP66
	UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001
Servicing	maintenance free

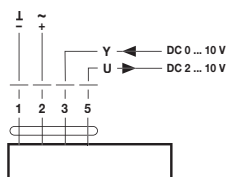
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Electrical Installation

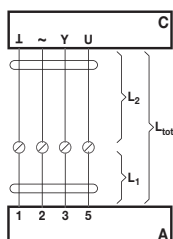
Wiring diagram

Note

- Connect via safety isolation transformer.
- Parallel connection of other actuators possible. Note performance data for supply.

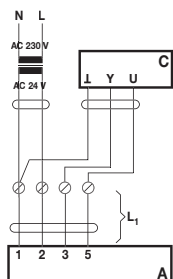


Cable lengths



Note

When several actuators are connected in parallel, the maximum cable length must be divided by the number of actuators.



Note

There are no special restrictions on installation if the supply and data cable are routed separately.

Cable colors:

1 = black
2 = red
3 = white
5 = orange

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)
L₂ = Customer cable
L_{tot} = Maximum cable length

Cross section L ₂ I / ~	Max. cable length L _{tot} = L ₁ + L ₂		Example for DC
	AC	DC	
0.75 mm ²	≤30 m	≤5 m	1 m (L ₁) + 4 m (L ₂)
1.00 mm ²	≤40 m	≤8 m	1 m (L ₁) + 7 m (L ₂)
1.50 mm ²	≤70 m	≤12 m	1 m (L ₁) + 11 m (L ₂)
2.50 mm ²	≤100 m	≤20 m	1 m (L ₁) + 19 m (L ₂)

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)

Wiring Diagrams

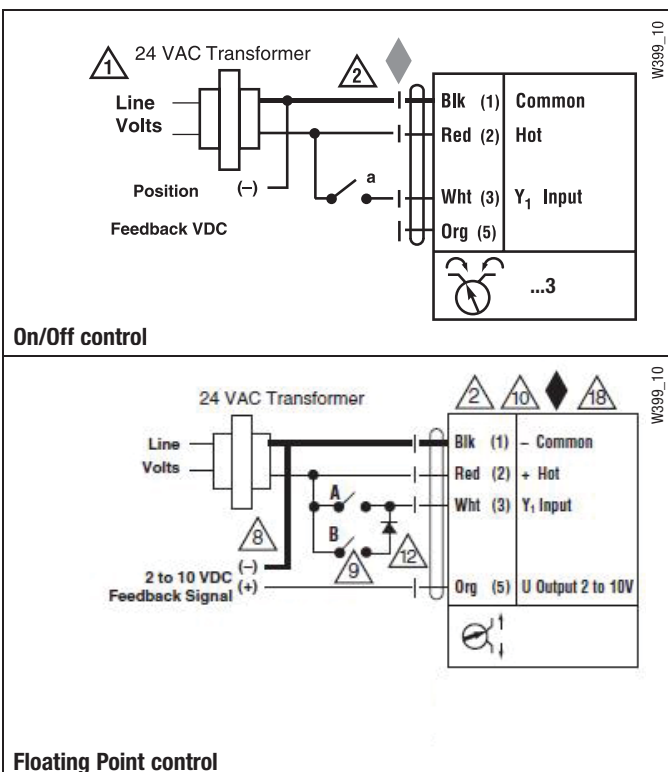
INSTALLATION NOTES

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

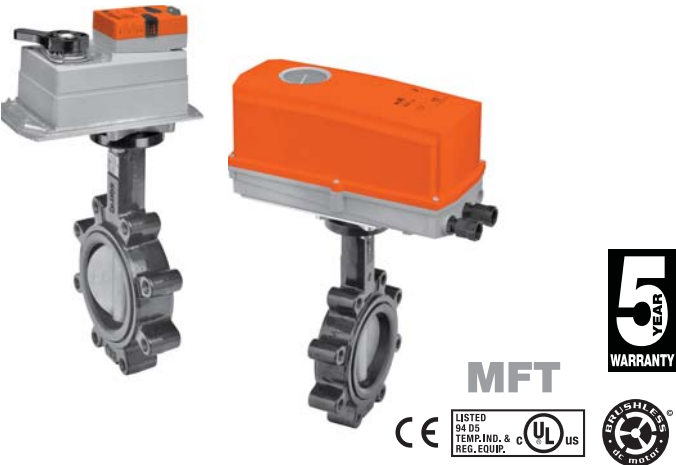
APPLICATION NOTES

Meets UL 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.



DKRX24-MFT-T, DKRX(B)24-MFT-T N4(H)
NEMA 2/NEMA 4X Actuators, Multi-Function Technology



Models

- DKRX24-MFT-T w/terminal block
- DKRX24-MFT-T N4 w/terminal block
- DKRB24-MFT-T N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 12 W / heater 33W holding 3 W
Transformer sizing	21 VA (class 2 power source) / heater 36 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 kΩ (0.1 mA) 500 Ω 1500 Ω (floating point, on/off)
Angle of rotation	90° electronically variable
Position indication	visual pointer (N4)
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	150 seconds (default) variable (75 to 290 seconds)
Fail-Safe	35 seconds
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
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 type	UL Type 4/NEMA 4X/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001
Servicing	maintenance free

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Wiring Diagrams

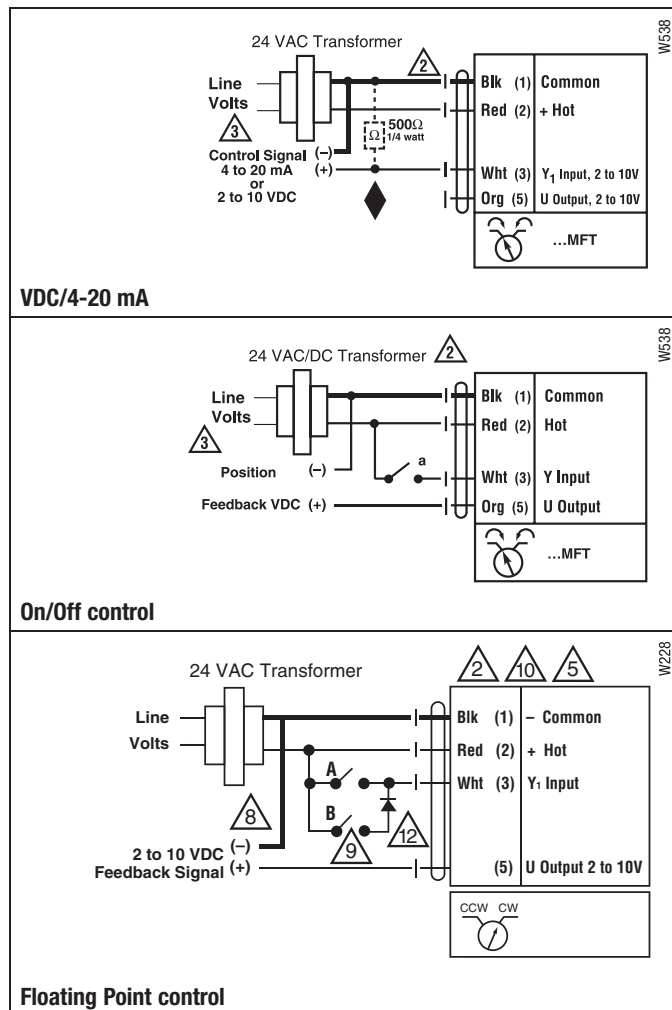
INSTALLATION NOTES

- 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** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- 8** Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 9** Contact closures A & B also can be triacs.
- 9** A & B should both be closed for triac source and open for triac sink.
- 10** For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- 12** IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

APPLICATION NOTES

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

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



DRCX24-3-T, DRCX(B)24-3-T N4(H) NEMA 2/NEMA 4X Actuators, On/Off, Floating Point



Models

DRCX24-3-T	w/terminal block
DRCX24-3-T N4	w/terminal block
DRCB24-3-T N4H	w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC $\pm$ 20/-10% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption	running 9W / heater 29W holding 2W
Transformer sizing	12 VA (class 2 power source) / heater 27 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	1000 Ω at control input
Angle of rotation	90°
Position indication	visual pointer
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
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 type	UL Type 4/NEMA 4X/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

INSTALLATION NOTES

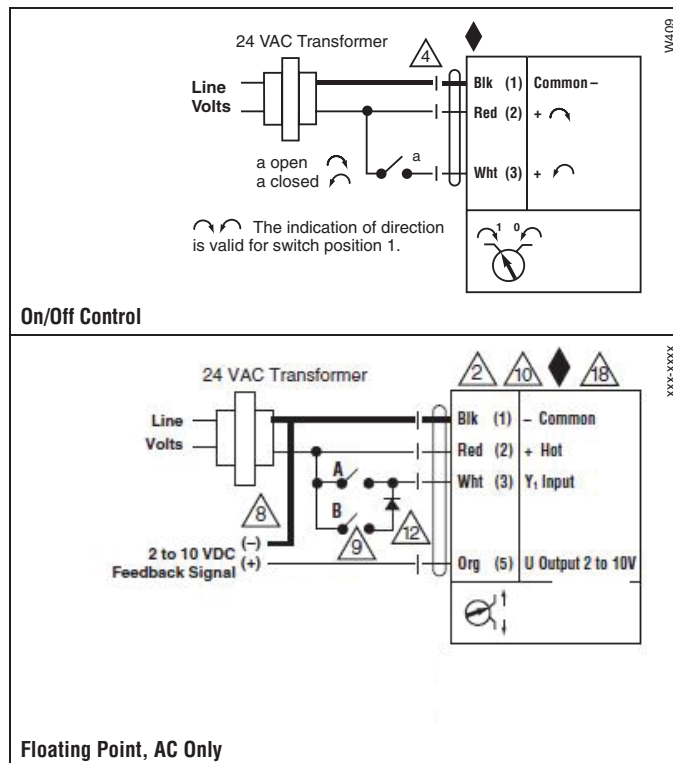
- 2 CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 4** Actuators may also be powered by 24 VDC.
- 5** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- 8** Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 9** Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- 10**

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.

