Version 07_25

Belimo Resilient Seat Butterfly Valves
HD & L Series Technical Documentation

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Butterfly Valve Nomenclature

F6	200	L	+PRB	UP	-3	-T	-200
Valve F6 = 2-way F7 = 3-way	**Valve Size** 50 = 2” 65 = 2½” 80 = 3” 100 = 4” 125 = 5” 150 = 6” 200 = 8” 250 = 10” 300 = 12” 350 = 14” 400 = 16” 450 = 18” 500 = 20” 600 = 24”	**Trim Material** HD = Stainless Disc, Ductile Iron Body, EPDM Liner, 0% Leakage to 200 psid (2...3”), 150 psid (14”+) L = Stainless Disc, Ductile Iron Body, EPDM Liner, 0% Leakage to 200 psid (4...12”) HDU/LU = Stainless Disc, Ductile Iron Body, EPDM Liner, 0% Leakage to 50 psid (3...10”) VIC = Ductile Iron Grooved End Body, Nickel Coated Ductile Iron Disc, 0% Leakage up to 200 psid -150SHP = ANSI Class 150, Stainless Disc, Steel Body, RPTFE Seat, 0% Leakage up to 285 psid -300SHP = ANSI Class 300, Stainless Disc, Steel Body, RPTFE Seat, 0% Leakage up to 600 psid	**Actuator Type** **Non Fail-Safe** ARB, ARX AMB, AMX GMB, GMX GRB, GRX GR/GM.. N4 PRB, PRX JRB, JRX SY **Fail-Safe Electronic** GKB, GKX GK..N4 PKRB, PKRX **Spring Return** AFB, AFX AFRB, AFRX “X” models are customizable. Refer to page 14 for programming options.	**Power Supply** -24 = AC/DC 24 V -110 = AC 110/120 V -120 = AC 120 V -220 = AC 230 V UP = AC 24...240 V or DC 24...125 V	**Control** -3-X1 = On/Off, Floating Point -SR = Modulating Input = 2...10 V -MFT or -MFT-X1 = Multi-Function Technology	-S = Built-in Auxiliary Switch N4 = NEMA 4X -T = Terminal Block	-200 = 8” -250 = 10”

Ordering Example

1 Choose the valve actuator combination.

F6200L+PRBUP-3-T-200

3 **For MFT orders only - select programming code (consult factory)**
Programming codes, refer to page 14.

NO **Tagging (if needed)**

2 Specify preference or configuration.

4 Does order require tagging?

2-way Configuration

Non Fail-Safe	On/Off		No Set Up Required Field Logic Determines Normal Position
	Modulating	NC	(Normally Closed) 0.5 V/2 V/4 mA = Closed
		NO	(Normally Open) 0.5 V/2 V/4 mA = Open
Fail-Safe	On/Off	NO/FO	(Normally Open/Fail Open) Field Logic Determines Normal Position Valve Fails OPEN
		NC/FC	(Normally Closed/Fail Closed) Field Logic Determines Normal Position Valve Fails CLOSED
	Modulating	NO/FC	(Normally Open/Fail Closed) 0.5 V/2 V/4 mA = Open Valve Fails CLOSED
		NC/FO	(Normally Closed/Fail Open) 0.5 V/2 V/4 mA = Closed Valve Fails OPEN
		NO/FO	(Normally Open/Fail Open) 0.5 V/2 V/4 mA = Primary Valve Open Primary (Actuated) Valve Fails OPEN
		NC/FC	(Normally Closed/Fail Closed) 0.5 V/2 V/4 mA = Primary Valve Closed Primary (Actuated) Valve Fails CLOSED

Set-Up **3-way Configuration**

Non Fail-Safe	On/Off			No Set Up Required Field Logic Determines Normal Position
	Modulating	NC	Specify Flow Pattern [see page 6]	Primary (Actuated) Valve (Normally Closed) 0.5 V/2 V/4 mA = Closed
		NO		Primary (Actuated) Valve (Normally Open) 0.5 V/2 V/4 mA = Open
Fail-Safe	On/Off	NO/FO	Specify Flow Pattern [see page 6]	(Normally Open/Fail Open) Field Logic Determines Normal Position Primary (Actuated) Valve Fails OPEN
		NC/FC		(Normally Closed/Fail Closed) Field Logic Determines Normal Position Primary (Actuated) Valve Fails CLOSED
	Modulating	NO/FC		(Normally Open/Fail Open) 0.5 V/2 V/4 mA = Primary Valve Open Primary (Actuated) Valve Fails OPEN
		NC/FO		(Normally Open/Fail Closed) 0.5 V/2 V/4 mA = Primary Valve Open Primary (Actuated) Valve Fails CLOSED
		NO/FC		(Normally Closed/Fail Open) 0.5 V/2 V/4 mA = Primary Valve Closed Primary (Actuated) Valve Fails OPEN
		NC/FC		(Normally Closed/Fail Closed) 0.5 V/2 V/4 mA = Primary Valve Closed Primary (Actuated) Valve Fails CLOSED

Tagging:
Valves may be tagged per customer specification.

Example:
Chiller 1
3rd Floor East

Part number for tagging:
99981-00101

5 Complete Ordering Example: F6200L+PRBUP-3-T-200
Configuration: NO
Programming: N/A

Resilient Seat Butterfly Valve Product Range

2-way					Suitable Actuators								
Valve Nominal Size				Type	Non Fail-Safe						Fail-Safe		
											Spring Return	Electronic	
C_V 90°	C_V 60°	IN	DN [mm]	2-way	HDU	LU	L	HD			HD	L	HD
115	44	2	50	F650				AR	GR Series		AF Series		
196	75	2½	65	F665									
302	116	3	80	F680	AR GR								GK
798	289	4	100	F6100	GR		JR					PKR	
1140	428	5	125	F6125									
2055	647	6	150	F6150									
3136	1202	8	200	F6200		PR	PR						
5340	2047	10	250	F6250									
8250	3162	12	300	F6300									
11917	4568	14	350	F6350						SY Series (2 Year Warranty)			
16388	6282	16	400	F6400									
21705	8320	18	450	F6450									
27908	10698	20	500	F6500									
43116	16528	24	600	F6600									

