

# F6/F7...HD/HDU Series Butterfly Valves



# F6...HDU Butterfly Valves 2"-12" Ductile Iron Lug Body Resilient Seat, 304 Stainless Disc



- 50 psi bubble tight shut-off
- Long stem design allows for 2" insulation
- Valve face-to-face dimensions comply with API 609 & MSS-SP-67
- Completely assembled and tested, ready for installation

## Application

These valves are designed to meet the needs of HVAC and commercial applications requiring bubble tight shut-off for liquids. 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. Designed for use in Victaulic piping systems when mated to Victaulic 41 series flange nipples.

## Jobsite Note

Valves should be stored in a weather protected area prior to construction. Complete installation recommendations can be found in Belimo's Installation and Maintenance Instructions for F6/F7...HD/HDU Butterfly Valves.

Technical Data	
Service	chilled, hot water, 60% glycol
Flow characteristic	modified equal percentage
Action	90° rotation
Sizes	2" to 12"
Type of end fitting	for use with ANSI Class 125/150 flanges
Materials	
Body	ductile iron ASTM A536
Body finish	epoxy powder coated
Disc	304 stainless steel
Seat	EPDM
Shaft	416 stainless steel
O-ring	EPDM
Upper bushing	RPTFE
Middle bushings	RPTFE
Lower bushing	RPTFE
Media temperature range	-22°F to 250°F [-30°C to 120°C]
Operation ambient temperature range	-22°F to 122°F [-30°C to 50°C]
Body pressure rating	ASME/ANSI Class 125/150 (200 psi at -30°F to 275°F)
Close-off pressure	50 psi
Rangeability	10:1 (for 30° to 70° range)
Maximum velocity	12 FPS

Valve		Nominal Size		Type	Suitable Actuators		
$C_v$ 90°	$C_v$ 60°	IN	DN [mm]	2-way	Spring	Non-Spring	
115	44	2"	50	F650HDU	AF Series	AM Series	SY Series
196	75	2½"	65	F665HDU			
302	116	3"	80	F680HDU	GM		
600	230	4"	100	F6100HDU			
1022	392	5"	125	F6125HDU			
1579	605	6"	150	F6150HDU			
3136	1202	8"	200	F6200HDU			
5340	2047	10"	250	F6250HDU			
8250	3062	12"	300	F6300HDU			

Valve	Size	$C_v$	MOD								ON/OFF
			10°	20°	30°	40°	50°	60°	70°	80°	
F650HDU	2"	115	.06	3	7	15	27	44	70	105	115
F665HDU	2½"	196	.10	6	12	25	45	75	119	178	196
F680HDU	3"	302	.20	9	18	39	70	116	183	275	302
F6100HDU	4"	600	.30	17	36	78	139	230	364	546	600
F6125HDU	5"	1022	.50	29	61	133	237	392	620	930	1022
F6150HDU	6"	1579	.80	45	95	205	366	605	958	1437	1579
F6200HDU	8"	3136	2	89	188	408	727	1202	1903	2854	3136
F6250HDU	10"	5340	3	151	320	694	1237	2047	3240	4859	5340
F6300HDU	12"	8250	4	234	495	1072	1911	3062	5005	7507	8250

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Maximum Dimensions (Inches)												
Valve	Size	C <sub>v</sub> 90°	C <sub>v</sub> 60°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)
F650HDU	2"	115	44	1.65	9.00	9.00	19.50	4.75	4	5/8-11UNC	AF	50
F665HDU	2½"	196	75	1.76	9.00	9.00	20.00	5.50	4	5/8-11UNC		50
F680HDU	3"	302	116	1.78	9.00	9.00	20.50	6.00	4	5/8-11UNC	2*AF	50
F6100HDU	4"	600	230	2.05	9.00	9.00	21.00	7.50	8	5/8-11UNC		50
F6125HDU	5"	1022	392	2.14	9.00	9.00	22.00	8.50	8	3/4-10UNC	AMB(X)	50
F650HDU	2"	115	44	1.65	7.00	7.00	15.00	4.75	4	5/8-11UNC		50
F665HDU	2½"	196	75	1.76	7.00	7.00	15.50	5.50	4	5/8-11UNC	GMB(X)	50
F680HDU	3"	302	116	1.78	7.00	7.00	16.00	6.00	4	5/8-11UNC		50
F6100HDU	4"	600	230	2.05	8.00	8.00	17.00	7.50	8	5/8-11UNC	GMB(X)	50
F6125HDU	5"	1022	392	2.14	8.00	8.00	17.50	8.50	8	3/4-10UNC		50
F6150HDU	6"	1579	605	2.19	8.00	8.00	22.50	9.50	8	3/4-10UNC	SY1...	50
F650HDU	2"	115	44	1.65	4.25	4.25	15.50	4.75	4	5/8-11UNC		50
F665HDU	2½"	196	75	1.76	4.25	4.25	16.00	5.50	4	5/8-11UNC	SY2...	50
F680HDU	3"	302	116	1.78	4.25	4.25	16.25	6.00	4	5/8-11UNC		50
F6100HDU	4"	600	230	2.05	8.00	13.00	22.00	7.50	8	5/8-11UNC	SY3...	50
F6125HDU	5"	1022	392	2.14	8.00	13.00	22.50	8.50	8	3/4-10UNC		50
F6150HDU	6"	1579	605	2.19	8.00	13.00	23.00	9.50	8	3/4-10UNC	SY3...	50
F6200HDU	8"	3136	1202	2.37	8.00	13.00	24.25	11.75	8	3/4-10UNC		50
F6250HDU	10"	5340	2047	2.58	8.00	13.00	25.50	14.25	12	7/8-9UNC	SY3...	50
F6300HDU	12"	8250	3062	3.01	8.00	13.00	27.25	17.00	12	7/8-9UNC		50

Dimension "A" is compressed, add .125" for relaxed state.

AF, AM and GM maximum actuator ambient temperature is 122°F.

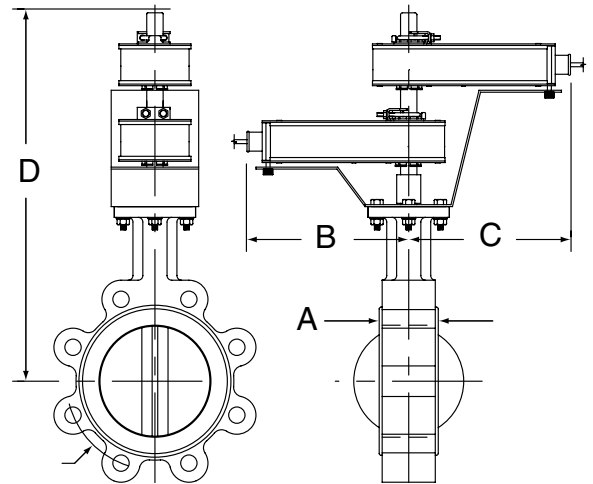
SY maximum actuator ambient temperature is 150°F.

Model SY1... does not have handwheel - override is via 8mm wrench on bottom side of actuator.

### Application Notes

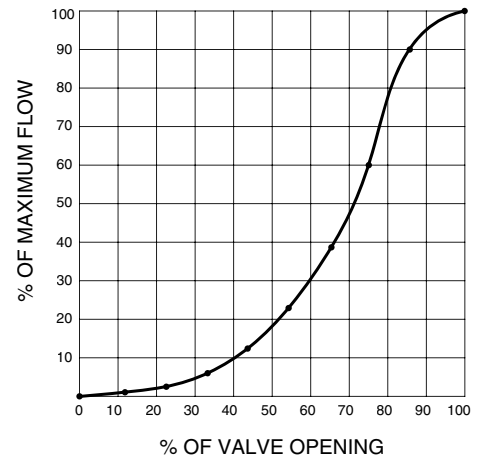
- Valves are rated at 50 psi differential pressure in the closed position.
- Valves are furnished with lugs tapped for use with ANSI Class 125/150 flanges. Installation flanges and hardware are not included.
- 2-way assemblies are furnished assembled and tested, ready for installation.
- Dimension "D" allows for actuator removal without the need to remove the valve from the pipe.
- Weather shields are available, dimensional data upon request.
- Dual actuated valves have actuators mounted on a common valve shaft.
- Belimo SY Series actuators are NEMA 4X rated.

### Dimensions



BF2WUDIM

### Flow Pattern



# F7...HDU Butterfly Valves 2"-12" Ductile Iron Lug Body Resilient Seat, 304 Stainless Disc



- 50 psi bubble tight shut-off
- Long stem design allows for 2" insulation
- Valve face-to-face dimensions comply with API 609 & MSS-SP-67
- 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 bubble tight shut off for liquids. 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. Designed for use in Victaulic piping systems when mated to Victaulic 41 series flange nipples.

## Jobsite Note

Valves should be stored in a weather protected area prior to construction. Complete installation recommendations can be found in Belimo's Installation and Maintenance Instructions for F6/F7...HD/HDU Butterfly Valves.

Technical Data	
Service	chilled, hot water, 60% glycol
Flow characteristic	modified linear
Action	90° rotation
Sizes	2" to 12"
Type of end fitting	for use with ANSI 125/150 flanges
Materials	
Body	ductile iron ASTM A536
Body finish	epoxy powder finish
Disc	304 stainless steel
Seat	EPDM standard
Shaft	416 stainless steel
O-ring	EPDM
Upper bushing	RPTFE
Middle bushings	RPTFE
Lower bushing	RPTFE
Media temperature range	-22°F to 250°F [-30°C to 120°C]
Operation ambient temperature range	-22°F to 122°F [-30°C to 50°C]
Body pressure rating	ASME/ANSI Class 125/150 (200 psi at -30°F to 275°F)
Close-off pressure	50 psi
Rangeability	10:1 (for 30° to 70° range)
Maximum velocity	12 FPS

$C_v$ 90°	$C_v$ 60°	Valve Nominal Size		Type	Suitable Actuators		
		IN	DN [mm]		3-way	Spring	Non-Spring
115	44	2"	50	F750HDU	AF Series	AM	SY Series
196	75	2½"	65	F765HDU			
302	116	3"	80	F780HDU		GM Series	
600	230	4"	100	F7100HDU			
1022	392	5"	125	F7125HDU			
1579	605	6"	150	F7150HDU			
3136	1202	8"	200	F7200HDU			
5340	2047	10"	250	F7250HDU			
8250	3062	12"	300	F7300HDU			

Valve	Size	$C_v$	MOD									ON/OFF	
			10°	20°	30°	40°	50°	60°	70°	80°	90°		
F750HDU	2"	115	.06	3	7	15	27	44	70	105	115		
F765HDU	2½"	196	.10	6	12	25	45	75	119	178	196		
F780HDU	3"	302	.20	9	18	39	70	116	183	275	302		
F7100HDU	4"	600	.30	17	36	78	139	230	364	546	600		
F7125HDU	5"	1022	.50	29	61	133	237	392	620	930	1022		
F7150HDU	6"	1579	.80	45	95	205	366	605	958	1437	1579		
F7200HDU	8"	3136	2	89	188	408	727	1202	1903	2854	3136		
F7250HDU	10"	5340	3	151	320	694	1237	2047	3240	4859	5340		
F7300HDU	12"	8250	4	234	495	1072	1911	3062	5005	7507	8250		

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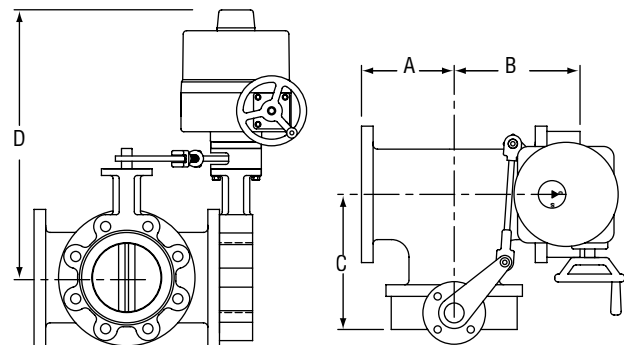
Maximum Dimensions (Inches)											
Valve	Size	C <sub>v</sub> 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)
F750HDU	2"	115	4.50	6.15	6.15	15.50	4.75	4	5/8-11UNC	AF	50
F765HDU	2½"	196	5.00	6.76	6.76	16.00	5.50	4	5/8-11UNC	2*AF	50
F780HDU	3"	302	5.50	7.28	7.28	16.25	6.00	4	5/8-11UNC		50
F750HDU	2"	115	4.50	6.15	6.15	15.50	4.75	4	5/8-11UNC	SY1...	50
F765HDU	2½"	196	5.00	6.76	6.76	16.00	5.50	4	5/8-11UNC		50
F780HDU	3"	302	5.50	7.28	7.28	21.00	6.00	4	5/8-11UNC	SY2...	50
F7100HDU	4"	600	6.50	8.55	8.55	21.75	7.50	8	5/8-11UNC		50
F7125HDU	5"	1022	7.50	9.64	9.64	22.25	8.50	8	3/4-10UNC		50
F7150HDU	6"	1579	8.00	10.19	10.19	22.75	9.50	8	3/4-10UNC	SY3...	50
F7200HDU	8"	3136	9.00	11.37	11.37	24.25	11.75	8	3/4-10UNC		50
F7250HDU	10"	5340	11.00	13.58	13.58	30.00	14.25	12	7/8-9UNC	SY4...	50
F7300HDU	12"	8250	12.00	15.01	15.01	32.00	17.00	12	7/8-9UNC		50

AF maximum actuator ambient temperature is 122°F.  
 SY... maximum actuator ambient temperature is 150°F.  
 Model SY1... does not have hand wheel-override is via 8mm wrench on bottom side of actuator.

### Application Notes

1. Valves are rated at 50 psi differential pressure in the closed position.
2. Valves are furnished with lugs tapped for use with ANSI Class 125/150 flanges. Installation flanges and hardware are not included.
3. 3-way assemblies are furnished assembled and tested, ready for installation.  
**All 3-way assemblies require the customer to specify the 3-way configuration prior to order entry to guarantee correct placement of valves and actuators on the assembly.**
4. Dimension "D" allows for actuator removal without the need to remove the valve from the pipe.
5. Weather shields are available, dimensional data upon request.
6. Dual actuated valves have single actuators mounted on each valve shaft.
7. Bolts supplied are for shipping purposes only. Upon installation replace with an appropriate SAE grade 5 or better hardware.
8. Belimo SY Series actuators are NEMA 4X rated.

### Dimensions



HS DMGP15

# F6...HD Butterfly Valves 2"-30" Ductile Iron Lug Body Resilient Seat, 304 Stainless Disc



- 200 psi (2" to 12") and 150 psi (14"-30") bubble tight shut-off
- Long stem design allows for 2" insulation
- Valve face-to-face dimensions comply with API 609 & MSS-SP-67
- Completely assembled and tested, ready for installation

## Application

These valves are designed to meet the needs of HVAC and commercial applications requiring bubble tight shut-off for liquids. 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. Designed for use in Victaulic piping systems when mated to Victaulic 41 series flange nipples.

## Jobsite Note

Valves should be stored in a weather protected area prior to construction. Complete installation recommendations can be found in Belimo's Installation and Maintenance Instructions for F6/F7...HD/HDU Butterfly Valves.

Technical Data	
Service	chilled, hot water, 60% glycol
Flow characteristic	modified equal percentage
Action	90° rotation
Sizes	2" to 30"
Type of end fitting	for use with ANSI 125/150 flanges
Materials	
Body	ductile iron ASTM A536
Body finish	epoxy powder coated
Disc	304 stainless steel
Seat	EPDM standard
Shaft	416 stainless steel
O-ring	EPDM
Upper bushing	RPTFE
Middle bushings	RPTFE
Lower bushing	RPTFE
Media temperature range	-22°F to 250°F [-30°C to 120°C]
Operation ambient temperature range	-22°F to 122°F [-30°C to 50°C]
Body pressure rating	ASME/ANSI Class 125/150 (200 psi at -30°F to 275°F)
Close-off pressure	200 psi (2"-12"), 150 psi (14"-30")
Rangeability	10:1 (for 30° to 70° range)
Maximum velocity	12 FPS

Valve		Nominal Size		Type	Suitable Actuators		
$C_v$ 90°	$C_v$ 60°	IN	DN [mm]	2-way	Spring	Non-Spring	
115	44	2"	50	F650HD	AF Series	AM	SY Series
196	75	2½"	65	F665HD			
302	116	3"	80	F680HD		GM	
600	230	4"	100	F6100HD			
1022	392	5"	125	F6125HD			
1579	605	6"	150	F6150HD			
3136	1202	8"	200	F6200HD			
5340	2047	10"	250	F6250HD			
8250	3062	12"	300	F6300HD			
11917	4568	14"	350	F6350HD			
16388	6282	16"	400	F6400HD			
21705	8320	18"	450	F6450HD			
27908	10698	20"	500	F6500HD			
43116	16528	24"	600	F6600HD			
73426	28146	30"	750	F6750HD			

Valve	Size	$C_v$	MOD								
			10°	20°	30°	40°	50°	60°	70°	80°	90°
F650HD	2"	115	.06	3	7	15	27	44	70	105	115
F665HD	2-1/2"	196	.10	6	12	25	45	75	119	178	196
F680HD	3"	302	.20	9	18	39	70	116	183	275	302
F6100HD	4"	600	.30	17	36	78	139	230	364	546	600
F6125HD	5"	1022	.50	29	61	133	237	392	620	930	1022
F6150HD	6"	1579	.80	45	95	205	366	605	958	1437	1579
F6200HD	8"	3136	2	89	188	408	727	1202	1903	2854	3136
F6250HD	10"	5340	3	151	320	694	1237	2047	3240	4859	5340
F6300HD	12"	8250	4	234	495	1072	1911	3062	5005	7507	8250
F6350HD	14"	11917	6	338	715	1549	2761	4568	7230	10844	11917
F6400HD	16"	16388	8	464	983	2130	3797	6282	9942	14913	16388
F6450HD	18"	21705	11	615	1302	2822	5028	8320	13168	19752	21705
F6500HD	20"	27908	14	791	1674	3628	6465	10698	16931	25396	27908
F6600HD	24"	43116	22	1222	2587	5605	9989	16528	26157	39236	43116
F6750HD	30"	73426	37	2081	4405	9545	17011	28146	44545	66818	73426