WARNING Mechanical Precautions
 The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
 The directional switch cannot be moved. Maintain Factory Settings



DRX24-MFT-T, DRX24-MFT-T N4, DRCX24-MFT-T, DRCX(B)24-MFT-T N4(H) NEMA 2/NEMA 4X Actuators, Multi-Function Technology



MFT



Models

DRX24-MFT-T	w/terminal block
DRX24-MFT-T N4	w/terminal block
DRCX24-MFT-T	w/terminal block
DRCX24-MFT-T N4	w/terminal block
DRCB24-MFT-T N4H	w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC $\pm$ 20% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption	running 6.5 W / heater 27W holding 2.5 W
Transformer sizing	9.5 VA (class 2 power source) / heater 25 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1000 Ω for floating point and on-off control
Angle of rotation	90° electronically variable
Position indication	visual pointer
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	
DRX...	150 seconds
DRCX...	35 seconds
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
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 type	UL Type 4/NEMA 4X/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14"
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

INSTALLATION NOTES

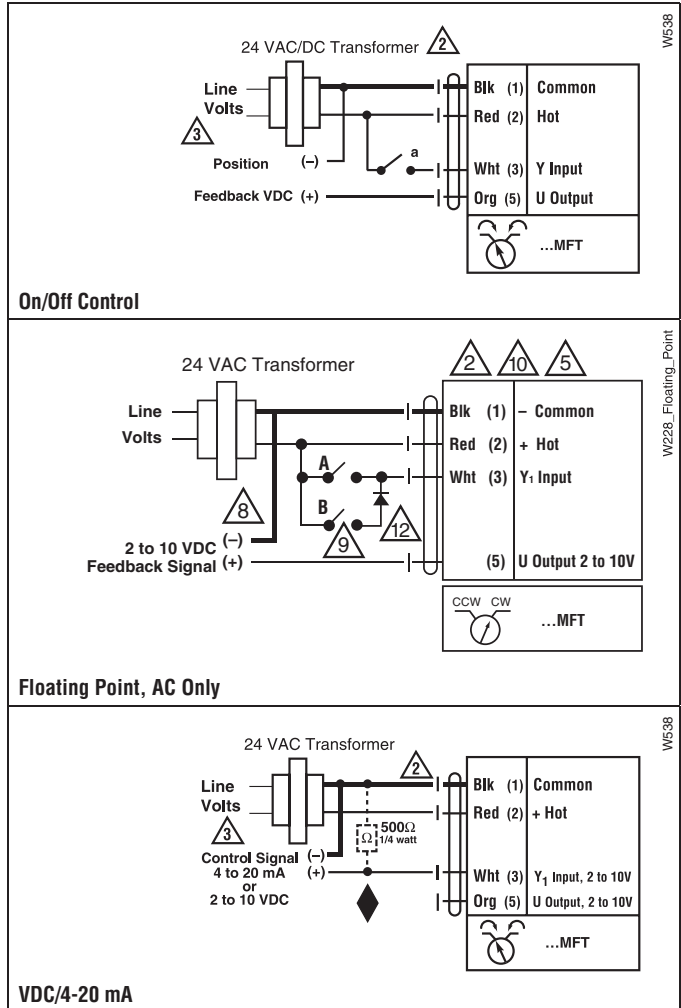
- 2 CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3** Actuators may also be powered by 24 VDC.
- 5** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- 8** Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 9** Contact closures A & B also can be triacs.
- 10** A & B should both be closed for triac source and open for triac sink.
For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- 12** IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

APPLICATION NOTES

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

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

WARNING Mechanical Precautions
The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings





Models

GKRB24-3-X1
GKRB24-3-5
GKB24-3-X1

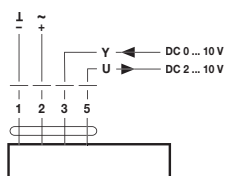
Technical Data	
Power supply	24VAC $\pm$ 20% 50/60Hz
Power consumption	12W (3W)
Transformer sizing	21VA (class 2 power source)
Electrical connection	18 GA plenum rated cable 1/2" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] 16 ft [5m]
Overload protection	electronic throughout 0 to 95 rotation
Operation range Y	on/off, floating point
Input impedance	100k Ω (0.1 mA), 500 Ω 1500 Ω (floating point, on/off)
Feedback output U	2 to 10VDC, 0.5mA max, VDC variable
Angle of rotation	max. 95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with  switch
Fail-safe position	adjustable with dial or tool 0 to 100% in 10% increments
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	
normal operation	150 seconds (default), variable 90 to 150 seconds
fail-safe	35 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	NEMA2, IP54, UL enclosure type 2
Housing material	UL94-5VA
Agency list	cULus acc. to UL 60730-1A/-2-14 CAN/CSA E60730-1:02 CE acc. to 2004/108/EEC and 2006/95/EC
Noise level	< 45dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Electrical Installation

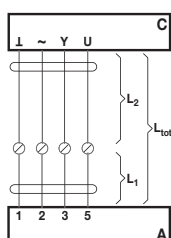
Note

- Connect via safety isolation transformer.
- Parallel connection of other actuators possible. Note performance data for supply.

Wiring diagram

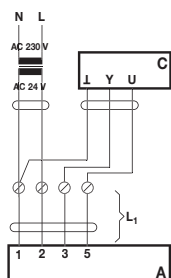


Cable lengths



Note

When several actuators are connected in parallel, the maximum cable length must be divided by the number of actuators.



Note

There are no special restrictions on installation if the supply and data cable are routed separately.

Cable colors:

1 = black
2 = red
3 = white
5 = orange

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)
L₂ = Customer cable
L_{tot} = Maximum cable length

Cross section L ₂ 1/~	Max. cable length L _{tot} = L ₁ + L ₂		Example for DC
	AC	DC	
0.75 mm ²	≤30 m	≤5 m	1 m (L ₁) + 4 m (L ₂)
1.00 mm ²	≤40 m	≤8 m	1 m (L ₁) + 7 m (L ₂)
1.50 mm ²	≤70 m	≤12 m	1 m (L ₁) + 11 m (L ₂)
2.50 mm ²	≤100 m	≤20 m	1 m (L ₁) + 19 m (L ₂)

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)

Wiring Diagrams

INSTALLATION NOTES

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

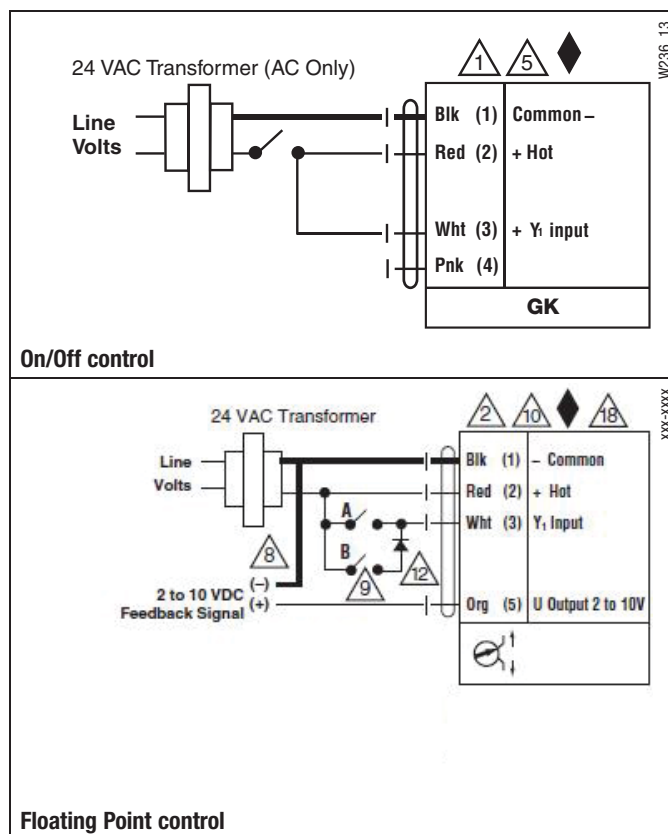
APPLICATION NOTES

Meets UL 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.