3-way					Suitable Actuators								
Valve Nominal Size				Type	Non Fail-Safe						Fail-Safe		
											Spring Return	Electronic	
C_V 90°	C_V 60°	IN	DN [mm]	3-way	HDU	L	HD				HD	L	HD
115	44	2	50	F750			AM	GM Series			AF		
196	75	2½	65	F765									GK Series
302	116	3	80	F780	GM Series								
798	289	4	100	F7100		JR						PKR	
1140	428	5	125	F7125									
2055	647	6	150	F7150									
3136	1202	8	200	F7200		PR							
5340	2047	10	250	F7250									
8250	3162	12	300	F7300									
11917	4568	14	350	F7350					SY Series (2 Year Warranty)				
16388	6282	16	400	F7400									
21705	8320	18	450	F7450									

5-year warranty

MODE OF OPERATION

Butterfly valves are capable of handling higher flow rates with relatively low pressure loss. These valves may be used for isolation (shut-off) service or throttling service within a range of 0...60 degrees for two-way valves. Butterfly valves are controlled with a maintenance-free electronic actuator or manually with an ergonomic handle or gear operator.

PRODUCT FEATURES

The unique disc and seat design ensures positive valve seating while maintaining low seating torque.

ACTUATOR SPECIFICATIONS

Control type	on/off, floating point, modulating, 2...10 V, multi-function technology (MFT)
Manual override	all models
Electrical connection	3 ft. [1 m] cable terminal block (-T models & SY)
Communication (PR)	BACnet MS/TP, NFC, listed by BTL, Modbus

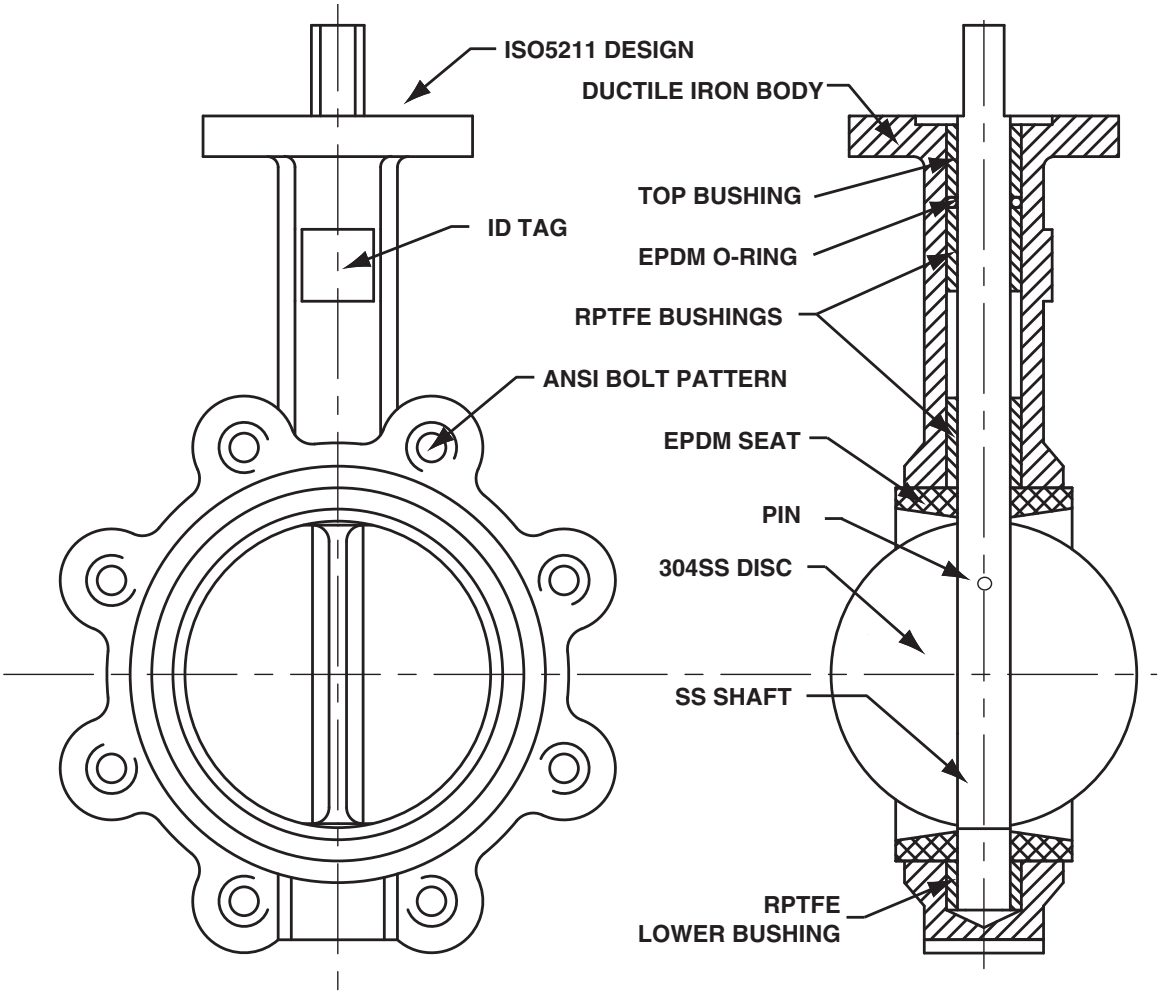
VALVE SPECIFICATIONS

Fluid	chilled, hot water, up to 60% glycol max
Flow characteristic	F6 modified equal percentage F7 modified linear
Sizes	2...24"
End fitting	for ASME/ANSI Class 125/150 flanges
Materials	
Body	ductile iron ASTM A536
Body finish	polyester powder coat
Disc	304 stainless steel
Shaft	
HD series	420 stainless steel
L series	420 stainless steel
Seat	EPDM
O-rings	EPDM
Bushings	
HD series	RPTFE
L series	bronze, steel, PTFE
Body pressure rating	232 psi cold working pressure (CWP)
Fluid (water) temperature range	-22...+250°F [-30...+120°C]
Close-off pressure	
HDU, LU series	50 psid, 3...10"
HD series	200 psid, 2...3", 150 psid 14...24"
L series	200 psid, 4...12"
Maximum velocity	12 FPS
Leakage	0%

Belimo resilient seat HD and L Series Butterfly Valves are designed for use in ANSI Class 150 piping systems and are supplied in standard lug style body designs.