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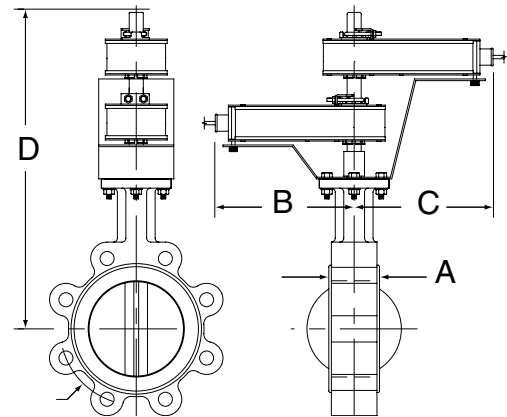
Maximum Dimensions (Inches)													
Valve	Size	C <sub>v</sub> 90°	C <sub>v</sub> 60°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F650HD	2"	115	44	1.65	9.00	9.00	19.50	4.75	4	5/8-11UNC	AF	200	
F665HD	2½"	196	75	1.76	9.00	9.00	20.00	5.50	4	5/8-11UNC	2*AF	200	
F680HD	3"	302	116	1.78	9.00	9.00	20.50	6.00	4	5/8-11UNC		200	
F650HD	2"	115	44	1.65	7.00	7.00	15.00	4.75	4	5/8-11UNC		AMB(X)	200
F665HD	2½"	196	75	1.76	7.00	7.00	15.50	5.50	4	5/8-11UNC	GMB(X)	200	
F680HD	3"	302	116	1.78	8.00	8.00	16.00	6.00	4	5/8-11UNC		200	
F6100HD	4"	600	230	2.05	8.00	8.00	21.00	7.50	8	5/8-11UNC		2*GMB(X)	200
Valve	Size	C <sub>v</sub> 90°	C <sub>v</sub> 60°	A(Max)	B (Max)	C (Max)	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F650HD	2"	115	44	1.65	8.00	13.00	20.25	4.75	4	5/8-11UNC	SY2...	200	
F665HD	2½"	196	75	1.76	8.00	13.00	20.75	5.50	4	5/8-11UNC		200	
F680HD	3"	302	116	1.78	8.00	13.00	21.00	6.00	4	5/8-11UNC		200	
F6100HD	4"	600	230	2.05	8.00	13.00	21.75	7.50	8	5/8-11UNC	SY3...	200	
F6125HD	5"	1022	392	2.14	8.00	13.00	22.25	8.50	8	3/4-10UNC		200	
F6150HD	6"	1579	605	2.19	8.00	13.00	22.75	9.50	8	3/4-10UNC		200	
F6200HD	8"	3136	1202	2.37	12.00	15.00	29.00	11.75	8	3/4-10UNC	SY4...	200	
F6250HD	10"	5340	2047	2.58	12.00	15.00	30.00	14.25	12	7/8-9UNC		200	
F6300HD	12"	8250	3062	3.01	12.00	15.00	32.00	17.00	12	7/8-9UNC		200	
F6350HD	14"	11917	4568	3.02	12.00	15.00	33.00	18.75	12	1-8UNC	SY5...	150	
F6400HD	16"	16388	6282	3.39	12.00	15.00	34.50	21.25	16	1-8UNC		SY6...†	150
F6450HD	18"	21705	8320	4.13	14.00	21.00	39.25	22.75	16	1 1/8-7UNC		SY8...†	150
F6500HD	20"	27908	10698	5.00	14.00	21.00	41.50	25.00	20	1 1/8-7UNC	150		
F6600HD	24"	43116	16528	5.94	14.00	22.00	53.25	29.50	20	1 1/4-7UNC	SY11...†		150
F6750HD	30"	73426	28146	6.57	14.00	22.00	57.50	36.00	28	1 1/4-7UNC	SY12...†	150	

Dimension "A" is compressed, add .125" for relaxed state.  
 †SY6 and larger available in 110/220 VAC versions only.  
 AF, AM and GM maximum actuator ambient temperature is 122°F.  
 SY... maximum actuator ambient temperature is 150°F.

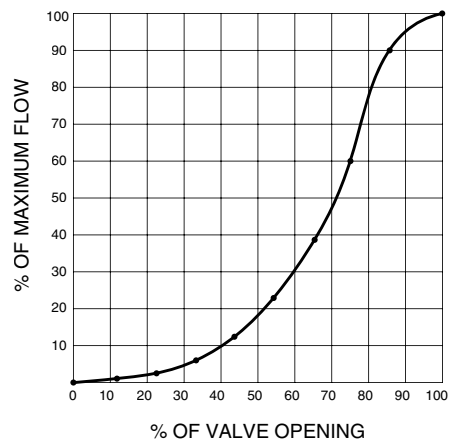
### Application Notes

1. Valves are rated at 200 psi differential pressure in the closed position (SY... 150 psi 14"+).
2. Valves are furnished with lugs tapped for use with ANSI Class 125/150 flanges. Installation flanges and hardware are not included.
3. 2-way assemblies are furnished assembled and tested, ready for installation.
4. Dimension "D" allows for actuator removal without the need to remove the valve from the pipe.
5. Weather shields are available, dimensional data upon request.
6. Dual actuated valves have actuators mounted on a common valve shaft.
7. Belimo SY Series actuators are NEMA 4X rated.

### Dimensions



### Flow Pattern



# F7...HD Butterfly Valves 2"-24" Ductile Iron Lug Body Resilient Seat, 304 Stainless Disc



- 200 psi (2" to 12") and 150 psi (14"-30") bubble tight shut-off
- Long stem design allows for 2" insulation
- Valve face-to-face dimensions comply with API 609 & MSS-SP-67
- 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 bubble tight shut off for liquids. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C<sub>v</sub> values provide for an economical control valve solution for larger flow applications. Designed for use in Victaulic piping systems when mated to Victaulic 41 series flange nipples. Fail safe operation is possible with NSV-SY series battery backup systems.

## Jobsite Note

Valves should be stored in a weather protected area prior to construction. Complete installation recommendations can be found in Belimo's Installation and Maintenance Instructions for F6/F7...HD/HDU Butterfly Valves.

Technical Data	
Service	chilled, hot water, 60% glycol
Flow characteristic	modified linear
Action	90° rotation
Sizes	2" to 24"
Type of end fitting	for use with ANSI 125/150 flanges
Materials:	
Body	ductile iron ASTM A536
Body finish	epoxy powder coated
Disc	304 stainless steel
Seat	EPDM standard
Shaft	416 stainless steel
O-ring	EPDM
Upper bushing	RPTFE
Middle bushings	RPTFE
Lower bushing	RPTFE
Media temperature range	-22°F to 250°F [-30°C to 120°C]
Operation ambient temperature range	-22°F to 122°F [-30°C to 50°C]
Body pressure rating	ASME/ANSI Class 125/150 (200 psi at -30°F to 275°F)
Close-off pressure	200 psi (2"-12"), 150 psi (14"-24")
Rangeability	10:1 (for 30° to 70° range)
Maximum Velocity	12 FPS

Valve		Nominal Size		Type	Suitable Actuators		
C <sub>v</sub> 90°	C <sub>v</sub> 60°	IN	DN [mm]	2-way	Spring	Non-Spring	
115	44	2"	50	F750HD	AF Series	AM	GM Series
196	75	2½"	65	F765HD			
302	116	3"	80	F780HD			
600	230	4"	100	F7100HD			
1022	392	5"	125	F7125HD			
1579	605	6"	150	F7150HD			
3136	1202	8"	200	F7200HD			
5340	2047	10"	250	F7250HD			
8250	3062	12"	300	F7300HD			
11917	4568	14"	350	F7350HD			
16388	6282	16"	400	F7400HD	SY Series		
21705	8320	18"	450	F7450HD			
27908	10698	20"	500	F7500HD			
43116	16528	24"	600	F7600HD			

Valve	Size	C <sub>v</sub>	MOD									ON/OFF	
			10°	20°	30°	40°	50°	60°	70°	80°	90°		
F750HD	2"	115	.06	3	7	15	27	44	70	105	115		
F765HD	2½"	196	.10	6	12	25	45	75	119	178	196		
F780HD	3"	302	.20	9	18	39	70	116	183	275	302		
F7100HD	4"	600	.30	17	36	78	139	230	364	546	600		
F7125HD	5"	1022	.50	29	61	133	237	392	620	930	1022		
F7150HD	6"	1579	.80	45	95	205	366	605	958	1437	1579		
F7200HD	8"	3136	2	89	188	408	727	1202	1903	2854	3136		
F7250HD	10"	5340	3	151	320	694	1237	2047	3240	4859	5340		
F7300HD	12"	8250	4	234	495	1072	1911	3062	5005	7507	8250		
F7350HD	14"	11917	6	338	715	1549	2761	4568	7230	10844	11917		
F7400HD	16"	16388	8	464	983	2130	3797	6282	9942	14913	16388		
F7450HD	18"	21705	11	615	1302	2822	5028	8320	13168	19752	21705		
F7500HD	20"	27908	14	791	1674	3628	6465	10698	16931	25396	27908		
F7600HD	24"	43116	22	1222	2587	5605	9989	16528	26157	39236	43116		

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### Maximum Dimensions (Inches)

Valve	Size	C, 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F750HD	2"	115	4.50	6.15	6.15	20.25	4.75	4	5/8-11UNC	AF	200	Fail Safe
F765HD	2½"	196	5.00	6.76	6.76	20.75	5.50	4	5/8-11UNC	2*AF	200	
F750HD	2"	115	4.50	6.15	6.15	20.25	4.75	4	5/8-11UNC	SY2...	200	Non-Fail Safe
F765HD	2½"	196	5.00	6.76	6.76	20.75	5.50	4	5/8-11UNC		200	
F780HD	3"	302	5.50	7.28	7.28	21.00	6.00	4	5/8-11UNC		200	
F7100HD	4"	600	6.50	8.55	8.55	21.75	7.50	8	5/8-11UNC		200	
F7125HD	5"	1022	7.50	9.64	9.64	22.25	8.50	8	3/4-10UNC		200	
F7150HD	6"	1579	8.00	10.19	10.19	22.75	9.50	8	3/4-10UNC	200		
F7200HD	8"	3136	9.00	11.37	11.37	29.00	11.75	8	3/4-10UNC	200		
F7250HD	10"	5340	11.00	13.58	13.58	30.00	14.25	12	7/8-9UNC	200		
F7300HD	12"	8250	12.00	15.01	15.01	32.00	17.00	12	7/8-9UNC	200		
F7350HD	14"	11917	14.00	17.02	17.02	33.00	18.75	12	1-8UNC	SY6...†	150	
F7400HD	16"	16388	15.00	18.39	18.39	38.50	21.25	16	1-8UNC	SY7...†	150	
F7450HD	18"	21705	16.50	20.63	20.63	39.50	22.75	16	1 1/8-7UNC	SY9...†	150	
F7500HD	20"	27908	18.00	23.00	23.00	41.50	25.00	20	1 1/8-7UNC	SY9...†	150	
F7600HD	24"	43116	22.00	27.9	27.9	53.25	29.50	20	1 1/4-7UNC	SY12...†	150	

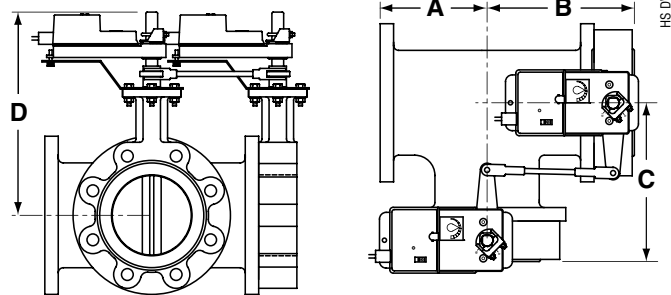
AF maximum actuator ambient temperature is 122°F.  
 SY... maximum actuator ambient temperature is 150°F.  
 †SY6 and larger available in 110/220 VAC versions only.

### Application Notes

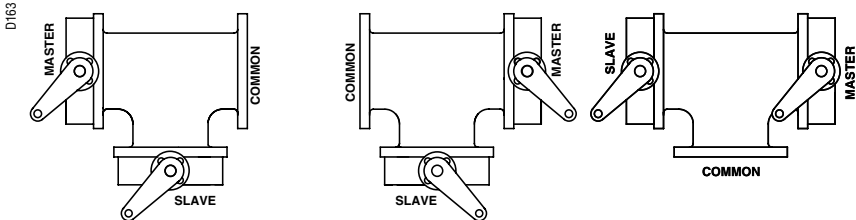
- Valves are rated at 200 psi differential pressure in the closed position.
- Valves are furnished with lugs tapped for use with ANSI Class 125/150 flanges. Installation flanges and hardware are not included.
- 3-way assemblies are furnished assembled and tested, ready for installation.  
**All 3-way assemblies require the customer to specify the 3-way configuration prior to order entry to guarantee correct placement of valves and actuators on the assembly.**
- Dimension "D" allows for actuator removal without the need to remove the valve from the pipe.
- Belimo SY Series actuators are NEMA 4X rated.
- Weather shields are available, dimensional data upon request.
- Dual actuated valves have single actuators mounted on each valve shaft.
- Bolts supplied are for shipping purposes only. Upon installation replace with an appropriate SAE grade 5 or better hardware.

**⚠ Note:** For tee configuration, please refer to page 4.

### Dimensions



### 3-Way Configuration Codes



CONFIG CODE	ON/OFF OR MOD@2VDC MASTER VALVE IS	MASTER VALVE @ FAIL
X10	OPEN	NON-FAIL
X11	OPEN	OPEN
X12	OPEN	CLOSED
X13	CLOSED	NON-FAIL
X14	CLOSED	OPEN
X15	CLOSED	CLOSED

CONFIG CODE	ON/OFF OR MOD@2VDC MASTER VALVE IS	MASTER VALVE @ FAIL
X20	OPEN	NON-FAIL
X21	OPEN	OPEN
X22	OPEN	CLOSED
X23	CLOSED	NON-FAIL
X24	CLOSED	OPEN
X25	CLOSED	CLOSED

CONFIG CODE	ON/OFF OR MOD@2VDC MASTER VALVE IS	MASTER VALVE @ FAIL
X30	OPEN	NON-FAIL
X31	OPEN	OPEN
X32	OPEN	CLOSED
X33	CLOSED	NON-FAIL
X34	CLOSED	OPEN
X35	CLOSED	CLOSED

X Specifies Bi-Directional Flow Capability

### NOTES

- Slave Valve operates inversely of the Master Valve.
- The Master Valve is always located on the run.
- The Slave Valve may also have an actuator if required (Direct Coupled).
- On/Off actuator normal position is a function of field logic.
- Proportional actuator normal position is a function of the CCW/CW switch.
- All 3-way assemblies are designed for 90 degree actuator rotation.

### ORDERING INFORMATION

Please note that HD series BF valves over 18" and ALL sizes 3-way tee assemblies ordered with Configuration Codes 30-35 are special order/custom built and are **NOT** returnable.

24 VAC					
SY1	SY2	SY3	SY4	SY5	
Amps	Amps	Amps	Amps	Amps	Amps
1.8	3	3	6	6.5	
MAX Distance between Actuator and Supply (feet)					
18	55	55			
16	87	87	43	40	
14	140	140	70	65	
12	214	214	107	99	
10	364	364	182	168	
8	543	543	271	250	

110 VAC											
SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
0.5	1	1	1.3	1.5	1.8	3.2	4	3.2	4	3	4
MAX Distance between Actuator and Supply (feet)											
18	758	758	583	505	421	237	189	237	189	253	189
16	1190	1190	916	794	661	372	298	372	298	397	298
14	1923	1923	1479	1282	1068	601	481	601	481	641	481
12	2941	2941	2262	1961	1634	919	735	919	735	980	735
10	5000	5000	3846	3333	2778	1563	1250	1563	1250	1667	1250
8	7463	7463	5741	4975	4146	2332	1866	2332	1866	2488	1866

220 VAC											
SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
0.3	0.5	0.5	0.6	0.7	0.8	1.6	2	1.6	2	1.6	2.2
MAX Distance between Actuator and Supply (feet)											
18	3030	3030	2525	2165	1894	947	758	947	758	947	689
16	4762	4762	3968	3401	2976	1488	1190	1488	1190	1488	1082
14	7692	7692	6410	5495	4808	2404	1923	2404	1923	2404	1748
12	11765	11765	9804	8403	7353	3676	2941	3676	2941	3676	2674
10	20000	20000	16667	14286	12500	6250	5000	6250	5000	6250	4545
8	29851	29851	24876	21322	18657	9328	7463	9328	7463	9328	6784

The NEC mandates that 24 VAC over 100 VA power requires CLASS 1 wiring conduit. Local codes may vary. Do NOT mix CLASS 1 & CLASS 2 circuits in the same conduit. Generally, 24 VAC actuators over 100 VA should be changed to 120 VAC models.