NOTE: Wiring diagrams shown are for single actuator mounted solutions





MFT



Models

GKRX24-MFT-X1
GKX24-MFT-X1

Technical Data	GKX24-MFT-X1
Power supply	24VAC $\pm 20\%$ 50/60Hz 24VDC $\pm 10\%$
Power consumption	12W (3W)
Transformer sizing	21VA (class 2 power source)
Electrical connection	18 GA plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] 16 ft [5m]
Overload protection	electronic throughout 0 to 95 rotation
Operation range Y	2 to 10 VDC, 4 to 20mA (default) variable (VDC,PWM, floating point, on/off)
Input impedance	100 k Ω (0.1 mA), 500 Ω 1500 Ω (PWM, floating point, on/off)
Feedback output U	2 to 10VDC, 0.5mA max, VDC variable
Angle of rotation	max. 95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with  switch
Fail-safe position	adjustable with dial or tool 0 to 100% in 10% increments
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	
normal operation	95 seconds (default), variable 90 to 150 seconds
fail-safe	35 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	NEMA2, IP54, UL enclosure type 2
Housing material	UL94-5VA
Agency list	cULus acc. to UL 60730-1A/-2-14 CAN/CSA E60730-1:02 CE acc. to 2004/108/EEC and 2006/95/EC
Noise level	< 45dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Note: GKR Actuators are on 2-way valves

GKX Actuators are on 3-way valves

Wiring Diagrams

INSTALLATION NOTES

- 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.
- 8 Contact closures A & B also can be triacs.
- 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

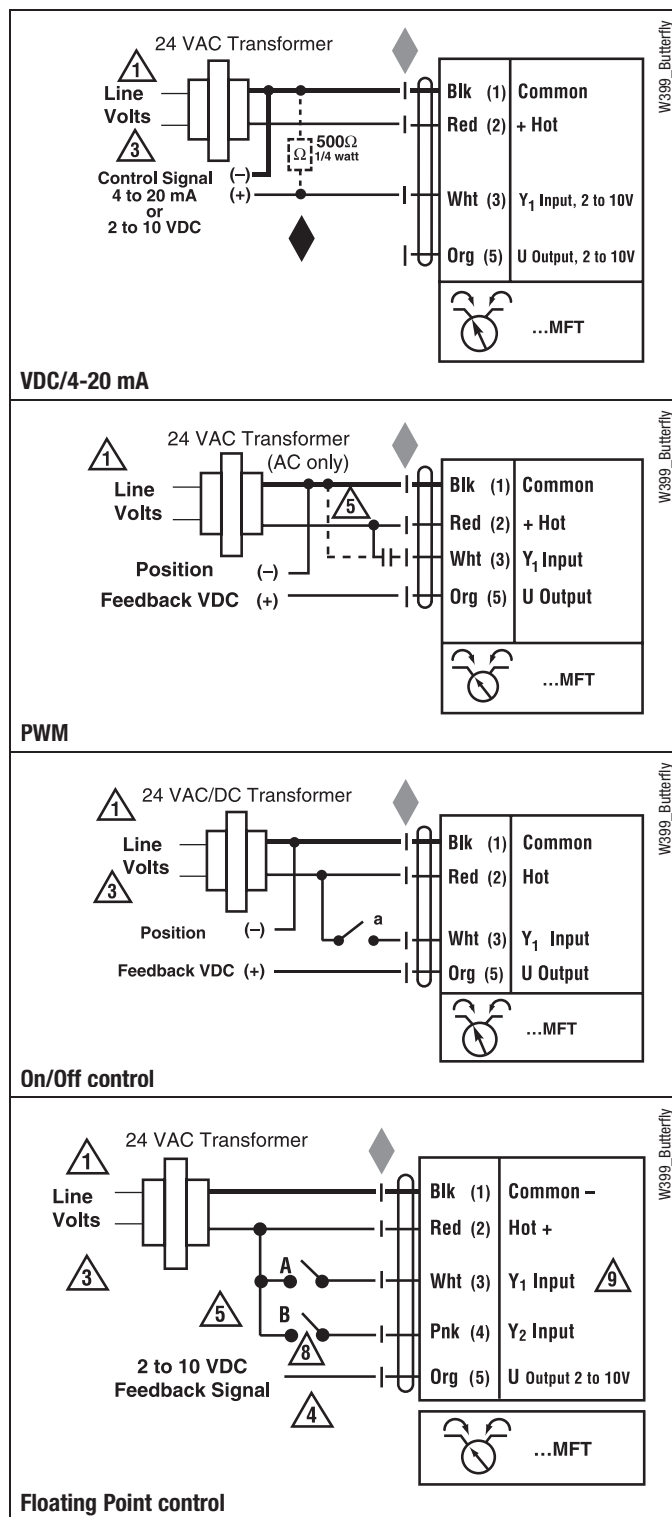
APPLICATION NOTES

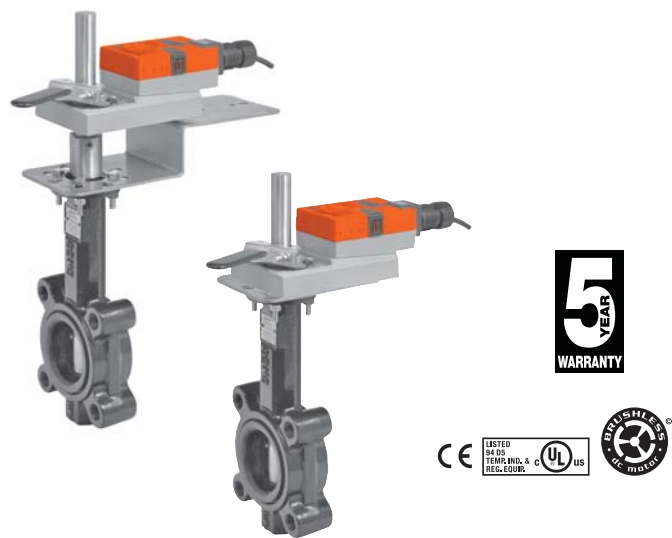
Meets UL requirements without the need of an electrical ground connection.

The ZG-R01 500 Ω resistor may be used.

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.

NOTE: Wiring diagrams shown are for single actuator mounted solutions





Models

AMB24-3-X1
ARB24-3-X1
ARB24-3-5

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 2.0 W
	holding 0.2 W
Transformer sizing	5.5 VA (class 2 power source)
Electrical connection	3 ft, 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Control	on/off, floating point
Input impedance	600 Ω
Angle of rotation	95°, adjustable with mechanical stop
Direction of rotation	reversible with protected  switch
Position indication	handle
Manual override	external push button
Running time	95 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 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus according to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE according to 89/336/EEC (and 2006/95/EC for line voltage and/or -S versions)
Noise level	<45dB(A)
Quality standard	ISO 9001

Note: AR Actuators are on 2-way valves
AM Actuators are on 3-way valves

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Wiring Diagrams

✂ **INSTALLATION NOTES**



CAUTION Equipment damage!

Actuators may be connected in parallel.
Power consumption and input impedance must be observed.



Actuators may also be powered by 24 VDC.



APPLICATION NOTES

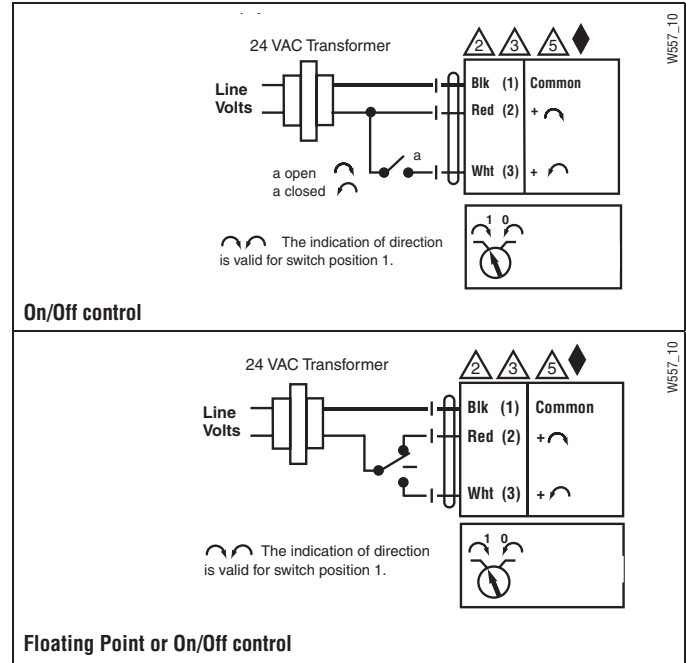


Meets cULus or UL and CSA requirements without the need of an electrical ground connection.



WARNING Live Electrical Components!

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.