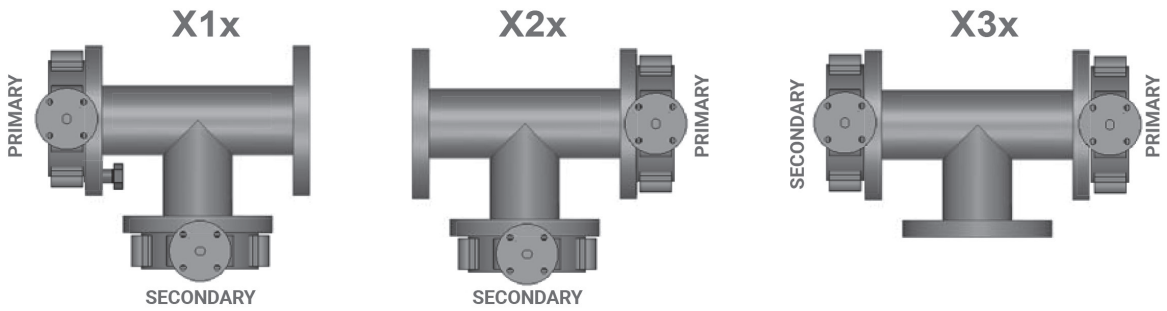
VALVE DESIGN FEATURES

- Unique seat and disc design ensures positive valve sealing while maintaining low seating torque
- Butterfly valve discs are precision machined to half ball profile, providing a precise disc-to-seat relationship
- Cartridge style seat incorporates an elastomer bonded to a phenolic stabilizing ring, eliminating elastomer movement and reducing seat tearing or fatiguing due to bunching
- Cartridge seat has a much smaller mass of elastomer than traditional boot seat designs, limiting seat swell and the accompanying variations in seating torque
- The five bushing design completely isolates the valve shaft from the body, resulting in increased control of the valve disc, lower valve seating torque, and longer valve life
- Ductile Iron Full Lug Bodies
- EPDM liner
- Stainless Steel Disc
- Three Models to suit the application:
  - HDU/LU Series provides undercut disc to 50 psi
  - HD Series provides full-rated close-off to 200 psi (2” to 3”) or 150 psi (14” to 24”)
  - L Series provides full-rated close-off to 200 psi (4” to 12”)
- 2-way and 3-way applications



MIXING/DIVERTING

Actuators installed default over Primary Valve.



CONFIG CODE	ON/OFF OR MOD@2 VDC PRIMARY VALVE IS	PRIMARY VALVE @ FAIL
X10	OPEN	FAIL IN PLACE
X11	OPEN	OPEN
X12	OPEN	CLOSED
X13	CLOSED	FAIL IN PLACE
X14	CLOSED	OPEN
X15	CLOSED	CLOSED

CONFIG CODE	ON/OFF OR MOD@2 VDC PRIMARY VALVE IS	PRIMARY VALVE @ FAIL
X20	OPEN	FAIL IN PLACE
X21	OPEN	OPEN
X22	OPEN	CLOSED
X23	CLOSED	FAIL IN PLACE
X24	CLOSED	OPEN
X25	CLOSED	CLOSED

CONFIG CODE	ON/OFF OR MOD@2 VDC PRIMARY VALVE IS	PRIMARY VALVE @ FAIL
X30	OPEN	FAIL IN PLACE
X31	OPEN	OPEN
X32	OPEN	CLOSED
X33	CLOSED	FAIL IN PLACE
X34	CLOSED	OPEN
X35	CLOSED	CLOSED

X Specifies Bi-Directional Flow Capability

Notes:

1. Secondary Valve operates inversely of the Primary Valve.
2. The Primary Valve is always located on the run.
3. The Secondary Valve may also have an actuator if required (Direct Coupled).
4. On/Off actuator normal position is a function of field logic.
5. Modulating actuator normal position (i.e., fully CW or fully CCW) is set by the direction control switch, PC-Tool or field programming via Belimo Assistant app.
6. All 3-way assemblies are designed for 90 degree actuator rotation.

Flow in Schedule 40 Pipe (Fluid Velocity in GPM). Use with HD/L Series Butterfly Valves.							
VALVE	**SIZE**	**2 FPS**	**4 FPS**	**6 FPS**	**8 FPS**	**10 FPS**	**12 FPS**
HD	2″	19	39	59	78	98	118
HD	2½″	30	61	92	122	153	184
HD	3″	44	88	132	176	220	264
HD	4″	78	157	235	313	392	470
HD	5″	122	245	367	490	612	734
HD	6″	176	352	529	705	881	1058
L	8″	313	627	940	1253	1567	1880
L	10″	490	979	1469	1958	2448	2738
L	12″	705	1410	2115	2820	3525	4230
HD	14″	959	1919	2879	3838	4798	5758
HD	16″	1253	2507	3760	5013	6267	7520
HD	18″	1586	3173	4759	6345	7931	9518
HD	20″	1958	3917	5875	7834	9792	11750
HD	24″	2820	5640	8460	11280	14100	16921

It is not recommended to exceed 12 feet per second through resilient seat butterfly valves.
Velocities greater than 12 fps may damage the valve liner and disc. Torque may increase, potentially exceeding the actuator's capacity.