**Actuators: SYx-MFT**



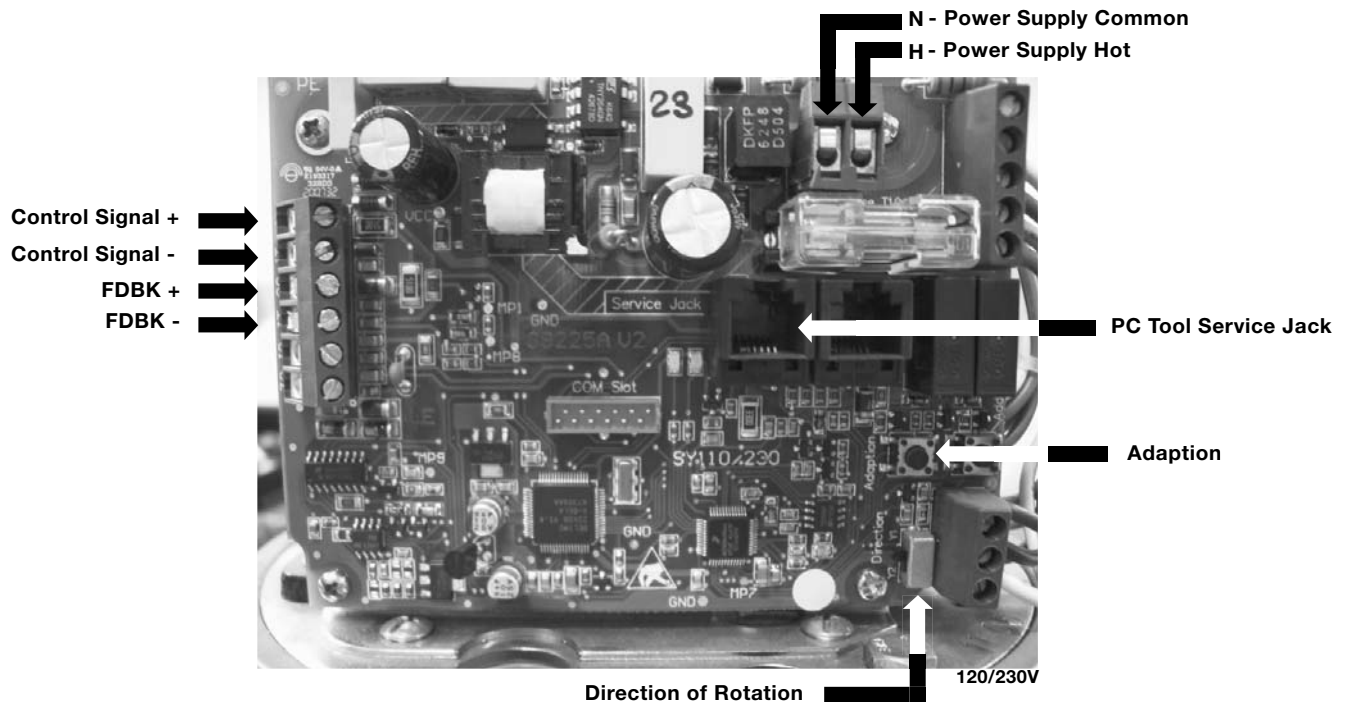
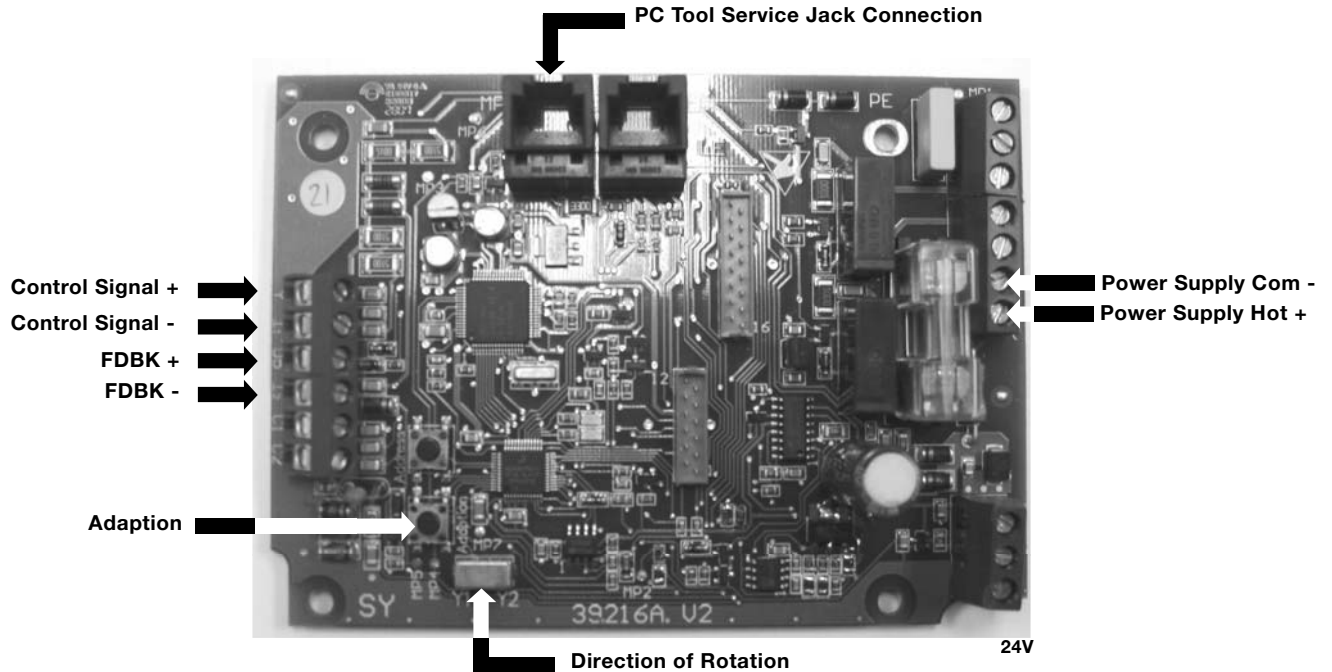
**INSTALLATION NOTES**



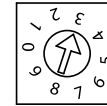
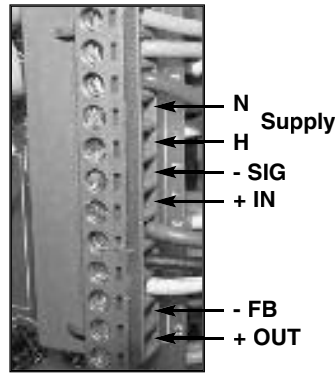
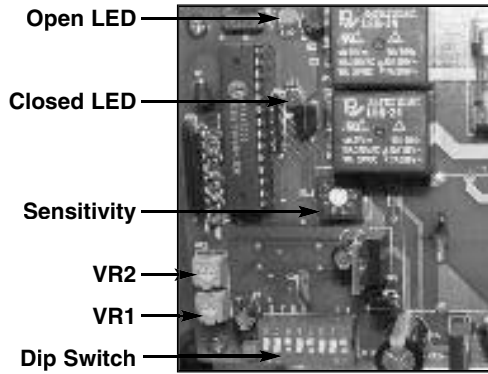
**CAUTION**

**Notes:**

1. Motor CAMS have been factory calibrated and should not be moved.
2. An adaption must be performed if any limit switch is adjusted. This will calibrate the beginning and end stopping points. Press the adaption button for 3 seconds and release.



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Sensitivity switch setting is position #3 for factory default. To widen dead-band, select a higher number (up to 9).

## INSTALLATION NOTES

**CAUTION**

- Notes:**
1. Applicable to the SY1 and legacy SY2-12 actuators.
  2. **Do not change sensitivity or dip switch settings with power applied!**
  3. VR1 and VR2 are factory calibrated and should not be moved.
  4. Motor CAMS have been factory calibrated and should not be moved.

### Dip Switch Settings

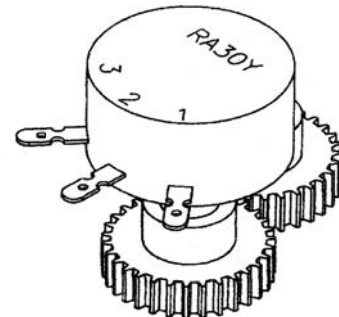
	INPUT = 2-10 VDC		RESPONSE = DIRECT
	INPUT = 4-20mA		RESPONSE = REVERSE
	INPUT = 1-5 VDC		LOSS OF SIGNAL = CLOSED (Direct Acting)
	OUTPUT = 4-20mA		LOSS OF SIGNAL = OPEN (Reverse Acting)
	OUTPUT = 2-10 VDC		LOSS OF SIGNAL = OPEN (Direct Acting)
			LOSS OF SIGNAL = CLOSED (Reverse Acting)
			LOSS OF SIGNAL = STOP

## WARNING

### Potentiometer (Factory Pre-set)

**For 2-position actuators with 1k feedback option**  
 Potentiometer points 1, 2, 3 are wired to terminal blocks 8, 9, 10.  
 When a valve is closed: 8, 9 → 1k Ω  
 9, 10 → 0k Ω  
 When a valve is opened: 8, 9 → 0k Ω  
 9, 10 → 1k Ω

**For modulating actuators with 1k feedback option\***  
 Potentiometer points 1, 2, 3 are wired to terminal blocks 8, 9, 10.  
 When a valve is closed: 8, 9 → 1k Ω  
 9, 10 → 0k Ω  
 When a valve is opened: 8, 9 → 0k Ω  
 9, 10 → 1k Ω

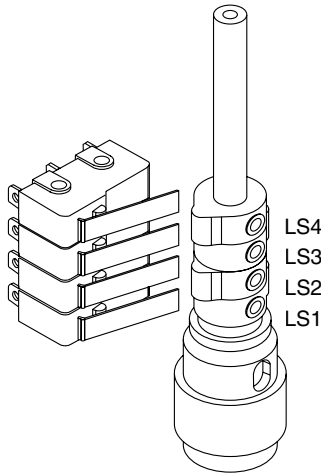


\*On modulating actuators **DO NOT** master/slave using optional potentiometer.



**Electrical Travel Adjustment (Factory Pre-set)**

**SY-1**



Factory pre-set see chart below. Field adjustable if required

- LS4**  
Auxiliary Switch for Closed Indication
- LS3**  
Auxiliary Switch for Opened Indication

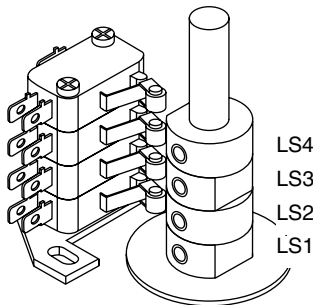
Factory pre-set and calibrated. Do not adjust - warranty voided

- LS2 "CLOSE"**
  - Clockwise Decrease Closed Angle
  - Counter-clockwise Increase Closed Angle
- LS1 "OPEN"**
  - Clockwise Increase Opening Angle
  - Counter-clockwise Decrease Opening Angle



**Electrical Travel Adjustment**

**SY-2-12**

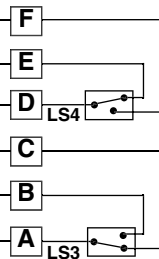
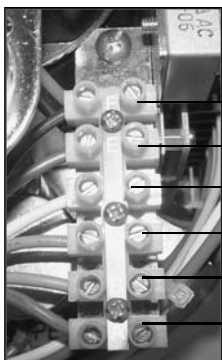


Factory pre-set see chart below. Field adjustable if required

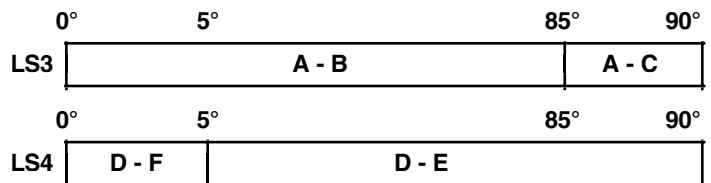
- LS4**  
Auxiliary Switch for Closed Indication
- LS3**  
Auxiliary Switch for Opened Indication

Factory pre-set and calibrated. Do not adjust - warranty voided

- LS2 "CLOSE"**
  - Clockwise Decrease Closed Angle
  - Counter-clockwise Increase Closed Angle
- LS1 "OPEN"**
  - Clockwise Increase Opening Angle
  - Counter-clockwise Decrease Opening Angle



Switches at left are shown with actuator fully open.



**INSTALLATION NOTES**



**Notes:**

1. An adaption must be performed when the limit switches are adjusted. For the SYx-MFT actuators. This will calibrate the beginning and end stopping points. Press the adaption button for 3 seconds and release.

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# Wiring for Damper Actuators and Control Valves

## On/Off, 24V, 120/230V



Actuators: SY1-24 SY1-110 SY2...12-110 SY2...12-220

W546

### 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 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.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



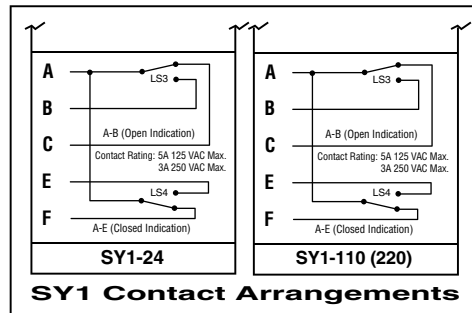
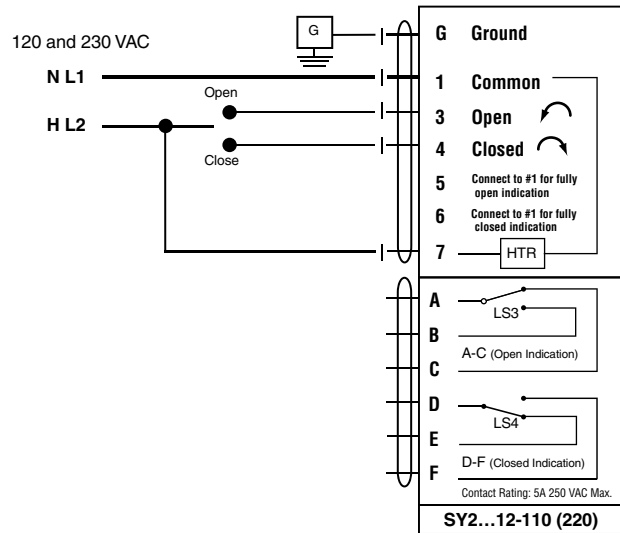
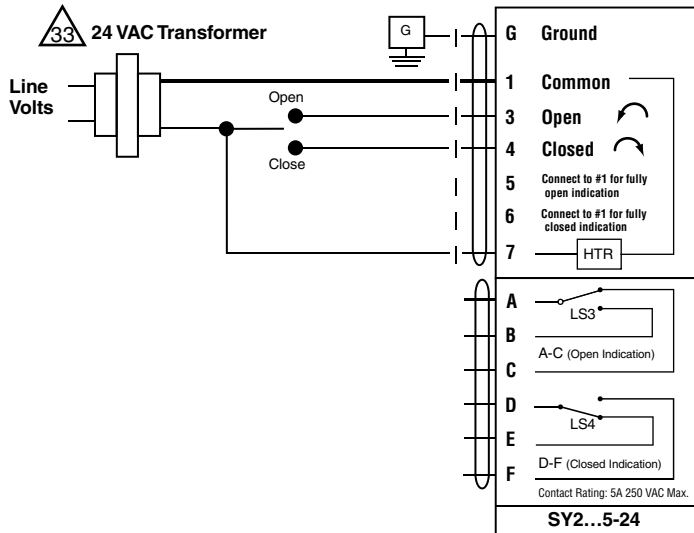
### INSTALLATION NOTES

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...12-110 (220)

- **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.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



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Actuators: SY1-24P SY1-110P SY1-220P

W547

### 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)



### APPLICATION NOTES



Ground shielded wire at control panel chassis.  
Tape back ground at actuator.



Use of feedback is optional.



### NOTES SY1...24P

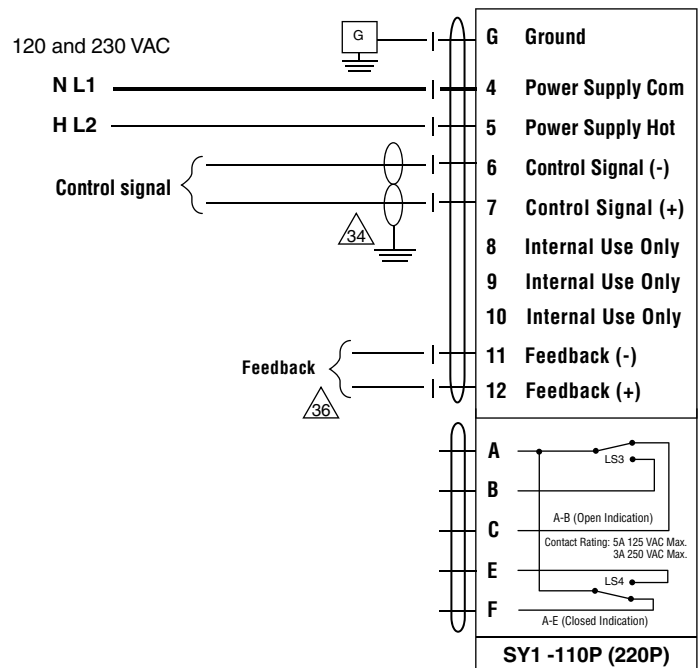
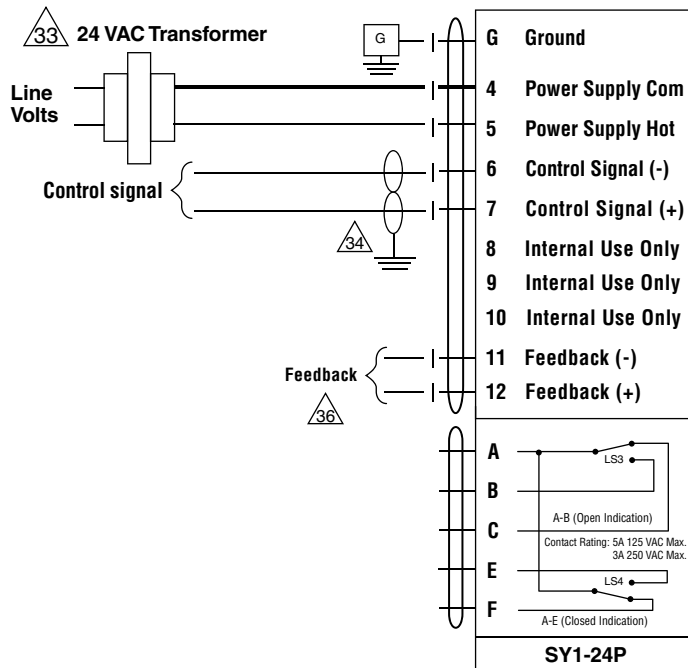
**33** Each actuator should be powered by a single, isolated control transformer.

- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately.
- Do not change sensitivity or dip switch settings with power applied.



### NOTES SY1...110P (220P)

- **Caution:** Power supply voltage.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately.
- Do not change sensitivity or dip switch settings with power applied.