Models

- AMX24-MFT-X1
- ARX24-MFT-X1
- ARB24-MFT-5

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 4 W holding 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
Operating range Y	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, PWM, floating point, on/off)
Input impedance	100k Ω (0.1 mA), 500 Ω 1500 Ω (PWM, floating point, on/off)
Feedback output U	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	95° electronically variable
Direction of rotation	reversible with protected  switch
Position indication	handle
Manual override	external push button
Running time	150 seconds (default) variable (90 to 350 secs)
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 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE according to 89/336/EEC
Noise level	<45dB(A)
Quality standard	ISO 9001

† Rated impulse voltage 4kV, Control pollution degree 3, Type of action 1

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Wiring Diagrams

INSTALLATION NOTES

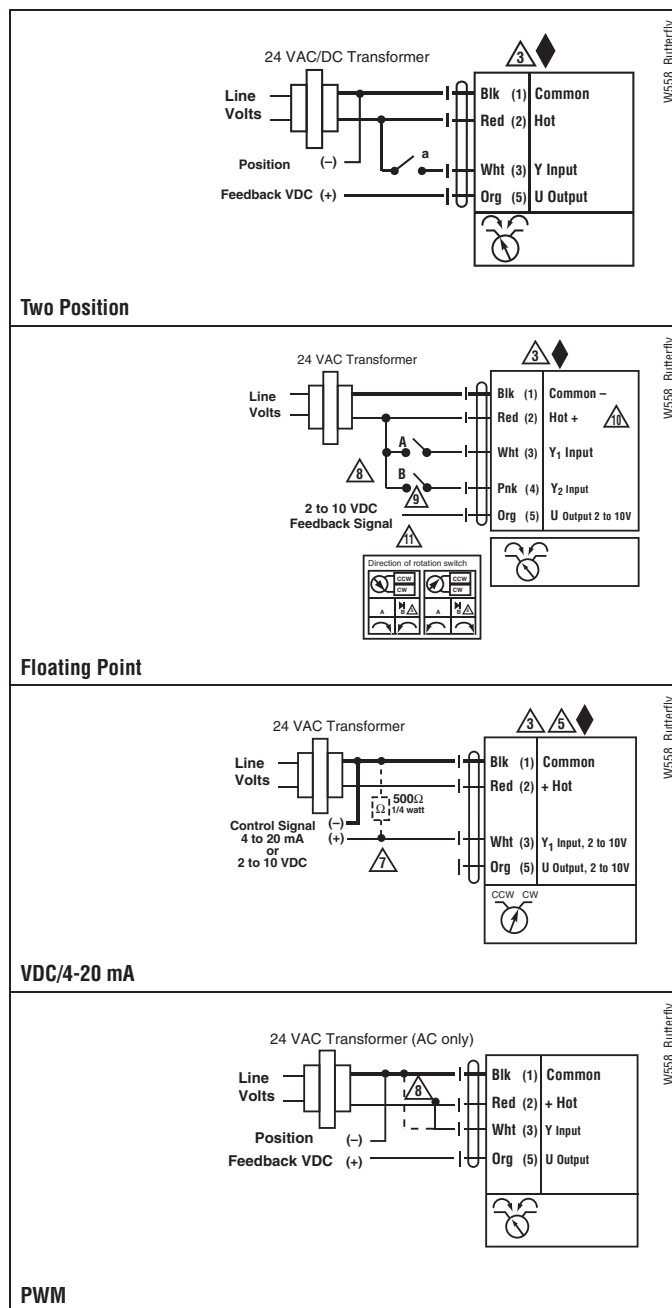
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller.
- 6 The actuator internal common reference is not compatible.
- 6 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 8 Contact closures A & B also can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

APPLICATION NOTES

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

WARNING Live Electrical Components!

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





Models

- GMB24-3-X1
- GRB24-3-X1
- GRB24-3-5
- GRB24-3-7

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 4.0 W holding 2 W
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Control signal	On/Off, Floating Point
Input impedance	600 Ω
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible with switch A/B
Position indication	0 to 1 and reversible indicator
Running time	150 sec.
Humidity	5 to 95% RH non-condensing
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 2/IP54
Housing material	UL94-5VA (flammability rating)
Agency listings	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93, CE according to 89/336/EEC
Noise level	max. 45 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001

Note: GR Actuators are on 2-way valves
GM Actuators are on 3-way valves

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Wiring Diagrams

✂️ INSTALLATION NOTES



CAUTION Equipment damage!

Actuators may be connected in parallel.
Power consumption and input impedance must be observed.



Actuators may also be powered by 24 VDC.



Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.



APPLICATION NOTES

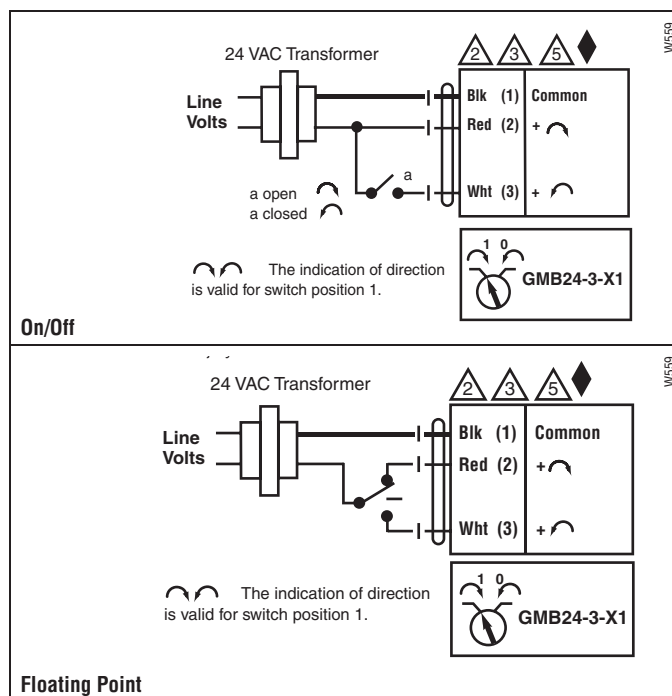


Meets cULus or UL and CSA requirements without the need of an electrical ground connection.



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.





Models

GMX24-MFT-X1
GRX24-MFT-X1
GRB24-MFT-5
GRX24-MFT-7

Technical Data	
Power supply	24 VAC $\pm$ 20% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption	running 4.5 W holding 2 W
Transformer sizing	7 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Control signal	2 to 10 VDC, 4 to 20 mA (with 500 Ω , 1/4 W resistor) ZG-R01
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
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible with switch A/B
Position indication	0 to 1 and reversible indicator
Running time	150 seconds
Humidity	5 to 95% RH non-condensing
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 2/IP54
Housing material	UL94-5VA (flammability rating)
Agency listings	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93, CE according to 89/336/EEC
Noise level	max. 45 dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Wiring Diagrams