				CONTROL TYPE			
SERIES	MODEL #	Power Supply	Duty Cycle	Modulating	3 Point	On/Off	Feedback
JR	JRBUP-3-T	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%		•	•	none
	JRXUP-3-T	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%		•	•	none
	JRBUP-MFT-T	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%	•	•	•	2...10 V
	JRXUP-MFT-T	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%	•	•	•	2...10 V
PR	PRBUP-3-T*	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%		•	•	none
	PRXUP-3-T*	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%		•	•	none
	PRBUP-MFT-T*	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%	•	•	•	2...10 V
	PRXUP-MFT-T*	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%	•	•	•	2...10 V
PKR	PKRXUP-MFT-T*	AC 24…240 V/ DC 24...125 V, 50/60 Hz	100%	•	•	•	2...10 V
SY4	SY4-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY4-24	AC/DC 24 V ±10%, 50/60 Hz	75%		•	•	none
	SY4-220	AC 230 V ±10%, 50/60 Hz	30%		•	•	none
	SY4-24MFT	AC/DC 24 V ±10%, 50/60 Hz	75%	•	•	•	2...10 V
	SY4-120MFT	AC 120 V ±10%, 50/60 Hz	75%	•			2...10 V
	SY4-230MFT	AC 230 V ±10%, 50/60 Hz	75%	•			2...10 V
SY5	SY5-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY5-24	AC/DC 24 V ±10%, 50/60 Hz	75%		•	•	none
	SY5-24MFT	AC/DC 24 V ±10%, 50/60 Hz	75%	•	•	•	2...10 V
	SY5-120MFT	AC 120 V ±10%, 50/60 Hz	75%	•			2...10 V
SY6	SY6-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY6-120MFT	AC 120 V ±10%, 50/60 Hz	75%	•			2...10 V
SY7	SY7-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY7-120MFT	AC 120 V ±10%, 50/60 Hz	75%	•			2...10 V
	SY7-230MFT	AC 230 V ±10%, 50/60 Hz	75%	•			2...10 V
SY8	SY8-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY8-120MFT	AC 120 V ±10%, 50/60 Hz	75%	•			2...10 V
	SY8-230MFT	AC 230 V ±10%, 50/60 Hz	75%	•			2...10 V
SY9	SY9-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY9-120MFT	AC 120 V ±10%, 50/60 Hz	50%	•			2...10 V
	SY9-230MFT	AC 230 V ±10%, 50/60 Hz	50%	•			2...10 V
SY10	SY10-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY10-120MFT	AC 120 V ±10%, 50/60 Hz	50%	•			2...10 V
	SY10-230MFT	AC 230 V ±10%, 50/60 Hz	50%	•			2...10 V
SY11	SY11-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY11-120MFT	AC 120 V ±10%, 50/60 Hz	50%	•			2...10 V
	SY11-230MFT	AC 230 V ±10%, 50/60 Hz	50%	•			2...10 V
SY12	SY12-110	AC 120 V ±10%, 50/60 Hz	30%		•	•	none
	SY12-120MFT	AC 120 V ±10%, 50/60 Hz	50%	•			2...10 V
	SY12-230MFT	AC 230 V ±10%, 50/60 Hz	50%	•			2...10 V

Modulating actuators will accept 0.5...10 V, 2...10 V or 4...20 mA control signals as standard.
All SY actuators are non fail-safe, but can be used with back up systems for fail-safe applications.
Fail-safe options available with PKR.
SY products carry a two year warranty when sold as part of an assembly or with a UFLK retrofit kit

*-200 and -250 versions have the same ratings.

General Wiring Instructions

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

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

Transformer(s)

Belimo actuators require a 24 VAC Class 2 transformer. The actuator enclosure cannot be opened in the field, there are no parts or components to be replaced or repaired.

- EMC Directive: 2004/108/EC
- Software Class A: Mode of Operation Type 1
- Low Voltage Directive: 2006/95/EC

Example: 3 AF Actuators Supplied, 16 Ga. wire (refer to table on page 3)
350 ft. (allowable wire length) ÷ 3 actuators = 117 ft. maximum wire run

Typical Transformer Sizing

Actuator Series	Voltage	Required VA Per Actuator
EFB, EFX	24	16
AFB, AFX	24	10
AF	24	10
NFB, NFX	24	9
LF	24	7
TF	24	5
GMB	24	7
AMB / ARB	24	6
NMB	24	6
LMB / LRB	24	3
CMB	24	1.5
AHB	24	4.5
LHB	24	3
LUB	24	3
AMQB	24	26
NMQB	24	23
LMQB	24	23
AHQB	24	23
LHQB	24	23
GK / GKR	24	21
NK	24	22
AHK	24	20

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

Multiple actuators, one transformer

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

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

Multiple actuators, multiple transformers

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

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

Wire type and wire installation tips

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

Wire length for actuator installation

Keep power wire runs below the lengths listed in the following tables. If more than one actuator is powered from the same wire run, divide the allowable wire length by the number of actuators to determine the maximum run to any single actuator.

Wire Size vs. Length of Run for SY Series Actuators On/Off

24 VAC		SY1	SY2	SY3	SY4	SY5
		[A]	[A]	[A]	[A]	[A]
	current	1.6	3.4	3.1	9.4	8.9
	wire gauge	MAX distance between actuator and supply [feet]				
	18	97	45	50		
	16	153	72	79	26	28
	14	244	115	126	42	44
	12	387	182	200	66	70
	10	616	290	318	105	111
	8	980	461	506	167	176

120 VAC		SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
		[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
	current	0.7	1.2	1.2	2.1	2	2.4	4.2	4.2	3	3.2	3.6	3.8
	wire gauge	MAX distance between actuator and supply [feet]											
	18	1,103	644	644	368	386	322	184	184	257	241	215	203
	16	1,750	1,021	1,021	583	613	510	292	292	408	383	340	322
	14	2,788	1,626	1,626	929	976	813	465	465	651	610	542	514
	12	4,428	2,583	2,583	1,476	1,550	1,292	738	738	1,033	969	861	816
	10	7,044	4,109	4,109	2,348	2,465	2,054	1,174	1,174	1,644	1,541	1,370	1,298
	8	11,204	6,536	6,536	3,735	3,922	3,268	1,867	1,867	2,614	2,451	2,179	2,064