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# Wiring for Damper Actuators and Control Valves

Proportional, 24V, 120/230V



**Actuators: 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

**33** 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)

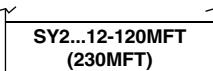
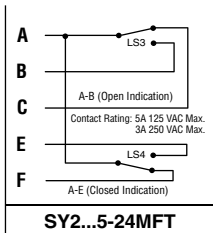
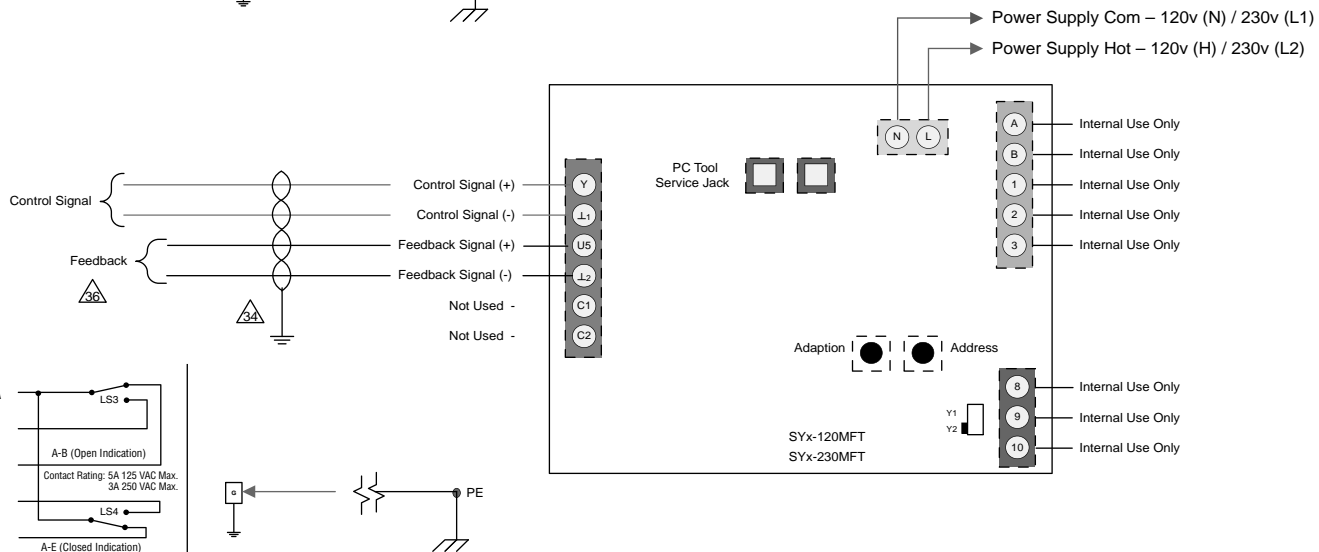
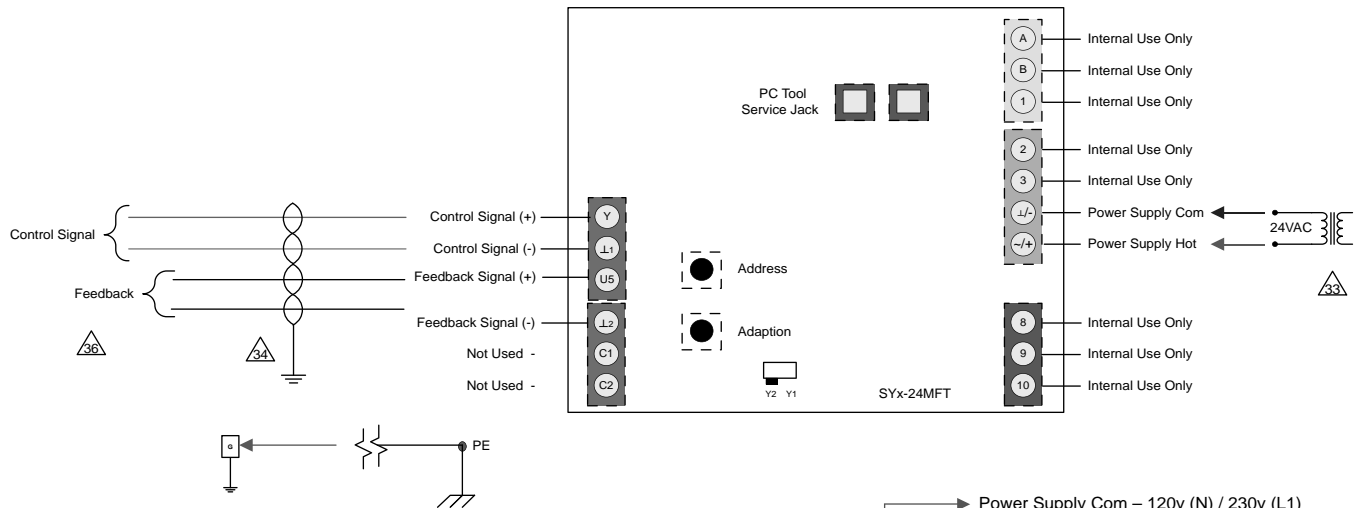
### APPLICATION NOTES

**34** 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.



W547-2

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**Actuators: SY1...5-24    SY1...12-110    SY1...12-220**

**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.

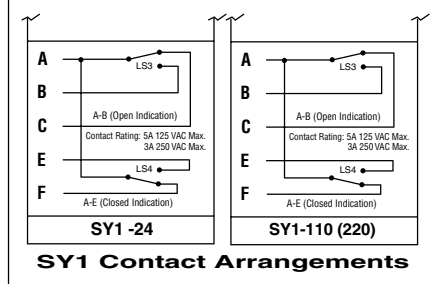
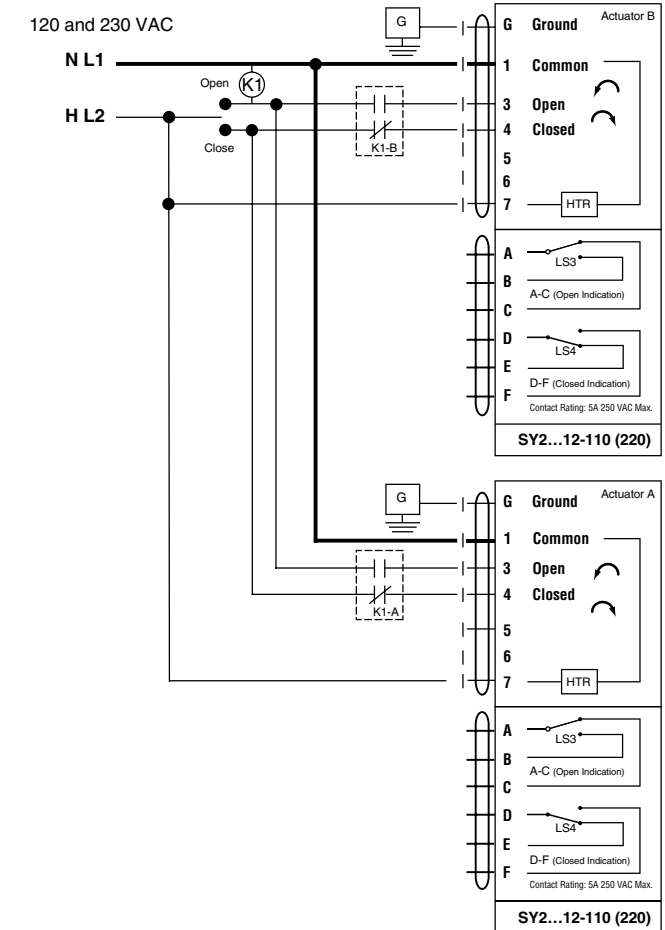
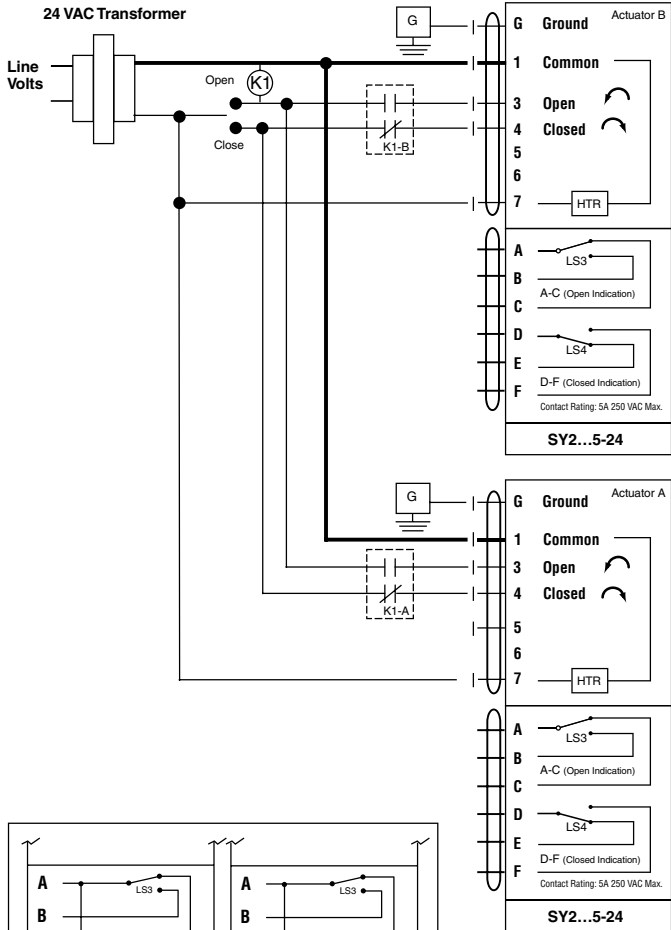
**INSTALLATION NOTES**

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**

- **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.
- **Required:** Terminal #7 needs to be field wired to enable heater circuit.



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# Wiring for Control Valves

## Proportional, 24V



Actuators: SY1-24P

W650

### 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.

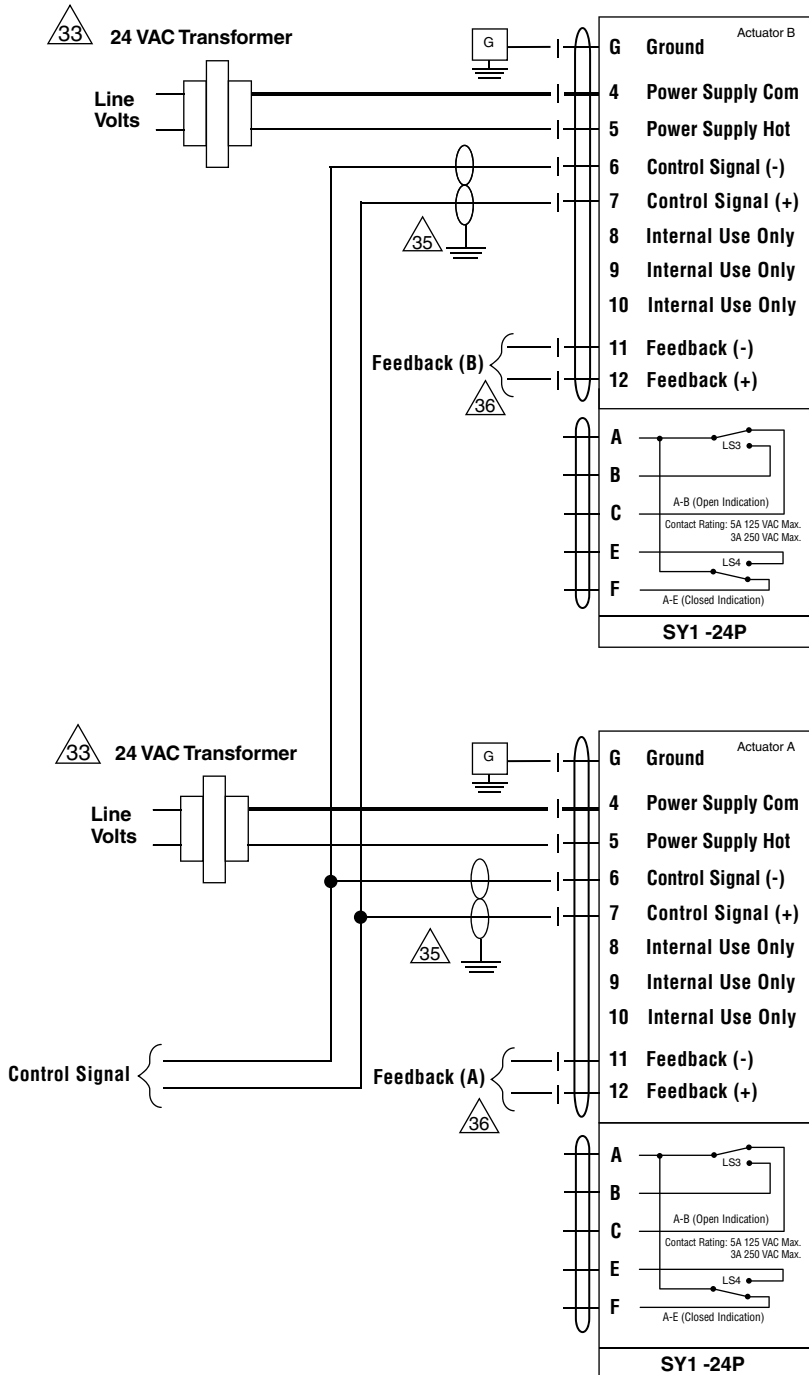
Transformer sizing = SY actuator draw X 1.25 (safety margin)  
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,  
3.75A X 24 VAC = 90VA Transformer).

### NOTES SY1-24P

- Each actuator should be powered by a single, isolated control transformer.
- SY1-24P notes:** Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited. Terminals 4 and 6 need to be wired separately otherwise irreversible damage will occur.
- Do not change sensitivity or dip switch settings with power applied.

### APPLICATION NOTES

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



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**Actuators: SY2...5-24MFT**