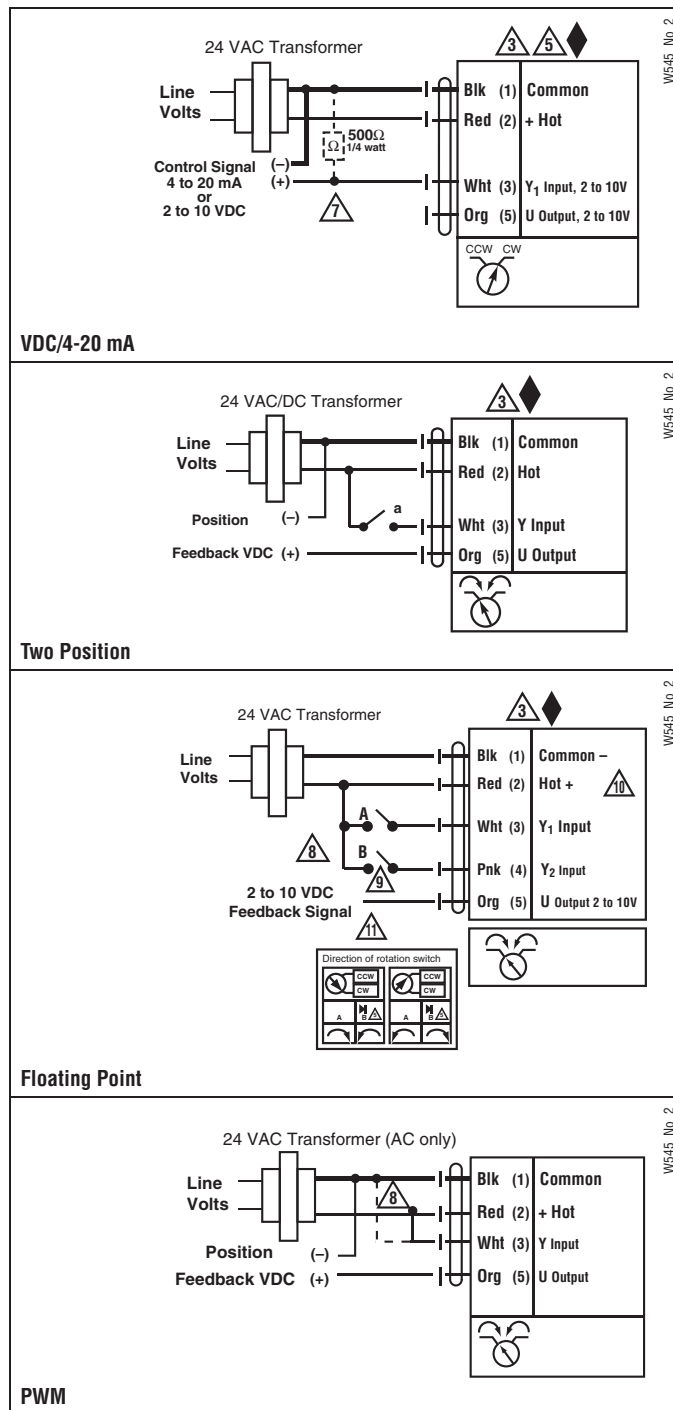
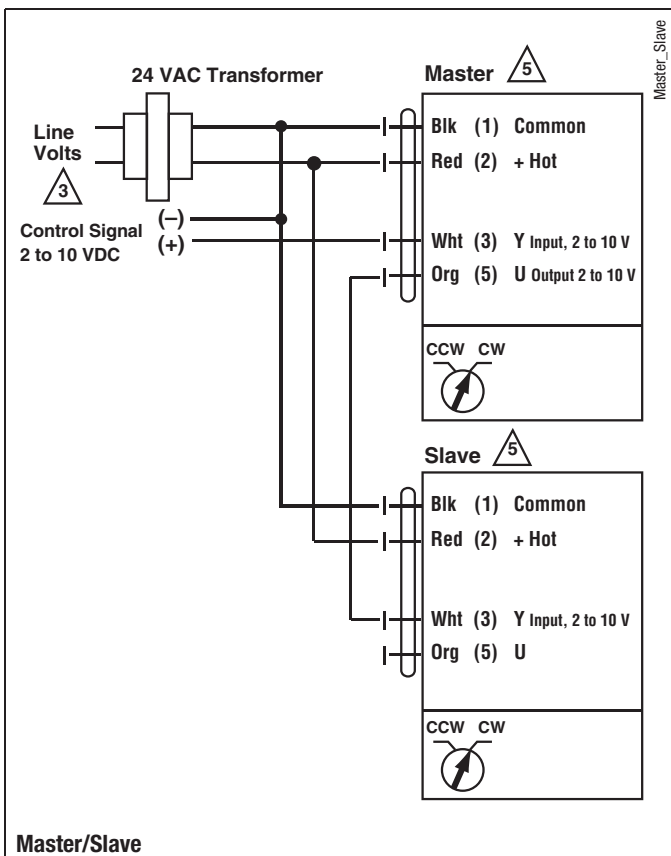
INSTALLATION NOTES

- 3 Actuators may also be powered by 24 VDC.
- 5 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.
- 8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller.

APPLICATION NOTES

- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.
- 9 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 11 Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.

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.



GRCX(B)24-3-T N4(H) NEMA 4X Actuators, On/Off, Floating Point



Models

GRCX24-3-T N4 w/terminal block
GRCB24-3-T N4H w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 8W / heater 29W holding 2.5W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	1000 Ω at control input
Angle of rotation	90°, adjustable with mechanical stop
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4)
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 type	UL Type 4/NEMA 4X/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

INSTALLATION NOTES



CAUTION Equipment damage!

Actuators may be connected in parallel.
Power consumption and input impedance must be observed.



Actuators may also be powered by 24 VDC.



Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.



APPLICATION NOTES

Meets cULus or UL and CSA requirements without the need of an electrical ground connection. Use suitable flexible metallic conduit or its equivalent with the conduit fitting.



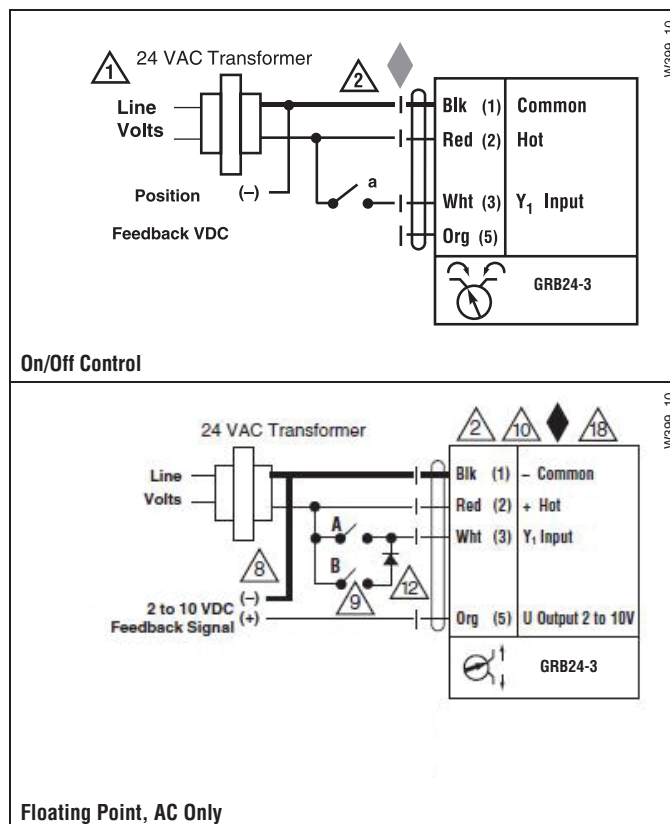
WARNING Live Electrical Components!

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.



WARNING Mechanical Precautions

The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings





MFT



Models

- GRX24-MFT-T N4 w/terminal block
- GRB24-MFT-T N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 8 W / heater 29W holding 2.5 W
Transformer sizing	11 VA (class 2 power source) / heater 24 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1000 Ω for floating point and on-off control
Angle of rotation	90°, adjustable with mechanical stop electronically variable
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	150 seconds (default) variable (75 to 290 seconds)
Humidity	5 to 100% RH (UL Type 4)
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 type	UL Type 4/NEMA 4X/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

INSTALLATION NOTES

- 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** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- 8** Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 9** Contact closures A & B also can be triacs.
- 10** A & B should both be closed for triac source and open for triac sink. For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- 12** IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

APPLICATION NOTES

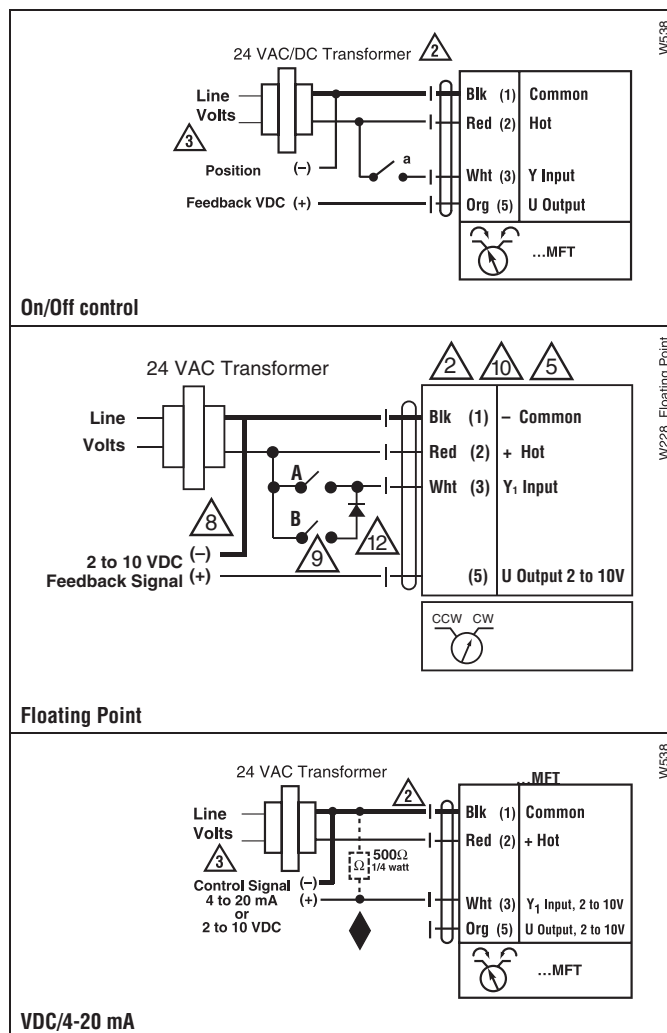
- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

WARNING Live Electrical Components!

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

WARNING Mechanical Precautions

The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings



GMCX(B)24-3-T-X1 N4(H) NEMA 4X Actuators, On/Off, Floating Point



Models

GMCX24-3-T-X1 N4 w/terminal block
GMCB24-3-T-X1 N4H w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 8W / heater 28W holding 2.5W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	1000 Ω at control input
Angle of rotation	95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with ↺/↻ switch
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4)
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 type	UL Type 4/NEMA 4X/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

✂️ INSTALLATION NOTES

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

Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.