230 VAC		SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
		[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
	current	0.4	0.6	0.6	1.1	1	1.1	2	2	2.5	2.6	2.7	2.5
	wire gauge	MAX distance between actuator and supply [feet]											
	18	3,701	2,467	2,467	1,346	1,480	1,346	740	740	592	569	548	592
	16	5,871	3,914	3,914	2,135	2,348	2,135	1,174	1,174	939	903	870	939
	14	9,352	6,234	6,234	3,401	3,741	3,401	1,870	1,870	1,496	1,439	1,385	1,496
	12	14,854	9,903	9,903	5,401	5,942	5,401	2,971	2,971	2,377	2,285	2,201	2,377
	10	23,626	15,751	15,751	8,591	9,450	8,591	4,725	4,725	3,780	3,635	3,500	3,780
	8	37,581	25,054	25,054	13,666	15,033	13,666	7,516	7,516	6,013	5,782	5,568	6,013

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.

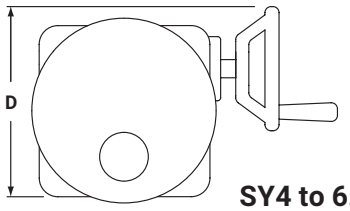
Wire Size vs. Length of Run for SY Series Actuators Modulating

24 VAC		SY1	SY2	SY3	SY4	SY5
		[A]	[A]	[A]	[A]	[A]
	current	2.8	3.4	3.1	9.4	8.9
	wire gauge	MAX distance between actuator and supply [feet]				
	18	55	45	50		
	16	88	72	79	26	28
	14	139	115	126	42	44
	12	221	182	200	66	70
	10	352	290	318	105	111
	8	560	461	506	167	176

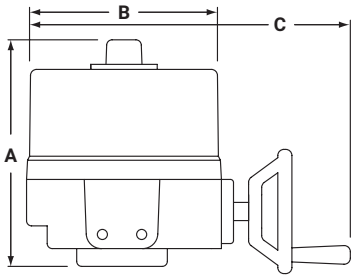
120 VAC		SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
		[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
	current	0.6	0.8	0.7	2.1	1.9	2	2	2.8	2.7	3	4.3	4.5
	wire gauge	MAX distance between actuator and supply [feet]											
	18	1,287	966	1,103	368	407	386	386	276	286	257	180	172
	16	2,042	1,531	1,750	583	645	613	613	438	454	408	285	272
	14	3,253	2,440	2,788	929	1,027	976	976	697	723	651	454	434
	12	5,167	3,875	4,428	1,476	1,632	1,550	1,550	1,107	1,148	1,033	721	689
	10	8,218	6,163	7,044	2,348	2,595	2,465	2,465	1,761	1,826	1,644	1,147	1,096
	8	13,072	9,804	11,204	3,735	4,128	3,922	3,922	2,801	2,905	2,614	1,824	1,743

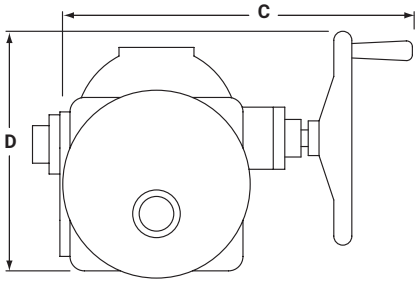
230 VAC		SY1	SY2	SY3	SY4	SY5	SY6	SY7	SY8	SY9	SY10	SY11	SY12
		[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
	current	0.4	0.4	0.4	1.1	1	1	1.2	1.6	1.1	1.4	2.2	2.5
	wire gauge	MAX distance between actuator and supply [feet]											
	18	3,701	3,701	3,701	1,346	1,480	1,480	1,234	925	1,346	1,057	673	592
	16	5,871	5,871	5,871	2,135	2,348	2,348	1,957	1,468	2,135	1,677	1,067	939
	14	9,352	9,352	9,352	3,401	3,741	3,741	3,117	2,338	3,401	2,672	1,700	1,496
	12	14,854	14,854	14,854	5,401	5,942	5,942	4,951	3,713	5,401	4,244	2,701	2,377
	10	23,626	23,626	23,626	8,591	9,450	9,450	7,875	5,906	8,591	6,750	4,296	3,780
	8	37,581	37,581	37,581	13,666	15,033	15,033	12,527	9,395	13,666	10,738	6,833	6,013

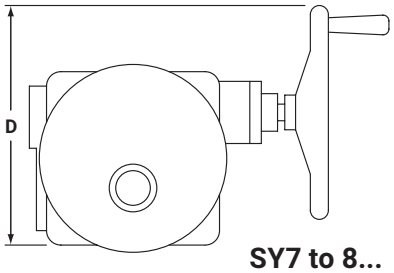
The NEC mandates that 24 VAC over 100 VA power requires CLASS 1 wiring conduit. Local codes may vary. Do NOT mix CLASS 1 & CLASS 2 circuits in the same conduit. Generally, 24 VAC actuators over 100 VA should be changed to 120 VAC models.



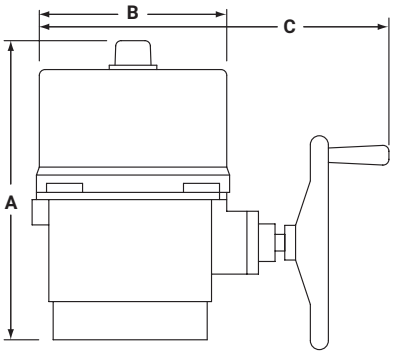
SY4 to 6...