W550-2

**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).

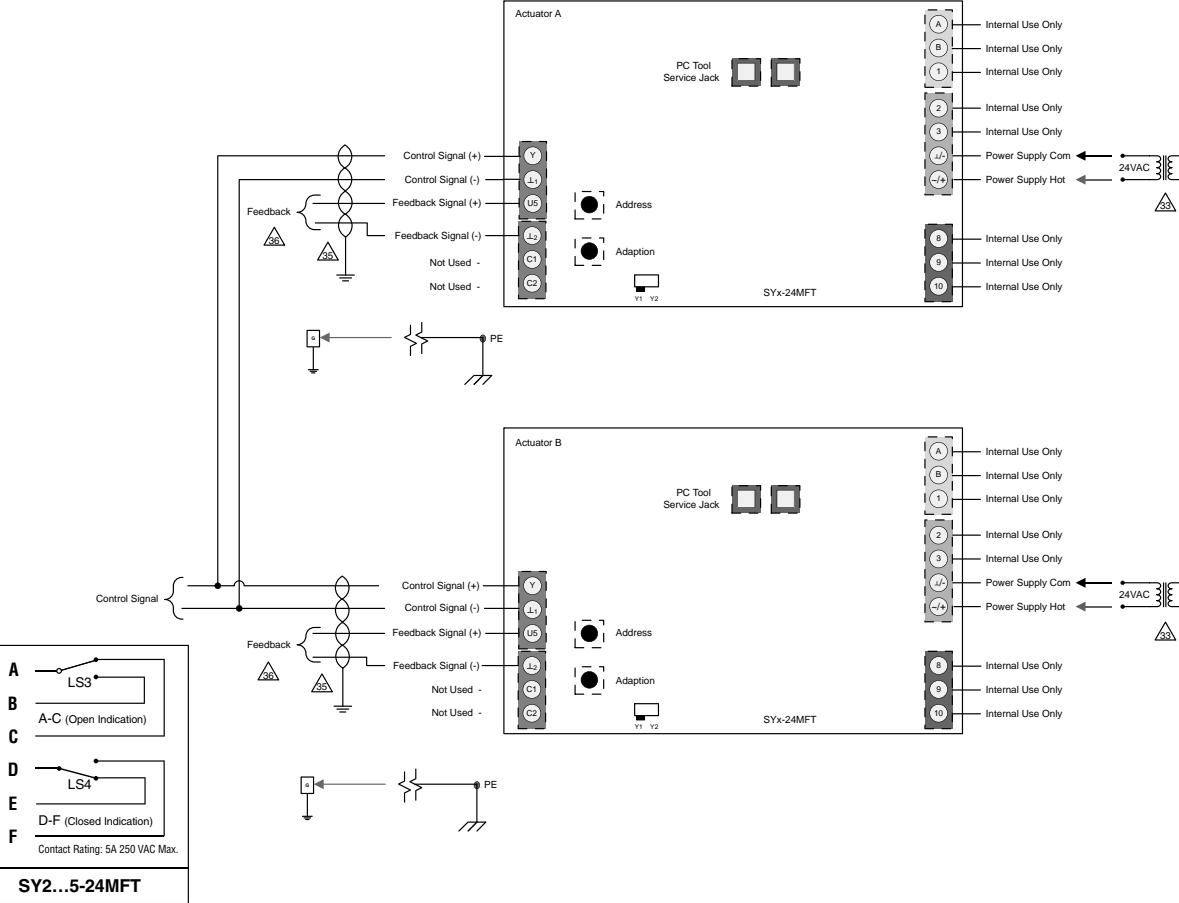
**NOTES SY2...5-24MFT**

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

**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.



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# Wiring for Control Valves

## Proportional, 110/220V, 120/230V



Actuators: SY1-110P SY1-220P

W652-1

### Hazard Identification

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

### CAUTION

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

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

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



### INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



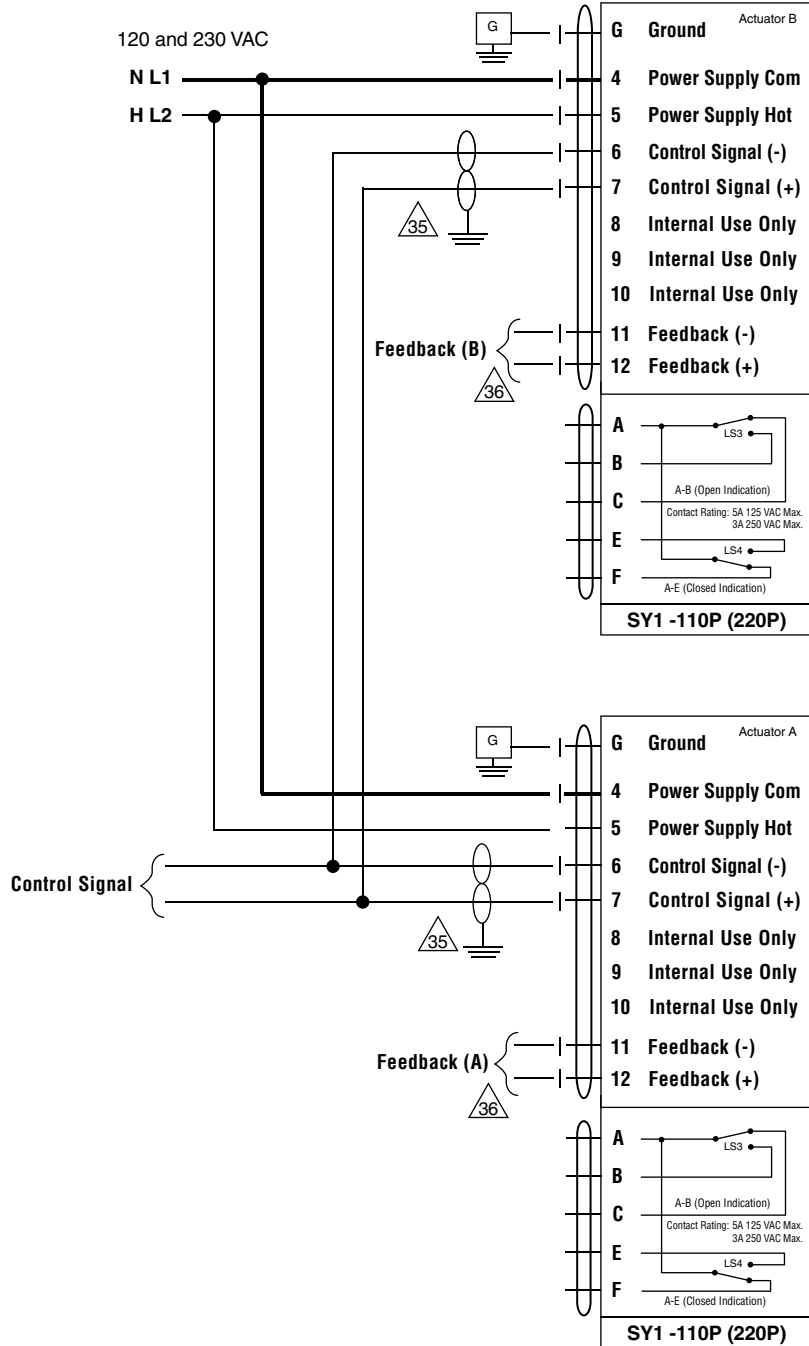
### APPLICATION NOTES

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



### NOTES SY1-110P (220P)

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



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

W552-2

**Hazard Identification**

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

**CAUTION**

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



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

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

**INSTALLATION NOTES**

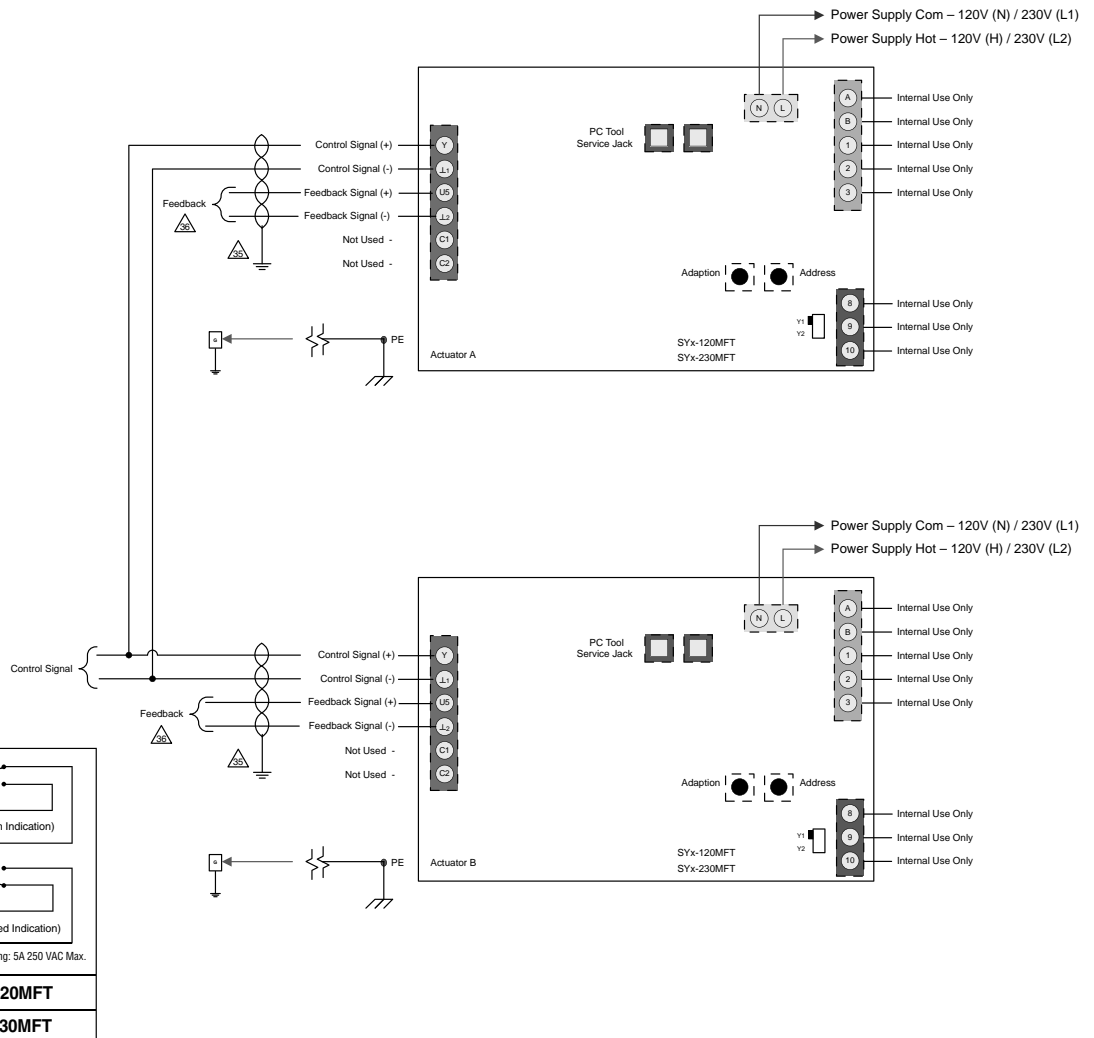
Observe class 1 and class 2 wiring restrictions.

**APPLICATION NOTES**

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

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

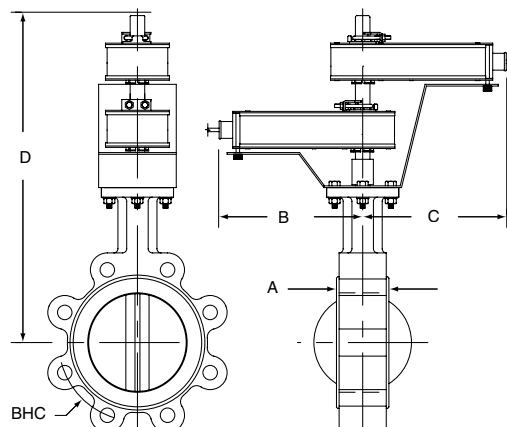
- **Caution:** Power supply voltage.



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### Dimensions with 2-Way Valve



BF2WUDIM\_A

## Models

- AF24 US
- AF24-S US     w/built-in Aux. Switches
- AF120 US
- AF120-S US    w/built-in Aux. Switches

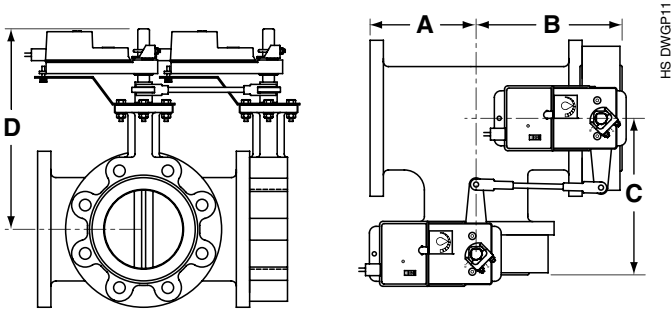
Technical Data		
Control		on/off
Power consumption		
AF24(-S) US	running	5 W
	holding	1.5 W
AF120(-S) US	running	6 W
	holding	2.3 W
Transformer sizing		10 VA, class 2 power
Electrical connection		3 ft, 18 GA appliance cables (-S model has 2 cables) ½" conduit connector
Electrical protection		120 V actuators double insulated
Overload protection		electronic throughout 0° to 95° rotation
Angle of rotation		95°
Position indication		visual indicator
Manual override		hex crank
Running time	control	150 sec. independent of load
	spring	< 20 sec.
Ambient temperature		-22° F to 122° F [-30° C to 50° C]
Housing		NEMA 2 / IP54
Agency listings		UL 873, CSA C22.2 No. 24 certified, CE
Noise level		max. 45 dB(A)

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

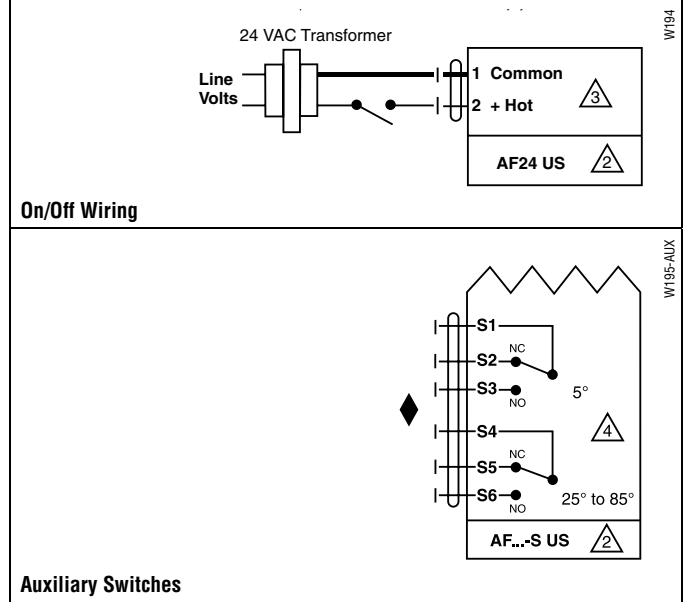
Valve	Size	Dimensions (Inches)				Fail Safe (psi)		
		A	B	C	D(Max)	BHC	AF	2*AF
F650HD	2"	1.65	9.00	9.00	19.50	4.75	200	
F650HDU	2"	1.65	9.00	9.00	19.50	4.75	50	
F665HD	2½"	1.76	9.00	9.00	20.00	5.50		200
F665HDU	2½"	1.76	9.00	9.00	20.00	5.50	50	
F680HD	3"	1.78	9.00	9.00	20.50	6.00		200
F680HDU	3"	1.78	9.00	9.00	20.50	6.00		50
F6100HDU	4"	2.05	9.00	9.00	21.00	7.50		50
F6125HDU	5"	2.14	9.00	9.00	22.00	8.50		50
F650-150SHP	2"	1.75	9.00	9.00	19.50	4.75		150
F665-150SHP	2½"	1.88	9.00	9.00	20.00	5.50		150
F680-150SHP	3"	1.92	9.00	9.00	20.50	6.00		150
F6100-150SHP	4"	2.13	9.00	9.00	21.00	7.50		150
F650-300SHP	2"	1.75	9.00	9.00	19.50	5.00		150
F665-300SHP	2½"	1.88	9.00	9.00	20.00	5.88		150
F680-300SHP	3"	1.92	9.00	9.00	20.50	6.63		150
F6100-300SHP	4"	2.13	9.00	9.00	21.00	7.88		150

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**Dimensions with 3-Way Valve**



Valve	Size	Dimensions (Inches)				Fail Safe (psi)		
		A	B	C	D(Max)	BHC	AF	2*AF
F750HD	2"	4.50	6.15	6.15	15.50	4.75	200	
F750HDU	2"	4.50	6.15	6.15	15.50	4.75	50	
F765HD	2½"	5.00	6.76	6.76	16.00	5.50		200
F765HDU	2½"	5.00	6.76	6.76	16.00	5.50		50
F780HDU	3"	5.50	7.28	7.28	16.25	6.00		50



**Wiring Diagrams**

**✂ INSTALLATION NOTES**

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

**📄 APPLICATION NOTES**

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

**⚠ WARNING Live Electrical Components!**

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

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# AF Actuators, Multi-Function Technology



## Models

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

### 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

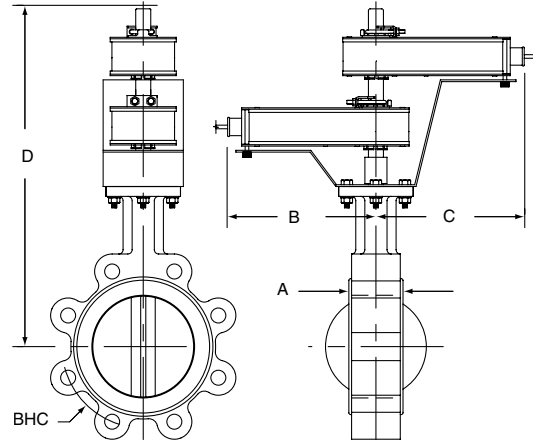
† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

♦ 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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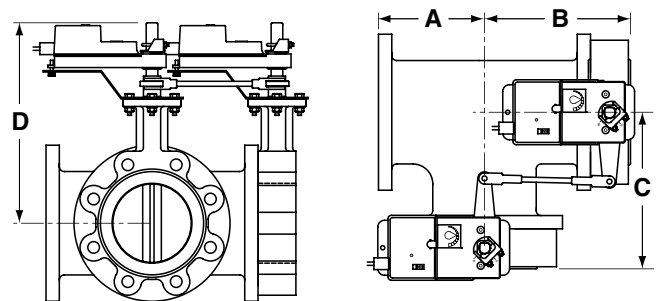
### Dimensions with 2-Way Valve



BF2WUDIM\_A

Valve	Size	Dimensions (Inches)				Fail Safe (psi)		
		A	B	C	D(Max)	BHC	AF	2*AF
F650HD	2"	1.65	9.00	9.00	19.50	4.75	200	
F650HDU	2"	1.65	9.00	9.00	19.50	4.75	50	
F665HD	2½"	1.76	9.00	9.00	20.00	5.50		200
F665HDU	2½"	1.76	9.00	9.00	20.00	5.50	50	
F680HD	3"	1.78	9.00	9.00	20.50	6.00		500
F680HDU	3"	1.78	9.00	9.00	20.50	6.00	50	
F6100HDU	4"	2.05	9.00	9.00	21.00	7.50		50
F6125HDU	5"	2.14	9.00	9.00	22.00	8.50		50
F650-150SHP	2"	1.75	9.00	9.00	19.50	4.75		150
F665-150SHP	2½"	1.88	9.00	9.00	20.00	5.50		150
F680-150SHP	3"	1.92	9.00	9.00	20.50	6.00		150
F6100-150SHP	4"	2.13	9.00	9.00	21.00	7.50		150
F650-300SHP	2"	1.75	9.00	9.00	19.50	5.00		150
F665-300SHP	2½"	1.88	9.00	9.00	20.00	5.88		150
F680-300SHP	3"	1.92	9.00	9.00	20.50	6.63		150
F6100-300SHP	4"	2.13	9.00	9.00	21.00	7.88		150

### Dimensions with 3-Way Valve



HS DWG/P11

Valve	Size	Dimensions (Inches)				Fail Safe (psi)		
		A	B	C	D(Max)	BHC	AF	2*AF
F750HD	2"	4.50	6.15	6.15	15.50	4.75	200	
F750HDU	2"	4.50	6.15	6.15	15.50	4.75	50	
F765HD	2½"	5.00	6.76	6.76	16.00	5.50		200
F765HDU	2½"	5.00	6.76	6.76	16.00	5.50	50	
F780HDU	3"	5.50	7.28	7.28	16.25	6.00		50

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### Wiring Diagrams

#### INSTALLATION NOTES

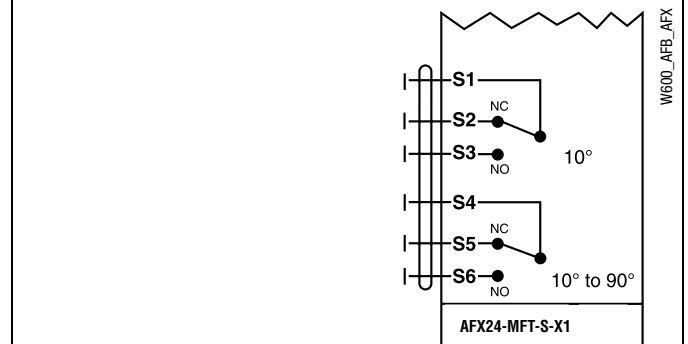
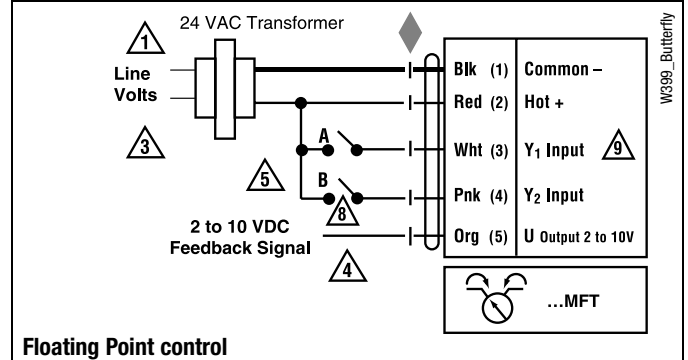
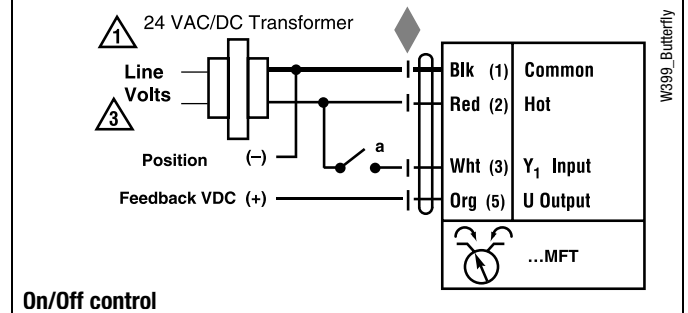
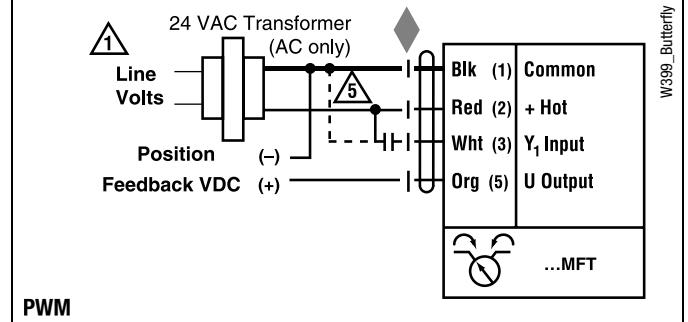
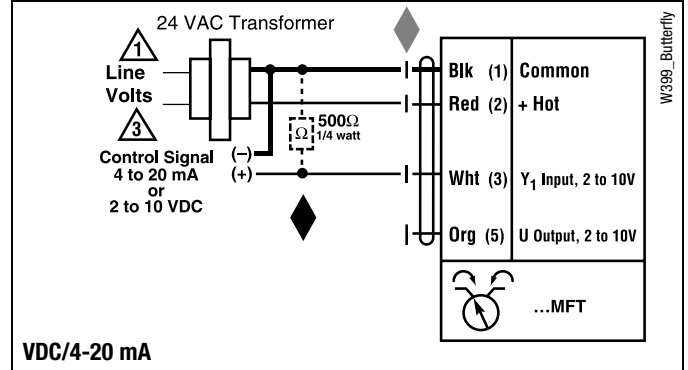
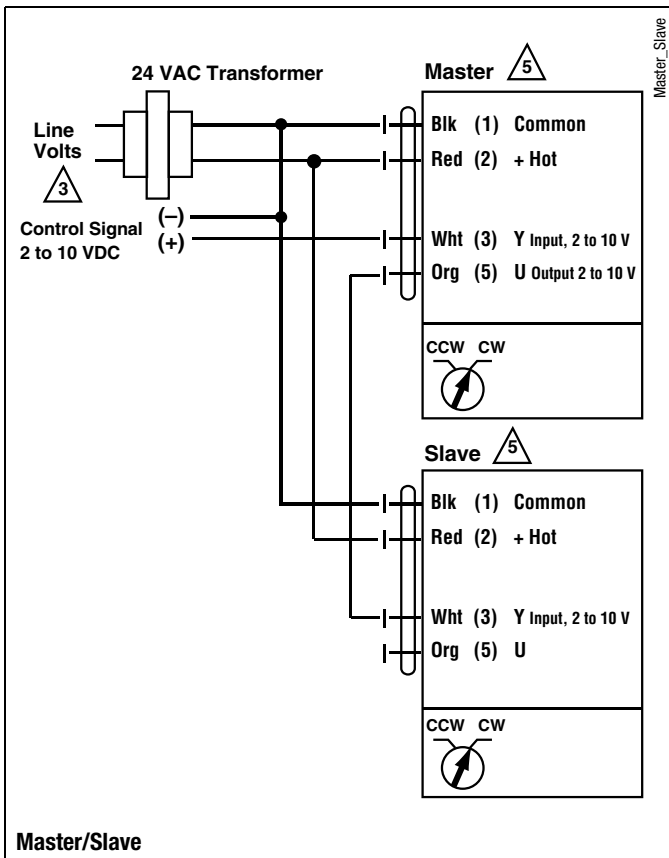
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac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