APPLICATION NOTES

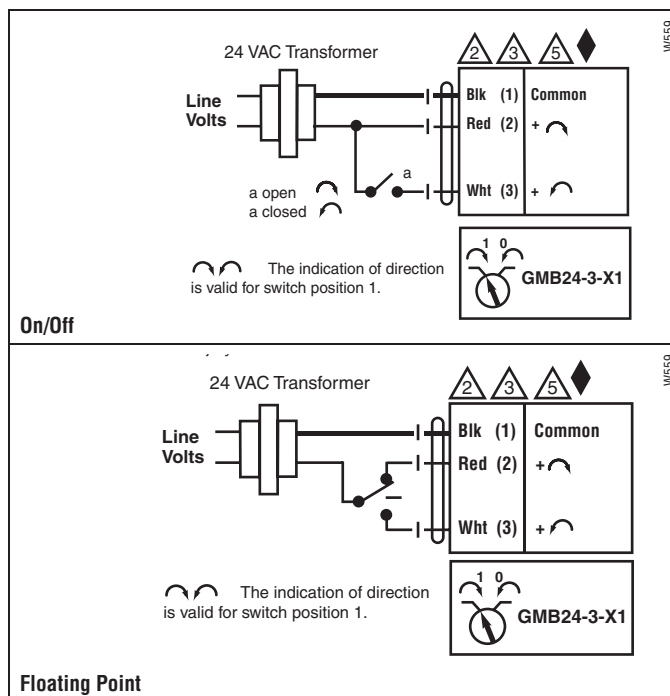


Meets cULus or UL and CSA requirements without the need of an electrical ground connection.



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



Models

GMX24-MFT-T-X1 N4 w/terminal block
GMB24-MFT-T-X1 N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 8 W / heater 29W holding 2.5 W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
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 1000 Ω for floating point and on-off control
Angle of rotation	95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with ↺/↻ switch
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	150 seconds (default) variable (75 to 290 seconds)
Humidity	5 to 100% RH (UL Type 4)
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 type	UL Type 4/NEMA 4X/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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- 8 Contact closures A & B also can be triacs.
A & B should both be closed for triac source and open for triac sink.
 - 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

 APPLICATION NOTES

◆ The ZG-R01 500 Ω resistor may be used.

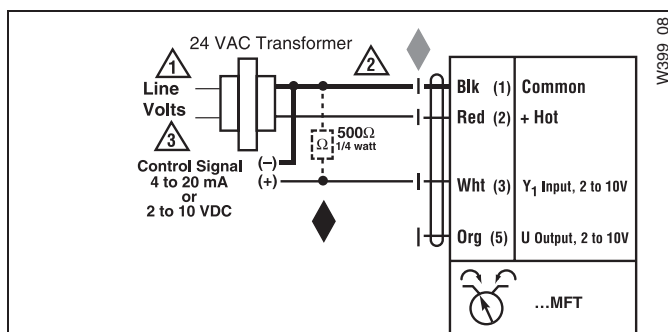
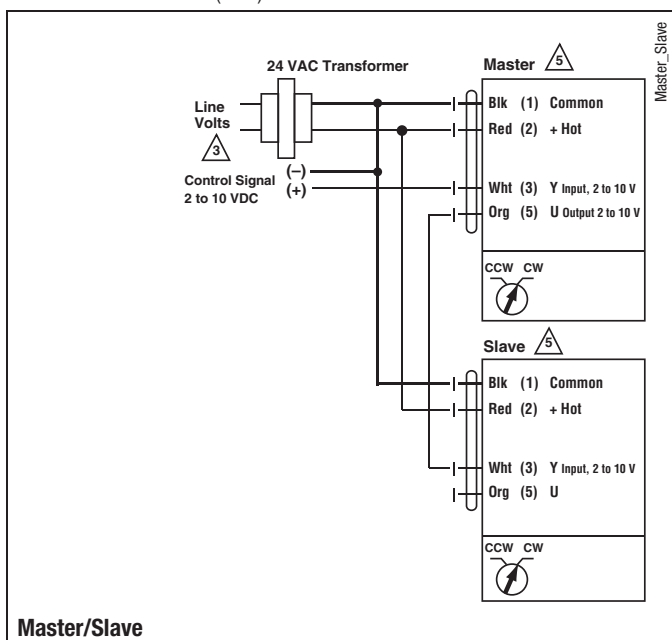
WARNING *Live Electrical Components!*
During installation, testing, servicing and troubles

 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.

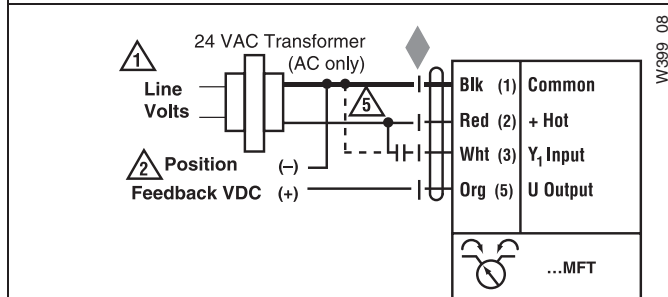
Wiring Diagrams

INSTALLATION NOTES

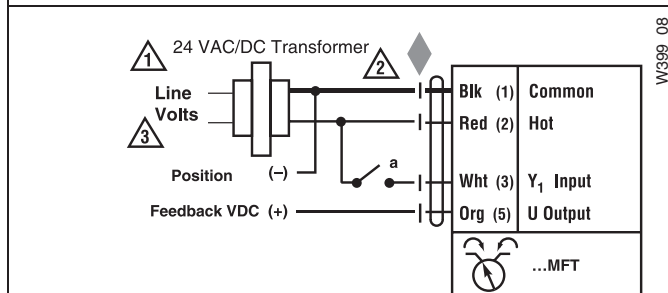
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION** *Equipment Damage!*
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback 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.



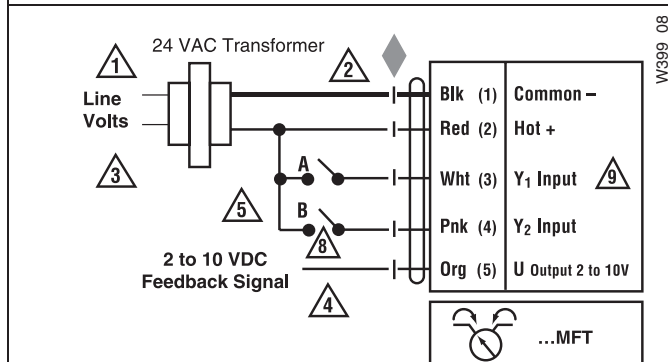
VDC/4-20 mA



PWM



On/Off control



PRBUP-MFT-T

Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Operating Range Y	2 to 10 VDC, 4 to 20 mA variable (VDC, floating point, on/off)
Input Impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for On/Off
Feedback Output U	2 to 10 VDC, 0.5 mA max, VDC variable
Angle of Rotation	90°
Torque motor	Min. 1400 in-lbs [160 Nm]
Direction of Rotation (Motor)	reversible with app
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4
Housing Material	Aluminum die cast and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°
Communication	BACnet MS/TP
Passive Sensor Inputs	2 (PT1000) (NI1000) (NTC)