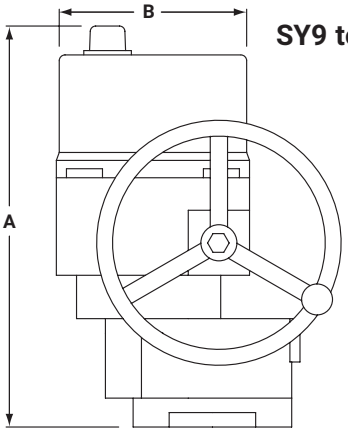






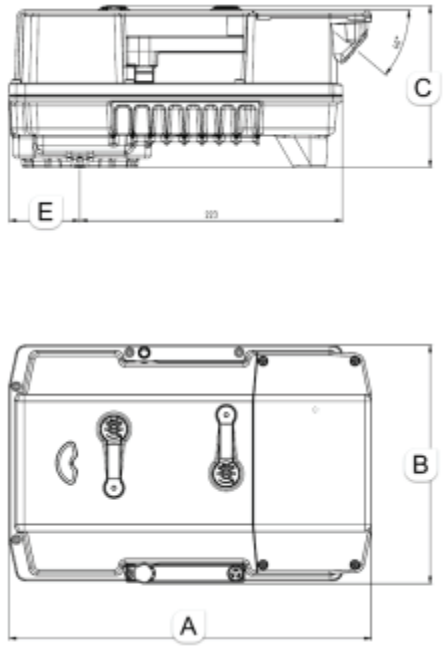
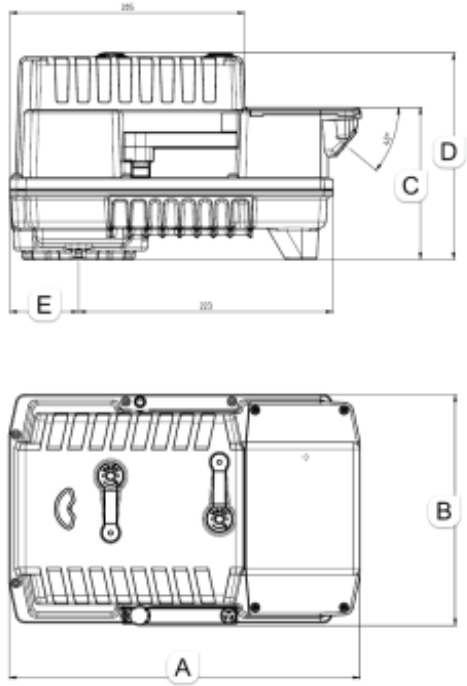
SY7 to 8...





SY9 to 12...

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

PR	PKR
	

MODEL	DIM A	DIM B	DIM C	DIM D	DIM E	Weight (Actuator Only)
	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]	Lbs [kg]
PR	12.09 [307]	7.96 [202]	5.40 [137]	-	2.37 [60]	12.8 [5.8]
PKR	12.09 [307]	7.96 [202]	5.28 [134]	7.13 [181]	2.37 [60]	14.2 [6.4]

ACTUATOR TYPE		CONFIGURATION DESCRIPTION	CODE	CONTROL		
				CONTROL INPUT	FEEDBACK POSITION	RUNNING TIME**
Standard Actuator Series: AR, AM, GR, GM,GKR, AFR, AF	-MFT		A01*	2...10 V	2...10 V	150 seconds
			A02	0.5...10 V	0.5...10 V	150 seconds
			A03	2...10 V	0.5...10 V	150 seconds
			A19	2...10 V	2...10 V	100 seconds
			A28	0.5...10 V	0.5...10 V	100 seconds
			A63	0.5...4.5 V	0.5...4.5 V	150 seconds
			A64	5.5...10 V	5.5...10 V	150 seconds
			F01	Floating Point	2...10 V	150 seconds
			J02	On/Off, Floating Point	2...10 V	150 seconds
PR and JR Series	-3, -T	NC	L11	On/Off, Floating Point	N/A	35 seconds
		NC	L12	On/Off, Floating Point	N/A	60 seconds
		NO	L15	On/Off, Floating Point	N/A	35 seconds
		NO	L16	On/Off, Floating Point	N/A	60 seconds
	-MFT	NC	L05*	2...10 V	2...10 V	35 seconds
		NC	L06	2...10 V	2...10 V	60 seconds
		NC	L09	0.5...10 V	0.5...10 V	35 seconds
		NC	L0A	0.5...10 V	0.5...10 V	60 seconds
		NC	L0D	4...20 mA	2...10 V	35 seconds
		NC	L0E	4...20 mA	2...10 V	60 seconds
		NO	L0H	2...10 V	2...10 V	35 seconds
		NO	L0J	2...10 V	2...10 V	60 seconds
		NO	L0M	0.5...10 V	0.5...10 V	35 seconds
		NO	L0R	4...20 mA	2...10 V	35 seconds
PKR Series		NC-FC	L21	On/Off, Floating Point	2...10 V	35 seconds
		NC-FO	L25	On/Off, Floating Point	2...10 V	35 seconds
		NO-FC	L29	On/Off, Floating Point	2...10 V	35 seconds
		NO-FO	L2D	On/Off, Floating Point	2...10 V	35 seconds
		NC-FC	L31*	2...10 V	2...10 V	35 seconds
		NC-FO	L35	2...10 V	2...10 V	35 seconds
		NO-FC	L39	2...10 V	2...10 V	35 seconds
		NO-FO	L3D	2...10 V	2...10 V	35 seconds
		NC-FC	L41	0.5...10 V	0.5...10 V	35 seconds
		NC-FO	L45	0.5...10 V	0.5...10 V	35 seconds
		NO-FC	L49	0.5...10 V	0.5...10 V	35 seconds
		NO-FO	L4D	0.5...10 V	0.5...10 V	35 seconds
		NC-FC	L51	4...20 mA	2...10 V	35 seconds
		NC-FO	L55	4...20 mA	2...10 V	35 seconds
		NO-FC	L59	4...20 mA	2...10 V	35 seconds
		NO-FO	L5D	4...20 mA	2...10 V	35 seconds
		NO-FO	L5E	4...20 mA	2...10 V	60 seconds
SY Series	-MFT	Loss of Signal Stop	ACE*	2...10 V	2...10 V	Varies by model
		Loss of Signal Stop	ACF	0.5...10 V	0.5...10 V	Varies by model
		Loss of Signal Stop	ACG	4...20 mA	4...20 mA	Varies by model
		Loss of Signal Open	ACJ	2...10 V	2...10 V	Varies by model
		Loss of Signal Open	ACK	0.5...10 V	0.5...10 V	Varies by model
		Loss of Signal Open	ACL	4...20 mA	4...20 mA	Varies by model
		Loss of Signal Close	ACN	2...10 V	2...10 V	Varies by model
		Loss of Signal Close	ACP	0.5...10 V	0.5...10 V	Varies by model
		Loss of Signal Close	ACR	4...20 mA	4...20 mA	Varies by model

*Default configuration
**Additional running times available upon request. JR can be selected with a 20 second run time.