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W399\_Butterfly

W399\_Butterfly

W399\_Butterfly

W399\_Butterfly

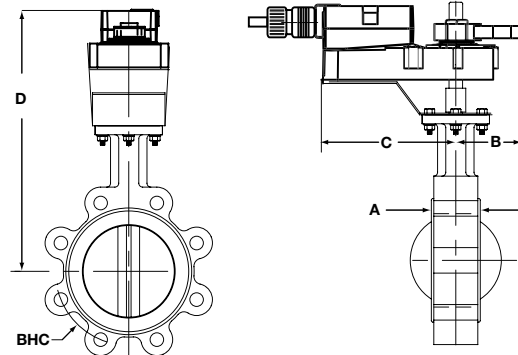
W600\_AFB\_AFX

# GKB24-3-X1 Actuators, On/Off, Floating Point



Technical Data	GKB24-3-X1
Power supply	24VAC ±20% 50/60Hz 24VDC ±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	on/off, floating point
Input impedance	100kΩ (0.1 mA), 500Ω 1500Ω (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

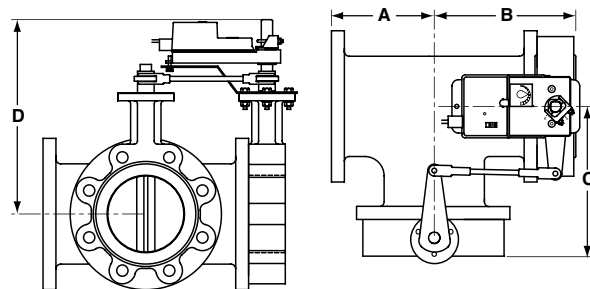
## Dimensions with 2-Way Valve



AM\_GM\_LineRevised

Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GK	
F680HD	3"	1.78	7.00	7.00	16.53	6.00	200	
F6100HDU	4"	2.05	8.00	8.00	17.53	7.50	50	
F6125HDU	5"	2.14	8.00	8.00	18.03	8.50	50	
F650-150SHP	2"	1.75	9.00	9.00	20.03	4.75	285	
F665-150SHP	2½"	1.88	9.00	9.00	20.53	5.50	285	
F680-150SHP	3"	1.92	9.00	9.00	21.03	6.00	285	
F6100-150SHP	4"	2.13	9.00	9.00	21.53	7.50	150	
F650-300SHP	2"	1.75	9.00	9.00	20.03	5.00	285	
F665-300SHP	2½"	1.88	9.00	9.00	20.53	5.88	285	
F680-300SHP	3"	1.92	9.00	9.00	21.03	6.63	285	
F6100-300SHP	4"	2.13	9.00	9.00	21.53	7.88	150	

## Dimensions with 3-Way Valve

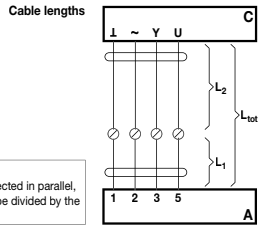
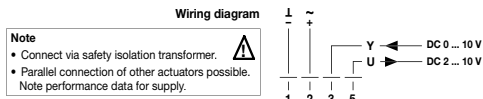


Single\_Butterfly

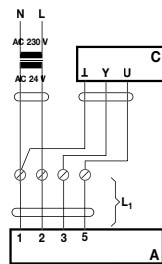
Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GM	
F765HD	2½"	5.00	6.70	6.70	16.53	5.50	200	
F780HDU	3"	5.50	7.20	7.20	16.78	6.00	50	
F750-150SHP	2"	4.50	6.25	6.25	17.03	4.75	150	
F765-150SHP	2½"	5.00	6.88	6.88	17.53	5.50	150	
F780-150SHP	3"	5.50	7.42	7.42	18.03	6.00	150	
F7100-150SHP	4"	6.50	8.63	8.63	18.53	7.50	150	

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### Electrical Installation



**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
- L<sub>1</sub> = Belimo connecting cable, 1 m (4 x 0.75 mm<sup>2</sup>)
- L<sub>2</sub> = Customer cable
- L<sub>tot</sub> = Maximum cable length

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

- A = Actuator
- C = Control unit
- L<sub>1</sub> = Belimo connecting cable, 1 m (4 x 0.75 mm<sup>2</sup>)

### 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.

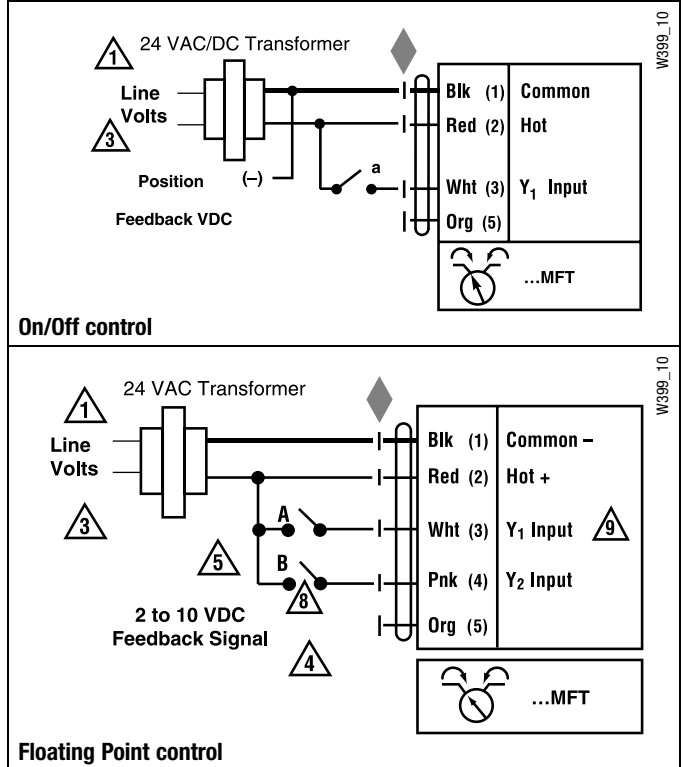
#### APPLICATION NOTES

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

#### 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**



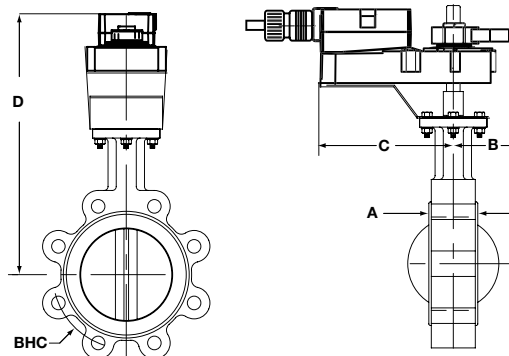


MFT CE LISTED 94 05 TEB,IND. & C UL US REG. EQUIP.



Technical Data	GKX24-MFT-X1
Power supply	24VAC ±20% 50/60Hz 24VDC ±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	100kΩ (0.1 mA), 500Ω 1500Ω (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

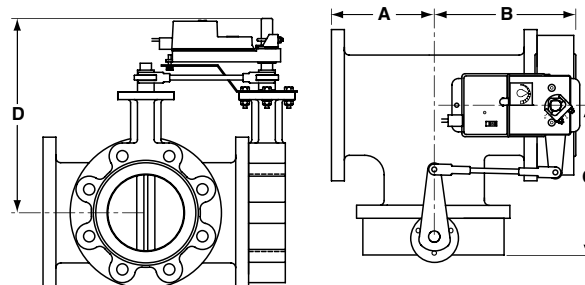
### Dimensions with 2-Way Valve



AM\_GM\_LineRevised

Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GK	
F680HD	3"	1.69	9.00	9.00	21.03	6.00	200	
F6100HDU	4"	1.92	9.00	9.00	21.53	7.50	50	
F6125HDU	5"	2.08	9.00	9.00	22.53	8.50	50	
F650-150SHP	2"	1.75	9.00	9.00	20.03	4.75	285	
F665-150SHP	2½"	1.88	9.00	9.00	20.53	5.50	285	
F680-150SHP	3"	1.92	9.00	9.00	21.03	6.00	285	
F6100-150SHP	4"	2.13	9.00	9.00	21.53	7.50	150	
F650-300SHP	2"	1.75	9.00	9.00	20.03	5.00	285	
F665-300SHP	2½"	1.88	9.00	9.00	20.53	5.88	285	
F680-300SHP	3"	1.92	9.00	9.00	21.03	6.63	285	
F6100-300SHP	4"	2.13	9.00	9.00	21.53	7.88	150	

### Dimensions with 3-Way Valve



Single\_Butterfly

Valve	Size	Dimensions (Inches)				Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GK
F780HDU	3"	5.50	7.20	7.20	16.78	6.00	200
F750-150SHP	2"	4.50	6.25	6.25	17.03	4.75	150
F765-150SHP	2½"	5.00	6.88	6.88	17.53	5.50	150
F780-150SHP	3"	5.50	7.42	7.42	18.03	6.00	150

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## 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.
- 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 of the controller.

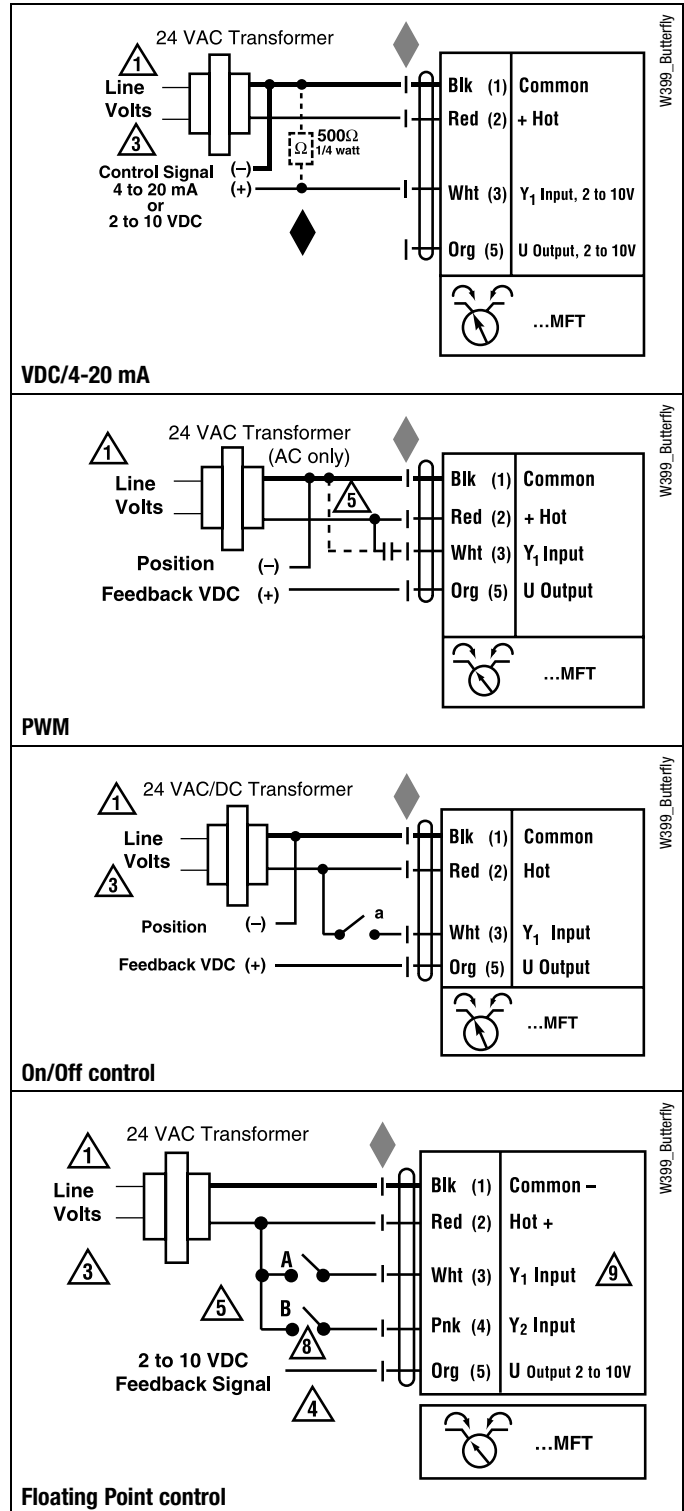
### APPLICATION NOTES

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**



# AM Series Actuators, On/Off, Floating Point

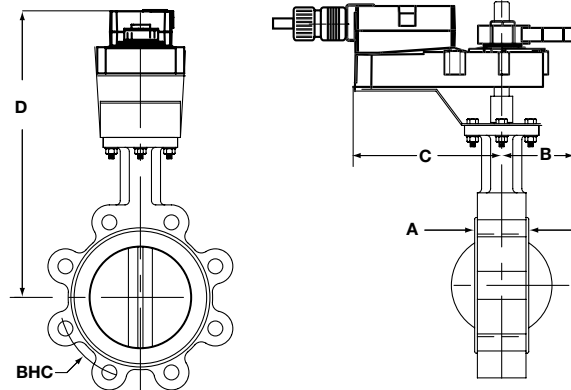


## Models

AMB24-3-X1

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

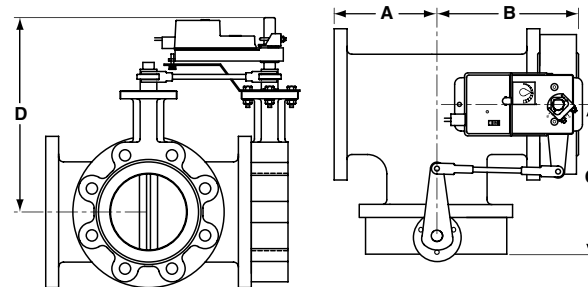
## Dimensions with 2-Way Valve



AM\_GM\_LineRevised

Valve	Size	Dimensions (Inches)				Non-Fail Safe (psi)		
		A	B	C	D(Max)	BHC	HD	HDU
F650HD(U)	2"	1.65	7.00	7.00	15.00	4.75	200	50
F665HD(U)	2½"	1.76	7.00	7.00	15.50	5.50	200	50
F680HDU	3"	1.78	7.00	7.00	16.00	6.00		50

## Dimensions with 3-Way Valve



Single\_Butterfly

Valve	Size	Dimensions (Inches)				Non-Fail Safe (psi)		
		A	B	C	D(Max)	BHC	HD	HDU
F750HD	2"	4.50	6.15	6.15	15.50	4.75	200	
F765HDU	2½"	5.00	6.76	6.76	16.00	5.50	200	50

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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**

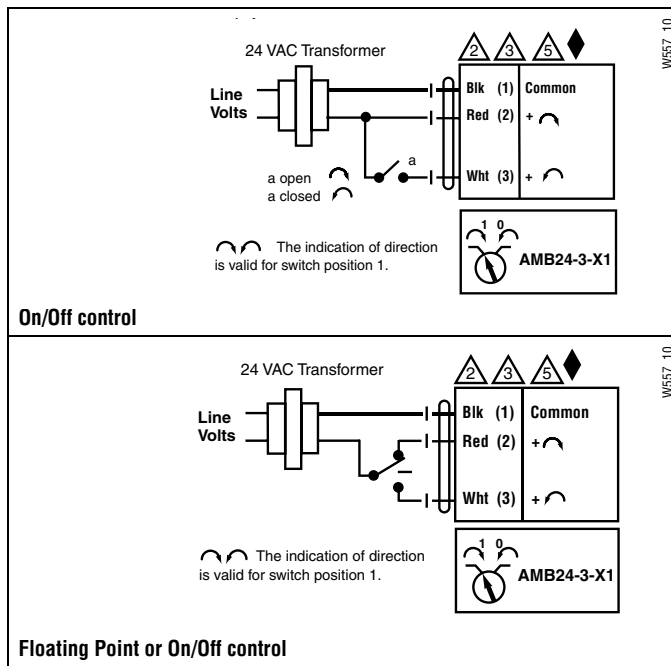


Meets cULus or UL and CSA requirements without the need of an electrical ground connection.



#### **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.





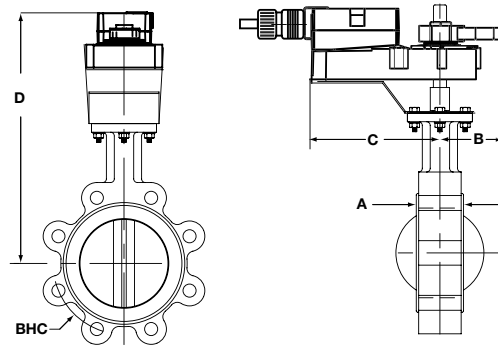
## Models

AMX24-MFT-X1

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

## Dimensions with 2-Way Valve

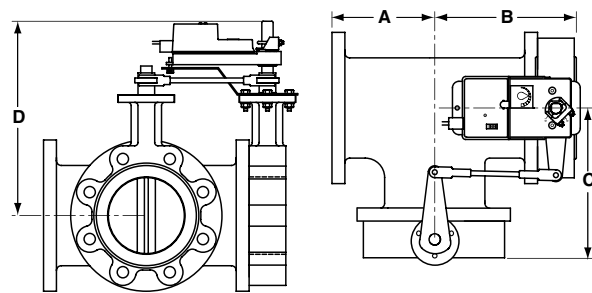


AM\_GM\_LineRevised

### Dimensions (Inches)

Valve	Size	A	B	C	D(Max)	BHC	Non-Fail Safe (psi)
F650HD(U)	2"	1.65	7.00	7.00	15.00	4.75	
F665HD(U)	2½"	1.76	7.00	7.00	15.50	5.50	
F680HDU	3"	1.78	7.00	7.00	16.00	6.00	

## Dimensions with 3-Way Valve



Single\_Butterfly

### Dimensions (Inches)

Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	HD	HDU
F750HD	2"	4.50	6.15	6.15	15.50	4.75	200	
F765HDU	2½"	5.00	6.76	6.76	16.00	5.50	200	50