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

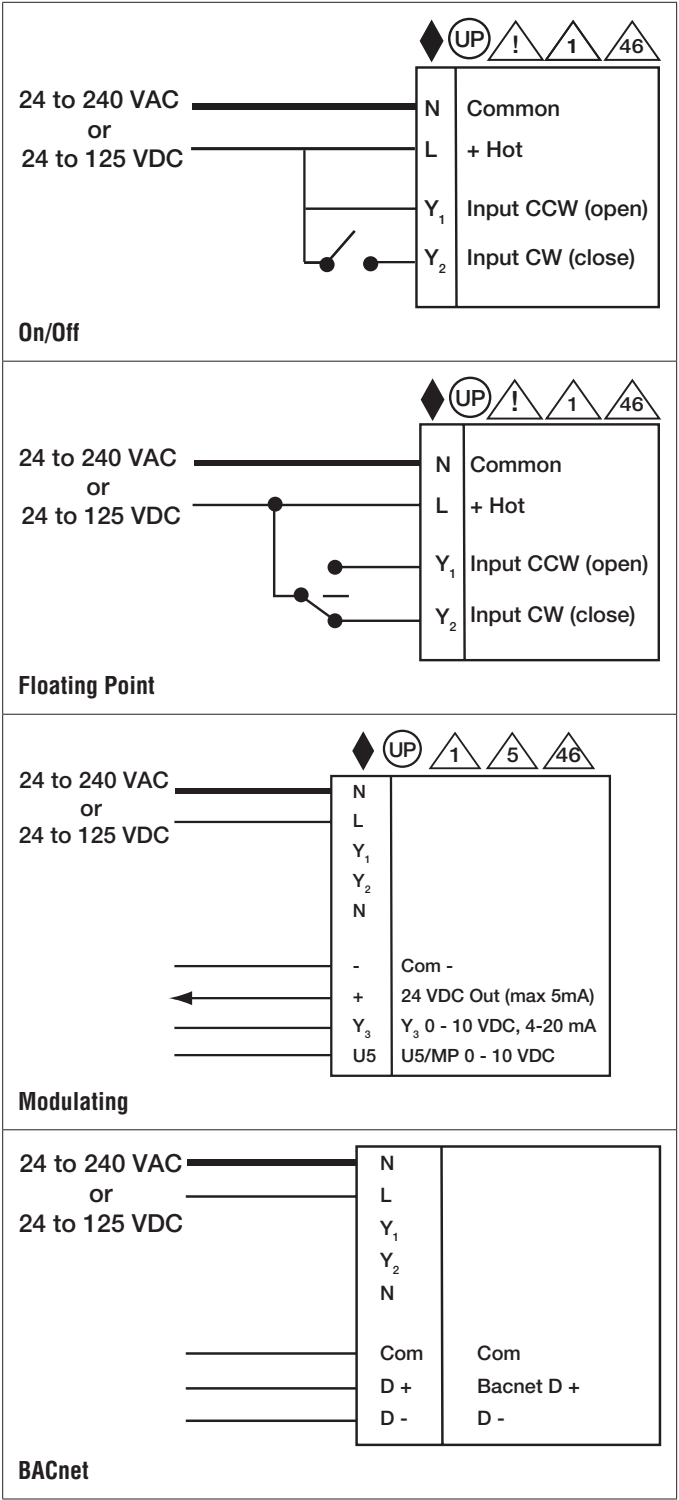
The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

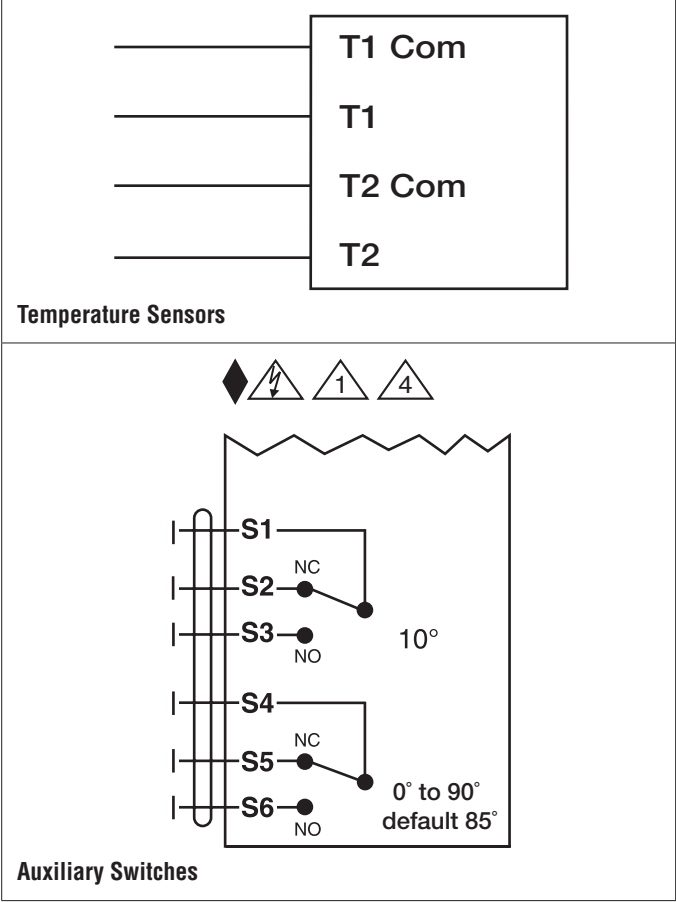
†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

- Meets cULus requirements without the need of an electrical ground connection.
- Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 240 VDC.
- Disconnect power.
- Provide overload protection and disconnect as required.
- Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- Only connect common to negative (-) leg of control circuits.
- Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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.





PRXUP-3-T

On/Off, Floating Point, Non-Spring Return, 24-240 V, NEMA 4X



Technical Data	
Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Input Impedance	1000 Ω
Angle of Rotation	90°
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4X
Housing Material	aluminum die cast polycarbonate cover
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

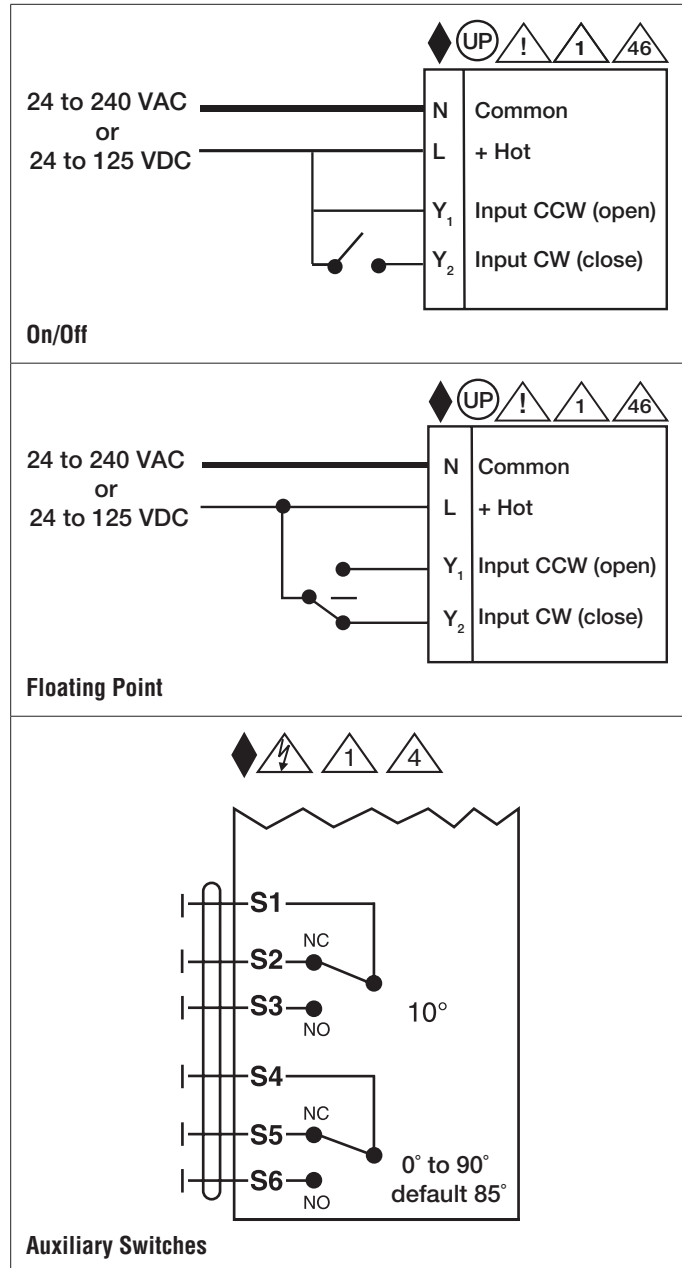
The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 125 VDC.
- ⚡ Disconnect power.
- 1 Provide overload protection and disconnect as required.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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.



PRXUP-MFT-T

Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Operating Range Y	2 to 10 VDC, 4 to 20 mA variable (VDC, floating point, on/off)
Input Impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for On/Off
Feedback Output U	2 to 10 VDC, 0.5 mA max, VDC variable
Angle of Rotation	90°
Torque motor	Min. 1400 in-lbs [160 Nm]
Direction of Rotation (Motor)	reversible with app
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4
Housing Material	Aluminum die cast and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°
Communication	BACnet MS/TP
Passive Sensor Inputs	2 (PT1000) (NI1000) (NTC)