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 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 6 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 series BFV valves. (Fig. 1a)
- Follow the recommended flange bolting sequence. (Fig. 8, pg. 16)

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.

Max Torque for Bolts

Valve Size	Bolt Size	Max Torque [ft-lbs]
2” - 4”	5⁄8”	70
5” - 8”	3⁄4”	120
10” - 12”	7⁄8”	200
14” - 16”	1”	240
18” - 20”	1 1⁄8”	380
24” - 30”	1 1⁄4”	520
32” - 48”	1 1⁄2”	800
54” - 60”	1 3⁄4”	1800

HD Series Butterfly Valves

Fig. 1

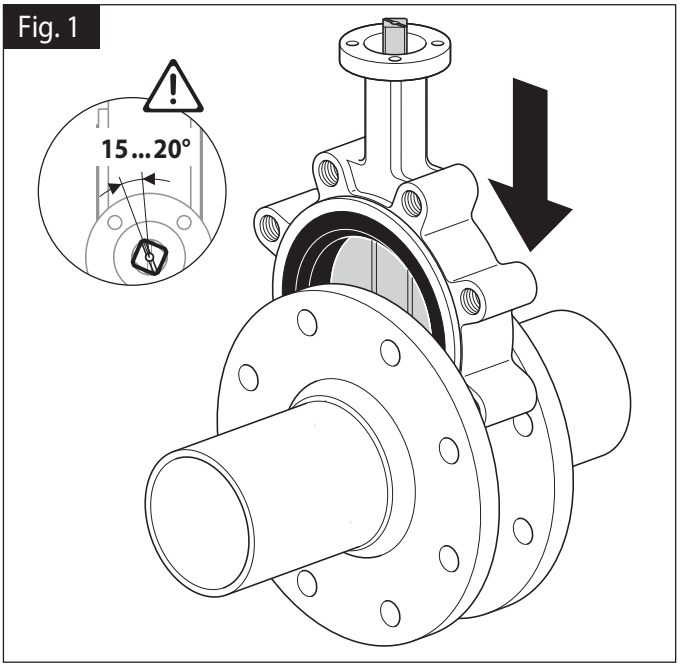


Fig. 1a

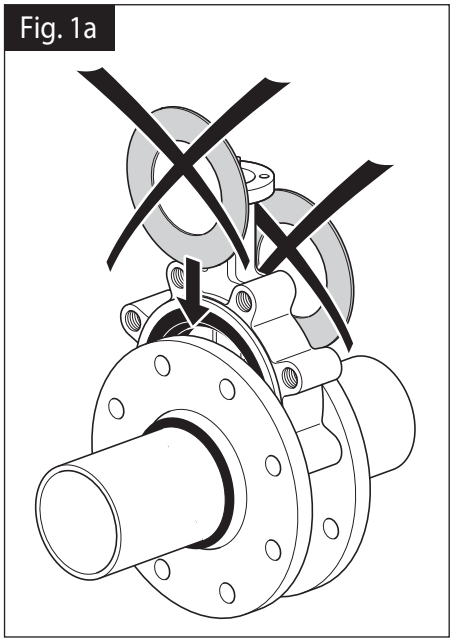


Fig. 2

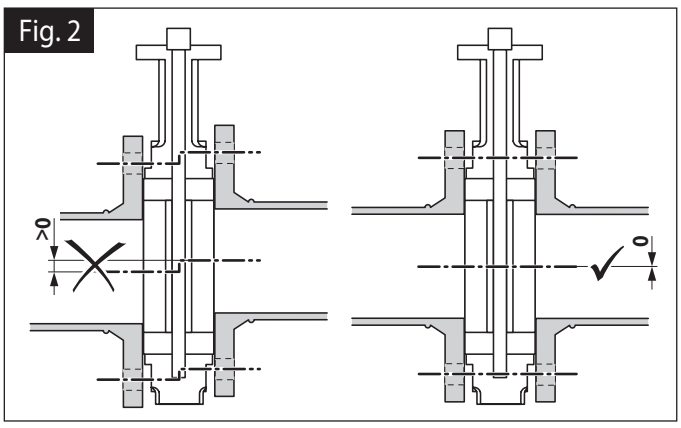


Fig. 3a

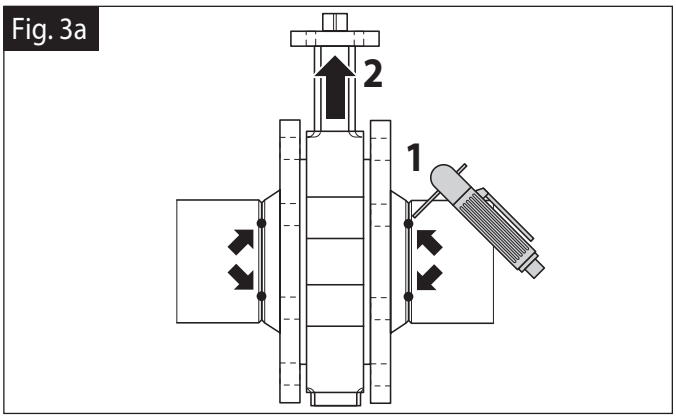


Fig. 3b

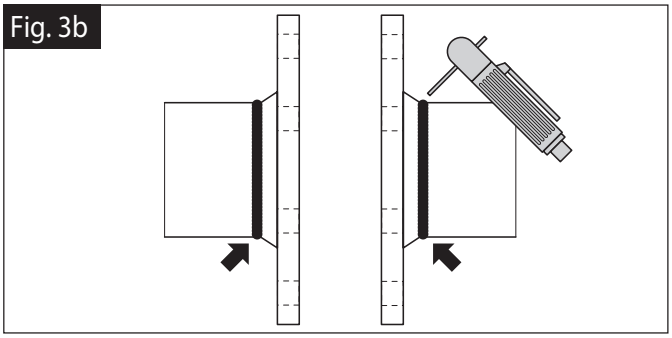
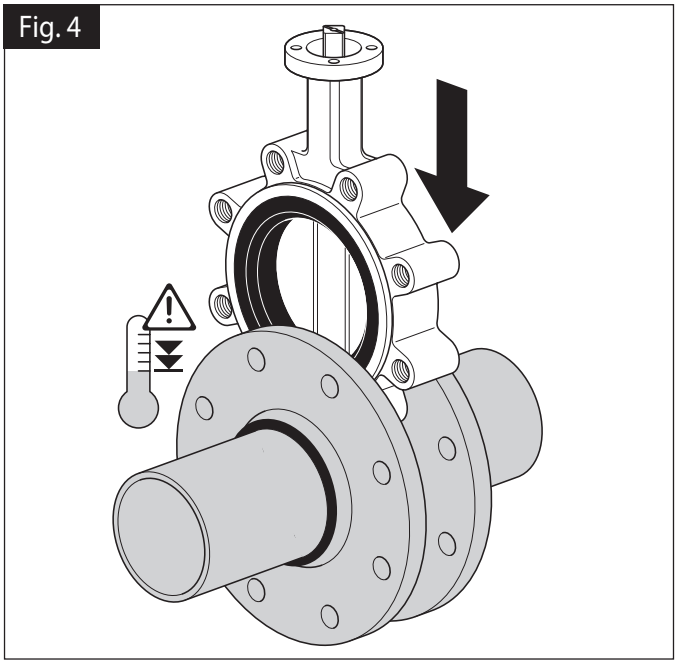


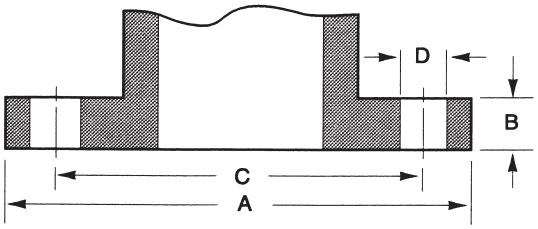
Fig. 4



FLANGE BOLTING RECOMMENDATIONS

Flange Detail for ANSI B16.5 Pipe Flanges

	FLANGES		DRILLING		BOLTING	
Nominal Pipe Size	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts
2"	6"	¾"	4¾"	¾"	4	⅝"
2½"	7"	⅞"	5½"	¾"	4	⅝"
3"	7½"	15/16"	6"	¾"	4	⅝"
4"	9"	15/16"	7½"	¾"	8	⅝"
5"	10"	15/16"	8½"	⅞"	8	¾"
6"	11"	1"	9½"	⅞"	8	¾"
8"	13½"	1⅛"	11¾"	⅞"	8	¾"
10"	16"	1 3/16"	14¼"	1"	12	⅞"
12"	19"	1¼"	17"	1"	12	⅞"
14"	21"	1⅜"	18¾"	1⅛"	12	1"
16"	23½"	1 7/16"	21¼"	1⅛"	16	1"