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### Wiring Diagrams

#### ✂️ INSTALLATION NOTES

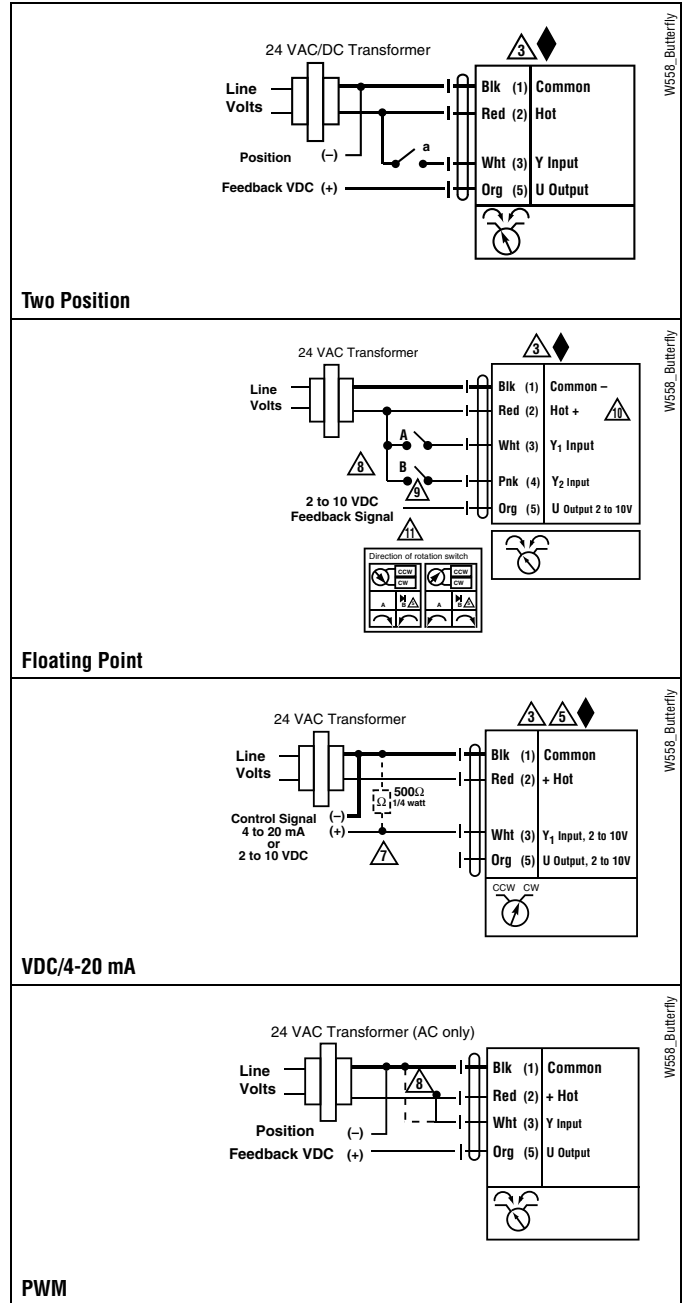
- ⚠️ 3 Actuators may also be powered by 24 VDC.
- ⚠️ 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- ⚠️ 6 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- ⚠️ 8 Contact closures A & 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

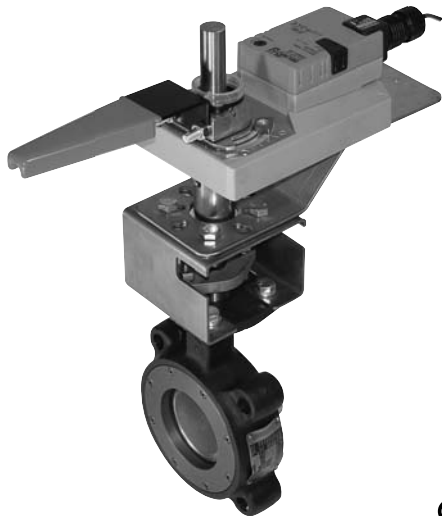
- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

#### ⚠️ 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.



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

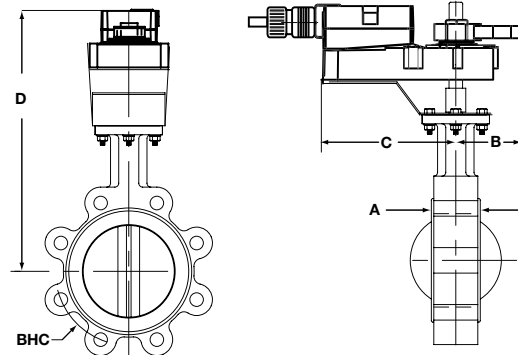


## Models

GMB24-3-X1

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

## Dimensions with 2-Way Valve

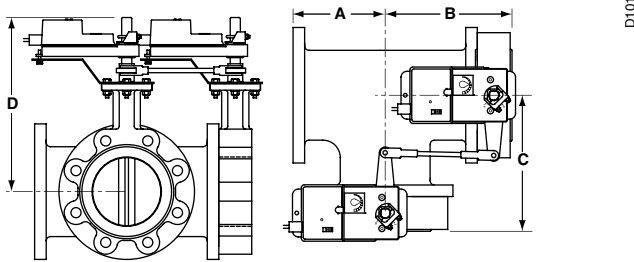


AM\_GM\_LineRevised

Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GM	2*GM
F680HD	3"	1.78	7.00	7.00	16.00	6.00	200	
F6100HD	4"	2.05	8.00	8.00	17.00	7.50		200
F6100HDU	4"	2.05	8.00	8.00	17.00	7.50	50	
F6125HDU	5"	2.14	8.00	8.00	17.50	8.50	50	
F6150HDU	6"	2.19	8.00	8.00	22.50	9.50		50
F650-150SHP	2"	1.75	9.00	9.00	19.50	4.75	285	
F665-150SHP	2½"	1.88	9.00	9.00	20.00	5.50	285	
F680-150SHP	3"	1.92	9.00	9.00	20.50	6.00	285	
F6100-150SHP	4"	2.13	9.00	9.00	21.00	7.50	150	285
F650-300SHP	2"	1.75	9.00	9.00	19.50	5.00	285	400
F665-300SHP	2½"	1.88	9.00	9.00	20.00	5.88	285	400
F680-300SHP	3"	1.92	9.00	9.00	20.50	6.63	285	400
F6100-300SHP	4"	2.13	9.00	9.00	21.00	7.88	150	285

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## Dimensions with 3-Way Valve



Valve	Size	Dimensions (Inches)					Non-Fail Safe (psi)	
		A	B	C	D(Max)	BHC	GM	2*GM
F765HD	2½"	5.00	6.70	6.70	16.00	5.50	200	
F780HD	3"	5.50	7.20	7.20	16.25	6.00		200
F780H DU	3"	5.50	7.20	7.20	16.25	6.00	50	
F7100HD	4"	6.50	8.45	8.45	17.00	7.50		200
F7100H DU	4"	6.50	8.45	8.45	17.00	7.50		50
F7125H DU	5"	7.50	9.60	9.60	17.50	8.50		50
F7150H DU	6"	8.00	10.08	10.08	18.00	9.50		50
F750-150SHP	2"	4.50	6.25	6.25	16.50	4.75	150	285
F765-150SHP	2½"	5.00	6.88	6.88	17.00	5.50	150	285
F780-150SHP	3"	5.50	7.42	7.42	17.50	6.00	150	285
F7100-150SHP	4"	6.50	8.63	8.63	18.00	7.50	150	
F750-300SHP	2"	5.00	6.75	6.75	15.50	5.00		285
F765-300SHP	2½"	5.50	7.38	7.38	16.00	5.88		285
F780-300SHP	3"	6.00	7.92	7.92	16.25	6.63		285
F7100-300SHP	4"	7.00	9.13	9.13	18.00	7.88		150

## Wiring Diagrams

### INSTALLATION NOTES

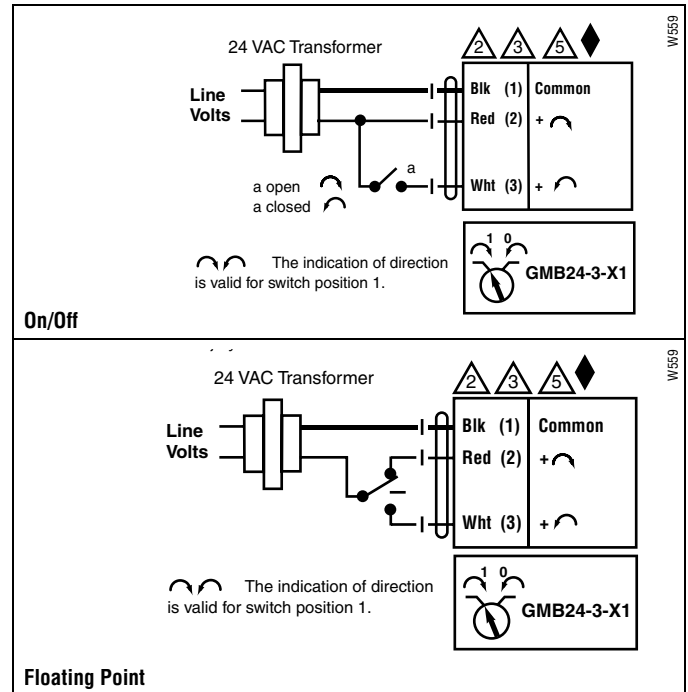
- ⚠️ **CAUTION** *Equipment damage!*  
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- ⚠️ **3** Actuators may also be powered by 24 VDC.
- ⚠️ **5** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.

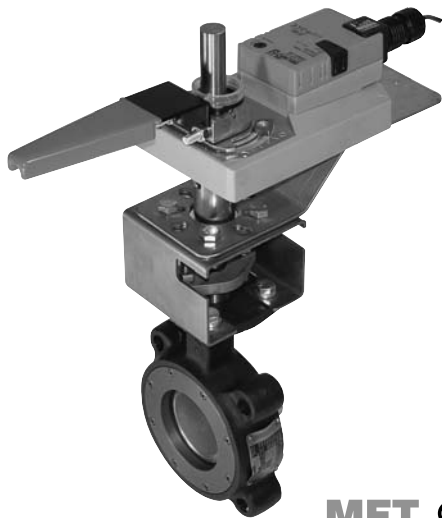
### APPLICATION NOTES

- ◆ 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.



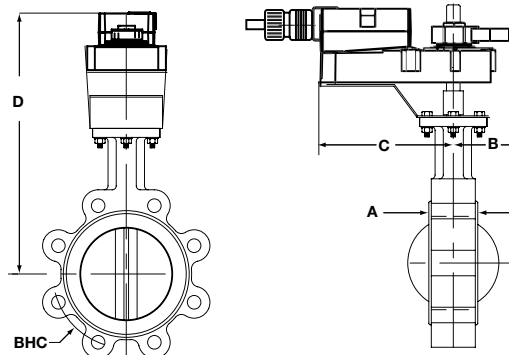


## Models

GMX24-MFT-X1

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 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 10VDC (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 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

### Dimensions with 2-Way Valve

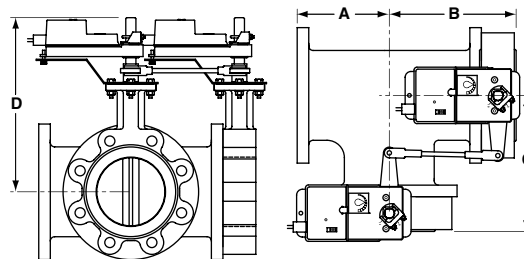


AM\_GM\_LineRevised

### Dimensions (Inches) Non-Fail Safe (psi)

Valve	Size	A	B	C	D(Max)	BHC	GM	2*GM
F680HD	3"	1.69	9.00	9.00	20.50	6.00	200	
F6100HD	4"	1.92	9.00	9.00	21.00	7.50		200
F6100HDU	4"	1.92	9.00	9.00	21.00	7.50	50	
F6125HDU	5"	2.08	9.00	9.00	22.00	8.50	50	
F6150HDU	6"	2.08	9.00	9.00	22.50	9.50		50
F650-150SHP	2"	1.75	9.00	9.00	19.50	4.75	285	
F665-150SHP	2½"	1.88	9.00	9.00	20.00	5.50	285	
F680-150SHP	3"	1.92	9.00	9.00	20.50	6.00	285	
F6100-150SHP	4"	2.13	9.00	9.00	21.00	7.50	150	285
F650-300SHP	2"	1.75	9.00	9.00	19.50	5.00	285	400
F665-300SHP	2½"	1.88	9.00	9.00	20.00	5.88	285	400
F680-300SHP	3"	1.92	9.00	9.00	20.50	6.63	285	400
F6100-300SHP	4"	2.13	9.00	9.00	21.00	7.88	150	285

### Dimensions with 3-Way Valve



D101

### Dimensions (Inches) Non-Fail Safe (psi)

Valve	Size	A	B	C	D(Max)	BHC	GM	2*GM
F765HD	2½"	5.00	6.70	6.70	16.00	5.50	200	
F780HD	3"	5.50	7.20	7.20	16.25	6.00		200
F780HDU	3"	5.50	7.20	7.20	16.25	6.00	50	
F7100HD	4"	6.50	8.45	8.45	17.00	7.50		200
F7100HDU	4"	6.50	8.45	8.45	17.00	7.50		50
F7125HDU	5"	7.50	9.60	9.60	17.50	8.50		50
F7150HDU	6"	8.00	10.08	10.08	18.00	9.50		50
F750-150SHP	2"	4.50	6.25	6.25	16.50	4.75	150	285
F765-150SHP	2½"	5.00	6.88	6.88	17.00	5.50	150	285
F780-150SHP	3"	5.50	7.42	7.42	17.50	6.00	150	285
F7100-150SHP	4"	6.50	8.63	8.63	18.00	7.50	150	
F750-300SHP	2"	5.00	6.75	6.75	15.50	5.00		285
F765-300SHP	2½"	5.50	7.38	7.38	16.00	5.88		285
F780-300SHP	3"	6.00	7.92	7.92	16.25	6.63		285
F7100-300SHP	4"	7.00	9.13	9.13	18.00	7.88		150

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### Wiring Diagrams

#### INSTALLATION NOTES

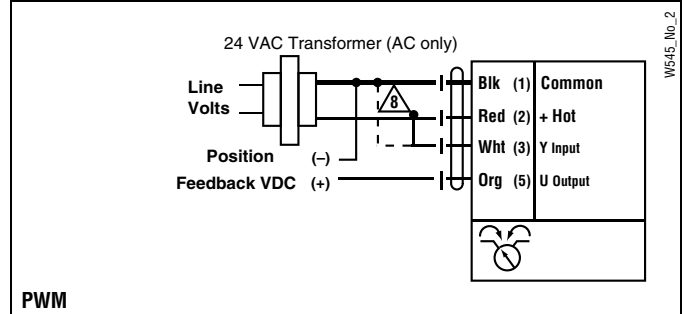
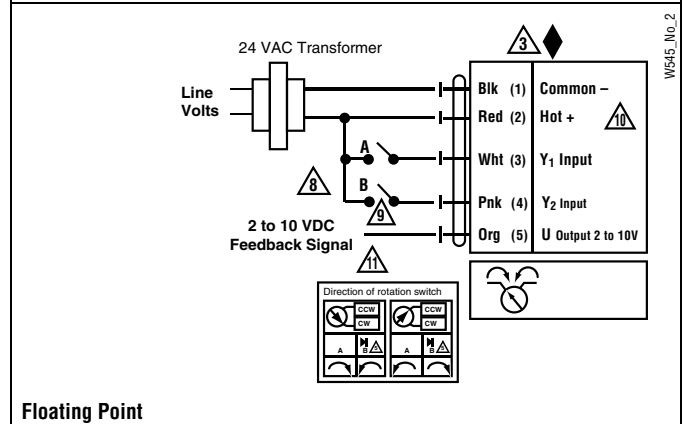
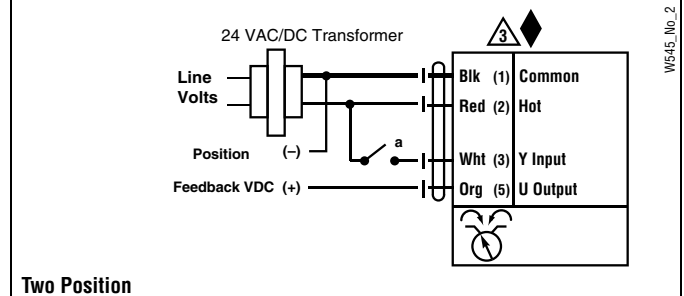
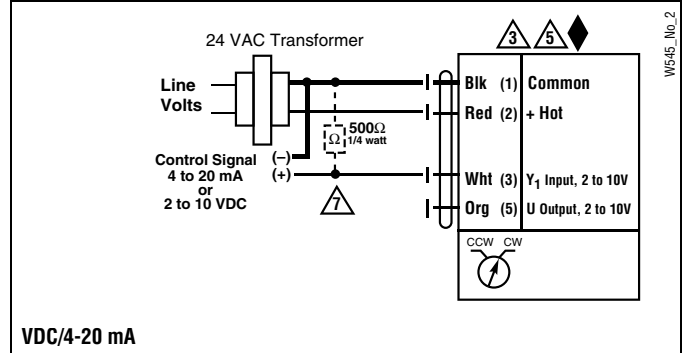
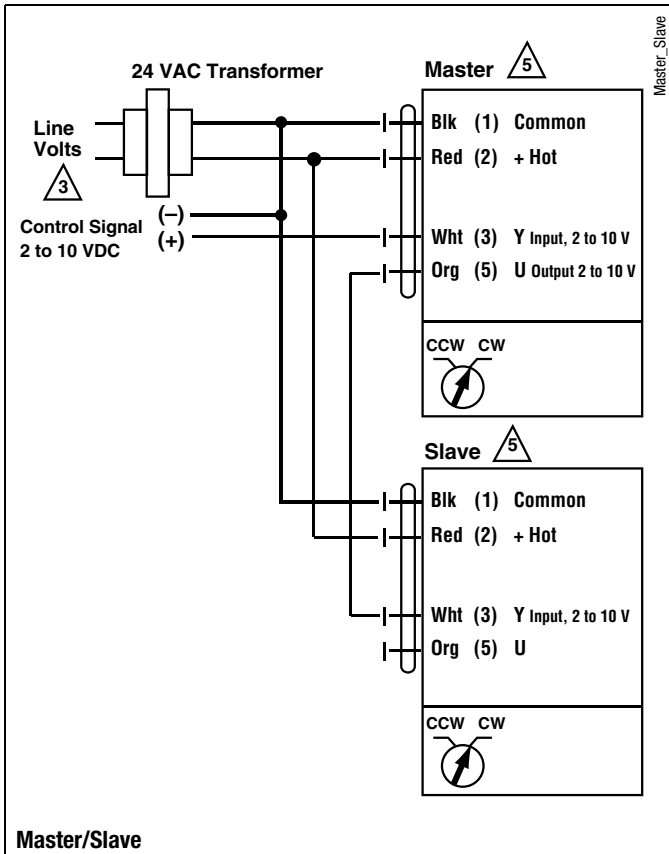
- 3 Actuators may also be powered by 24 VDC.
- 5 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.
- 8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 10 For triac sink the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



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### HD(U) Series Butterfly Valves

#### Storage of Butterfly Valve Assemblies

- Assemblies must be stored indoors, protected from the elements.
- Materials received on job sites that have long installation lead times should receive extra protection from construction damage.
- Resilient seats must be protected from abrasion, cutting and nicking, as this will damage the liner and may cause flange area leaks.
- Electric actuators cannot be stored in wet, damp or caustic areas.
- Do not store construction material on top of valve assemblies.