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

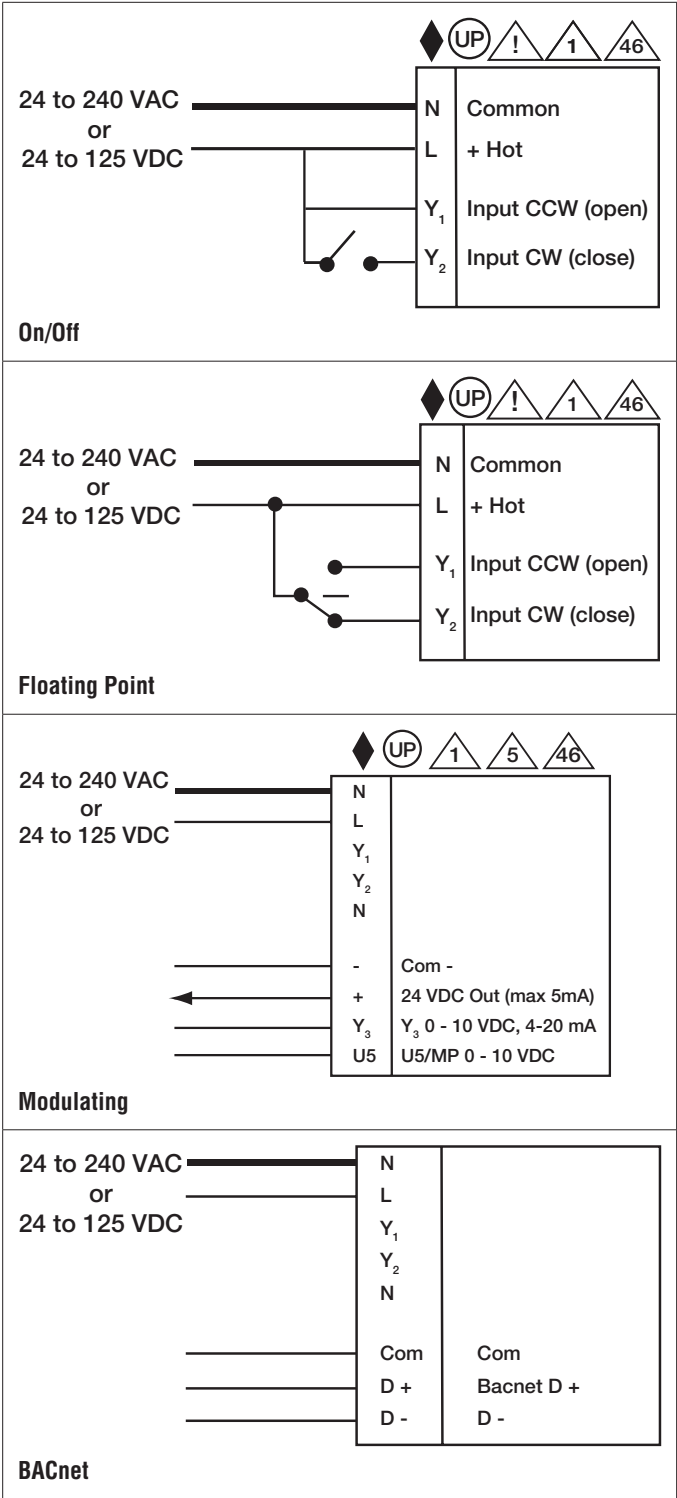
The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

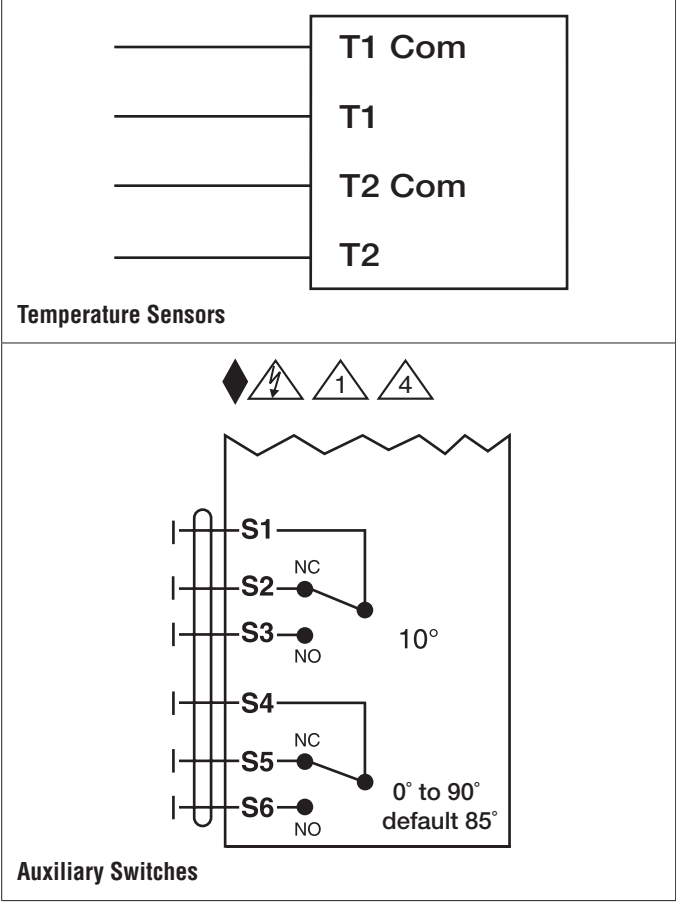
Wiring Diagrams

- Meets cULus requirements without the need of an electrical ground connection.
- Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 240 VDC.
- Disconnect power.
- Provide overload protection and disconnect as required.
- Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- Only connect common to negative (-) leg of control circuits.
- Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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.



PRXUP-MFT-T
Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



PRBUP-3-T

On/Off, Floating Point, Non-Spring Return, 24-240 V, NEMA 4X



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Input Impedance	1000 Ω
Angle of Rotation	90°
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4X
Housing Material	aluminum die cast polycarbonate cover
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

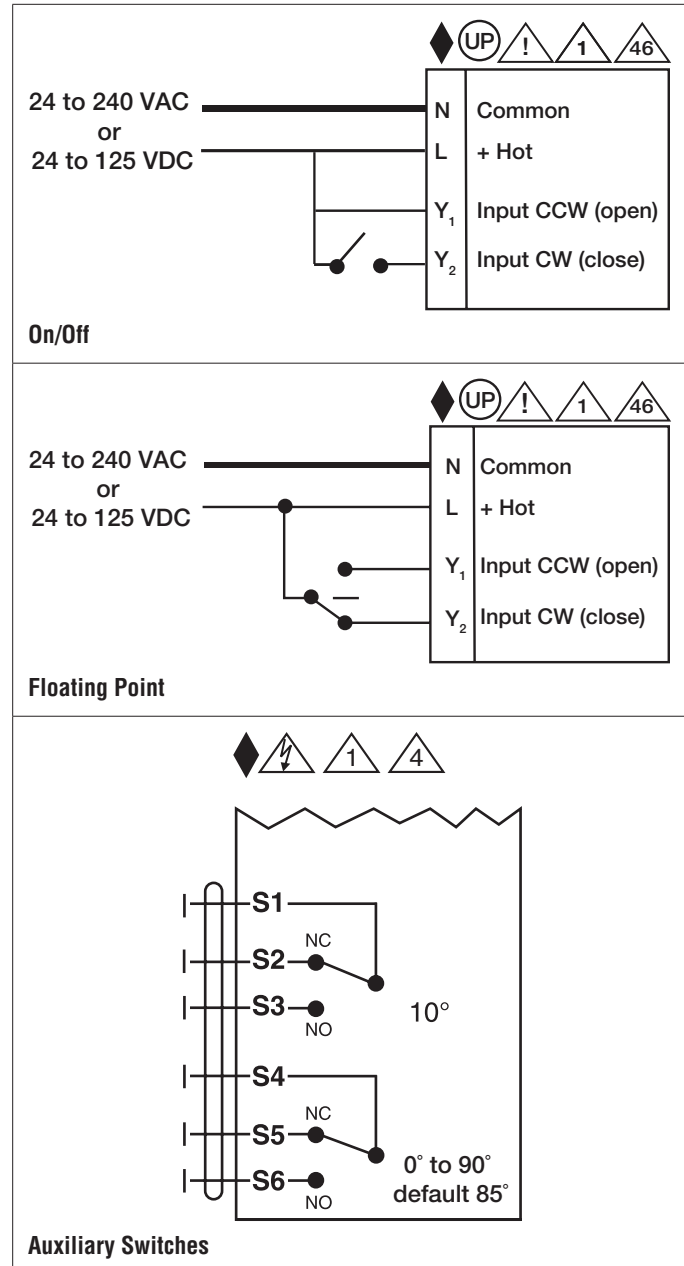
†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 125 VDC.

- ⚡ Disconnect power.
- 1 Provide overload protection and disconnect as required.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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GRB120-3-5-14

On/Off Floating Point, Non-Spring Return, 110 V



Technical Data

Power Supply	100-240 VAC $\pm$ 20%, 50/60 Hz
Power Consumption Running	4 W
Power Consumption Holding	2 W
Transformer Sizing	7 VA @ 24 VAC (class 2 power source)
Electrical Connection	18 GA appliance rated cable with 1/2" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] and 16 ft [5m]
Overload Protection	electronic throughout 0° to 95° rotation
Input Impedance	600 Ω
Angle of Rotation	90°, adjustable with mechanical stop
Direction of Rotation (Motor)	reversible with built-in switch
Manual Override	external push button
Running Time (Motor)	150 sec
Humidity	5 to 95% RH non-condensing
Ambient Temperature Range	-22°F to +122°F [-30°C to +50°C]
Storage Temperature Range	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2, IP42, UL enclosure type 2
Housing Material	UL94-5VA
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	<45 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	3.5 lb [1.6 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

Wiring Diagrams
✂ INSTALLATION NOTES

-  Actuators with appliance cables are numbered.
-  Provide overload protection and disconnect as required.
-  Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
-  Meets cULus requirements without the need of an electrical ground connection.

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