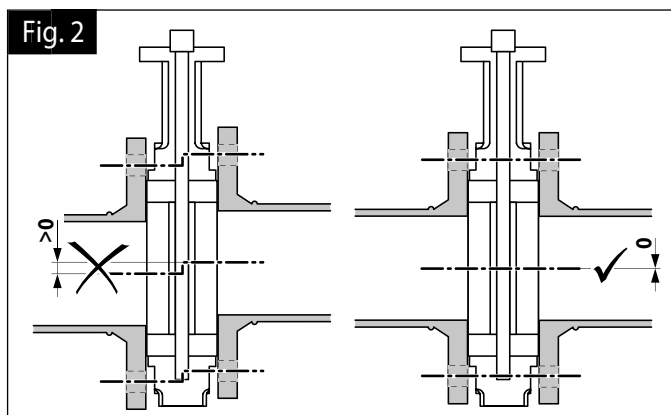
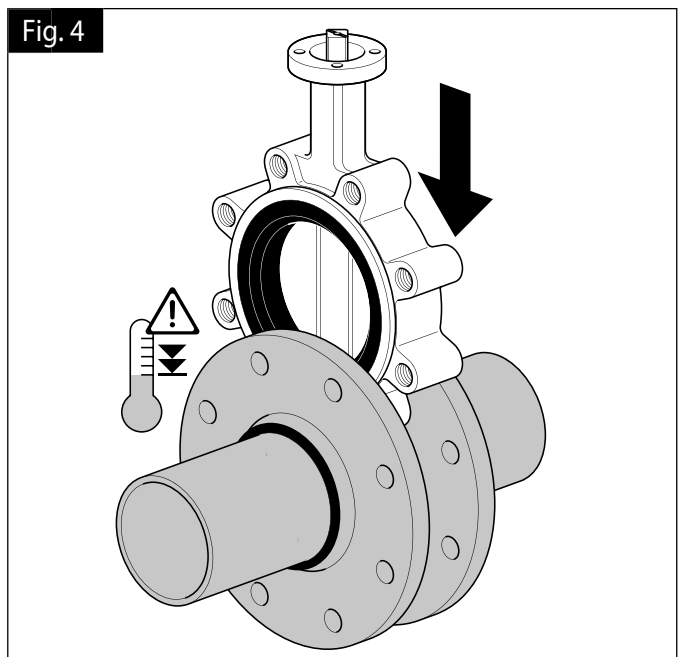
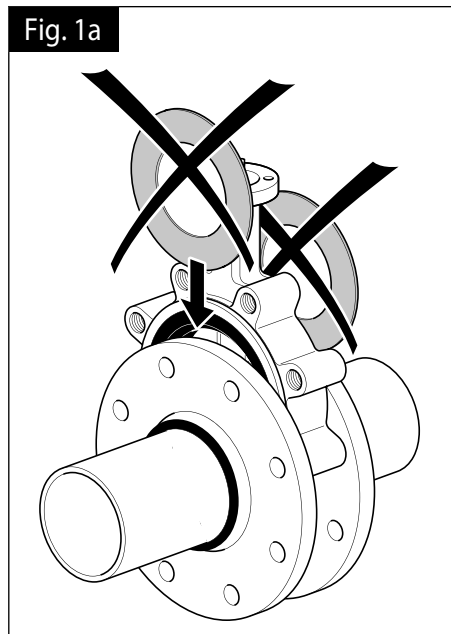
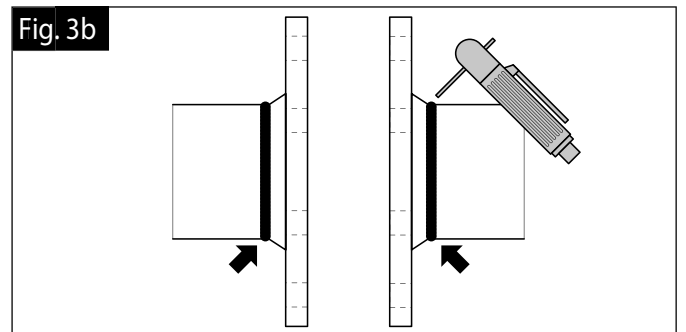
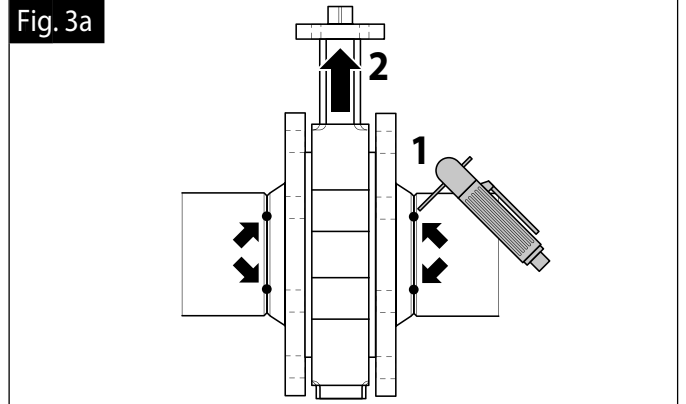
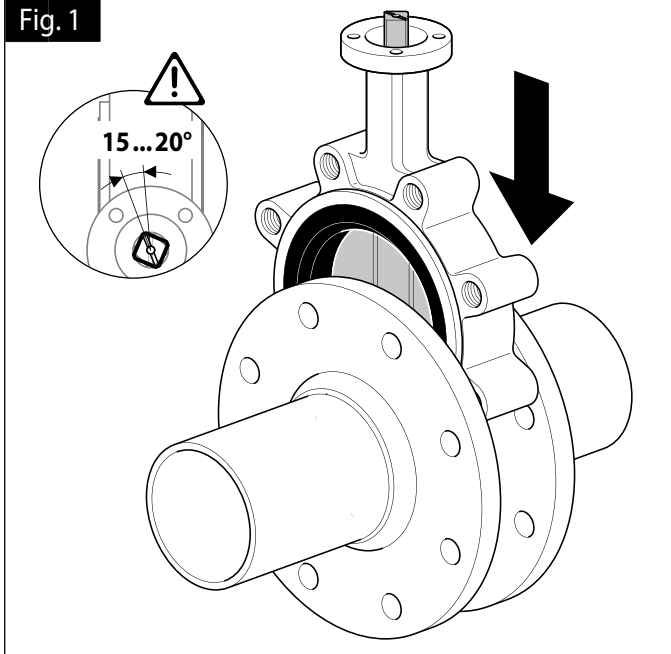
#### Installation Practices

- HD(U) series butterfly valves are designed to be installed between ANSI 125/150 flat-faced, raised face, slip-on or weld neck flanges.
- Valve should be installed a minimum of 10 pipe diameters from upstream or downstream elbows, strainers, pumps, etc.
- For chilled water, condenser water or hot water applications, the valve should be installed with the stem in a vertical orientation, with the actuator mounted above the valve.
- For applications in which there is a possibility of sediment in the flow, the valve should be installed with the stem in a horizontal position and the bottom of the disc should close FROM the downstream side, rather than from the upstream side.
- Make sure the flange faces are clean and free of rust, scale and debris to prevent damage to the liner face.
- Do NOT use flange gaskets on HD(U) series BF valves. (Fig. 1a)
- Follow the recommended flange bolting sequence. (Fig. 8, pg. 85)
- When installing in Victaulic piping systems, use Victaulic 41 series flange nipples.

#### Installation using Welded Flanges

- Mount flanges on both sides of valve body and install bolts to properly align valve body and both flanges.
- Install the valve with the disc in the “Almost Closed” position (Fig. 1)
- Do not use any flange gaskets (Fig. 1a)
- Make sure the valve liner and flange internal diameters are in alignment. (Fig. 2)
- Take valve body / flange pair assembly and align with piping ends.
- TACK weld the flanges to the piping in several places. (Fig. 3a) Do NOT seam weld at this time!
- Remove the lug bolts and carefully remove the valve body from the flanges.
- Seam weld the entire flange / piping connection for both flanges. (Fig 3b)
- Let the piping components cool completely before re-inserting the valve body. (Fig. 4)
- **WARNING!** Seam welding with the valve body installed between the flanges can damage the liner due to heat migration through the flange to the valve body.

**HD(U) Series Butterfly Valves**

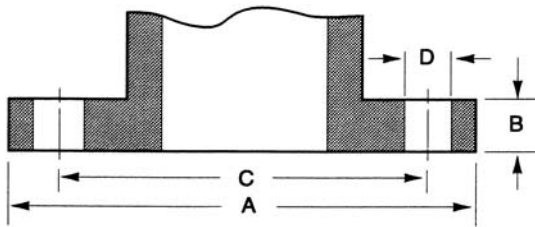


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### FLANGE BOLTING RECOMMENDATIONS

#### Flange Detail for ANSI B16.5 Pipe Flanges

Nominal Pipe Size	FLANGES		DRILLING		BOLTING	
	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts
2"	6"	3/4"	4-3/4"	3/4"	4	5/8"
2-1/2"	7"	7/8"	5-1/2"	3/4"	4	5/8"
3"	7-1/2"	15/16"	6"	3/4"	4	5/8"
4"	9"	15/16"	7-1/2"	3/4"	8	5/8"
5"	10"	15/16"	8-1/2"	7/8"	8	3/4"
6"	11"	1"	9-1/2"	7/8"	8	3/4"
8"	13-1/2"	1-1/8"	11-3/4"	7/8"	8	3/4"
10"	16"	1-3/16"	14-1/4"	1"	12	7/8"
12"	19"	1-1/4"	17"	1"	12	7/8"
14"	21"	1-3/8"	18-3/4"	1-1/8"	12	1"
16"	23-1/2"	1-7/16"	21-1/4"	1-1/8"	16	1"
18"	25"	1-5/8"	22-3/4"	1-1/4"	16	1-1/8"
20"	27-1/2"	1-11/16"	25"	1-1/4"	20	1-1/8"
24"	32"	1-7/8"	29-1/2"	1-3/8"	20	1-1/4"



**WARNING!** Personal injury or property damage may result if the valve is installed where service conditions could exceed the valve ratings.

### PRE-INSTALLATION PROCEDURE

1. Remove any protective flange covers from the valve.
2. Inspect the valve to be certain the waterway is free from dirt and foreign matter. Be certain the adjoining pipeline is free from any foreign material such as rust and pipe scale or welding slag that could damage the seat and disc sealing surfaces.
3. Any actuator should be mounted on the valve prior to installation to facilitate proper alignment of the disc in the valve seat.
4. Check the valve identification tag for materials, and operating pressure to be sure they are correct for the application.

5. Check the flange bolts or studs for proper size, threading, and length.
6. These valves are designed to be installed between ASME/ANSI Class 125/150 flanges.
7. Carefully follow installation using welded flanges on page 82 of this document.
8. Follow ASME flange alignment standards:  
SECTION 335.1.1 ALIGNMENT
  - a. PIPING DISTORTIONS: Any distortion of piping to bring into alignment for joint assembly which introduces a detrimental strain in equipment or piping components is prohibited.
  - b. FLANGE JOINTS: Before bolting up, flange faces shall be aligned to the design plane within 1/16"/ft measured across any diameter; flange bolt holes shall be aligned within 1/8" maximum offset.
9. When observed during assembly, the flange faces shall be parallel within 1 degree, and the force required to align pipe axes shall not exceed 10 lb/ft per inch of NF bolts and nuts shall be fully engaged.

### FLANGE BOLTING RECOMMENDATIONS

#### Lug Valves, 2"-30", ANSI 125/150 Bolt Pattern

Valve Size	Thread Size	Number Required	Bolt Length Semi-Lug Butterfly (inches)
2"	5/8-11	4	1.25
2-1/2"	5/8-11	4	1.50
3"	5/8-11	4	1.50
4"	5/8-11	8	1.75
5"	3/4-10	8	1.75
6"	3/4-10	8	2.00
8"	3/4-10	8	2.25
10"	7/8-9	12	2.25
12"	7/8-9	12	2.50
14"	1-8	12	2.75
16"	1-8	16	2.75
18"	1 1/8-7	16	3.50
20"	1 1/8-7	20	4.25
24"	1 1/4-7	20	4.75
30"	1 1/4-7	24	4.50

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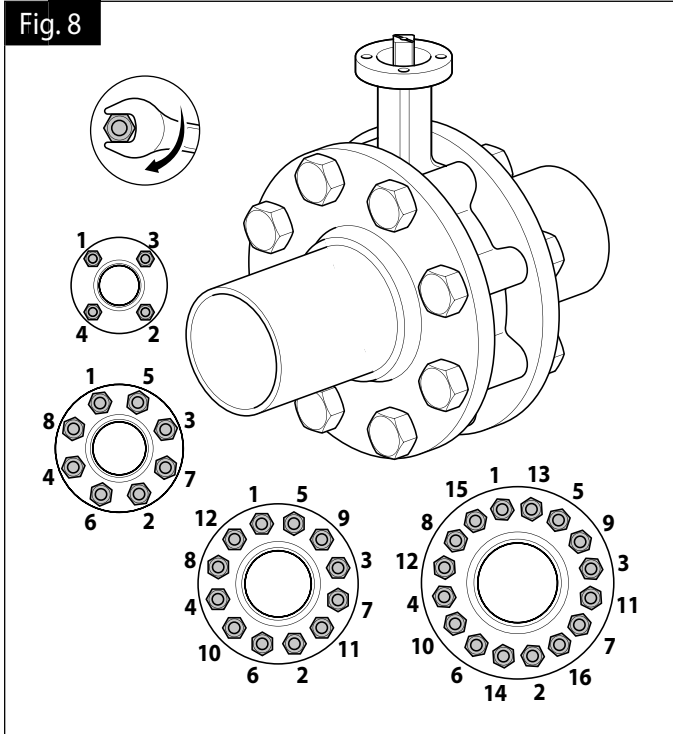
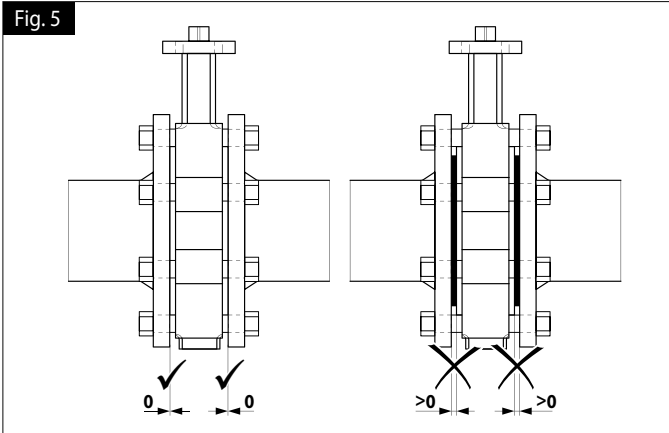
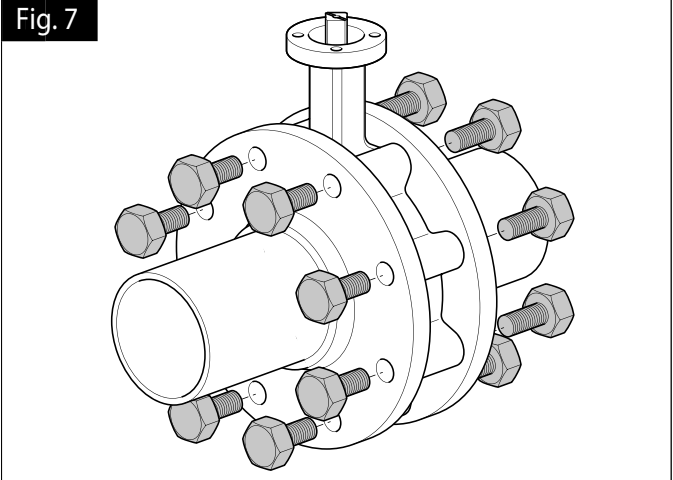
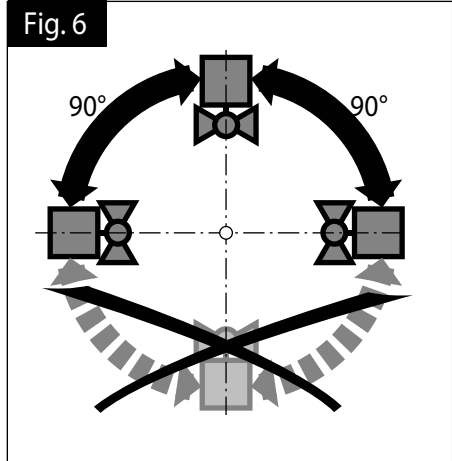


**Valve Installation Procedure**

Position the connecting pipe flanges in the line to insure proper alignment prior to valve installation. Spread the pipe flanges apart enough to allow the valve body to be located between the flanges without actually contacting the flange surfaces. Exercise particular care in handling the valve so as to prevent possible damage to the disc or seat faces.

**Note: Actuator must be mounted at or above pipe center line for all actuator types. (Fig. 6)**

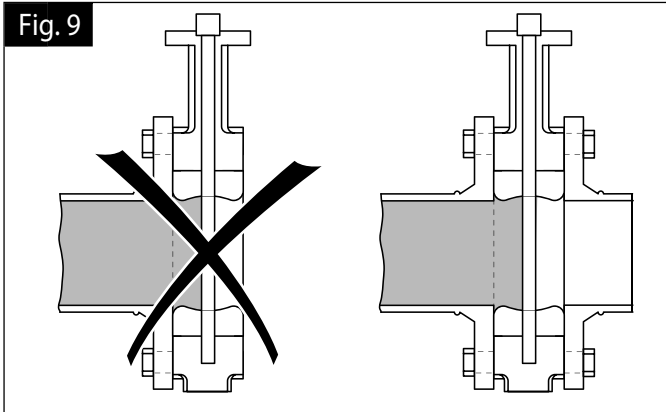
1. For Lug style valves:
  - a. Place the valve between the flanges.
  - b. Install all bolts between the valve and the mating flanges.  
Hand tighten bolts as necessary. (Fig. 7)
2. Before completing the tightening of any bolts, the valve should be centered between the flanges and then carefully opened and closed to insure free, unobstructed disc movement.
3. Using the sequence, (Fig. 8) tighten the flange bolts evenly to assure uniform compression. In assembling flange joints, the resilient seating surface shall be uniformly compressed. (Fig. 5)
4. If an actuator is to be operated, electricity should be connected to the unit in accordance with the local electrical codes.
5. Cycle the valve to the fully open position, then back to the fully closed position, checking the actuator travel stop settings for proper disc alignment. The valve should be operated to assure that no binding is taking place. If no power is available, use the manual handwheel.
6. The valve is now ready for operation.



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Fig. 9



### Valve Installation- Dead End Service

#### INSTALLATION NOTES

1. Follow previously described pre-installation and installation procedures.
2. To achieve the full close-off pressure of the HD/HDU series, a flange is required on the open or down stream side of the valve (Fig. 9)

### Maintenance Instructions

#### Safety Precautions

Before removing the valve from the line or loosening any bolts, it is important to verify the following conditions:

1. Be sure the line is depressurized and drained.
2. Be sure of the pipeline media. Proper care should be taken for protection against toxic and/or flammable fluids.
3. Never remove the valve without an Operator (Manual or Automatic) already attached to the valve shaft.
4. Never remove the Operator from the valve while the valve is in the pipeline under pressure.
5. Always be sure that the disc is cracked approximately 5° off of the closed position before removing the valve.

#### General Maintenance

The following periodic preventative maintenance practices are recommended for all Butterfly Valves.

1. Operate the valve from full open to full closed to assure operability.
2. Check flange bolting, actuator mounts and hangers for evidence of loosening and correct as needed.
3. Inspect the valve and surrounding area for previous or existing leakage at flange faces or shaft connections.
4. Check piping and/or wiring to actuators and related equipment for looseness and correct as needed.

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