18"	25"	1⅝"	22¾"	1¼"	16	1⅛"
20"	27½"	1 11/16"	25"	1¼"	20	1⅛"
24"	32"	1⅞"	29½"	1⅜"	20	1¼"



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"	⅝ - 11	4	1¼
2½"	⅝ - 11	4	1½
3"	⅝ - 11	4	1½
4"	⅝ - 11	8	1¾
5"	¾ - 10	8	1¾
6"	¾ - 10	8	2
8"	¾ - 10	8	2¼
10"	⅞ - 9	12	2¼
12"	⅞ - 9	12	2½
14"	1 - 8	12	2¾
16"	1 - 8	16	2¾
18"	1⅛ - 7	16	3½
20"	1⅛ - 7	20	4¼
24"	1¼ - 7	20	4¾
30"	1¼ - 7	24	4½

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. When installing in Victaulic piping systems, use Victaulic 41 series flange nipples. 741 flanges not recommended without the use of adapter rings.
2. HD-Series Butterfly valves are designed to be installed between ANSI 125/150 flat-faced, raised face, slip-on or weld neck flanges.
3. Do NOT use flange gaskets on HD-Series Butterfly valves.
4. 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)
5. 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.
6. 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) A small gap may be present if max torque is reached. Do not over tighten bolts or stripping may occur. (Fig. 5)
7. If an actuator is to be operated, electricity should be connected to the unit in accordance with the local electrical codes.
8. 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.
9. The valve is now ready for operation.

Fig. 5

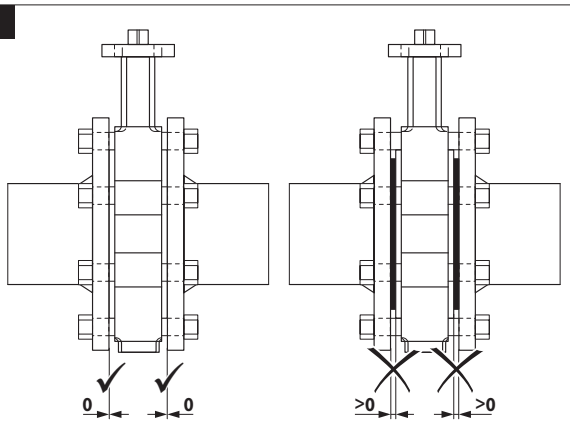


Fig. 6

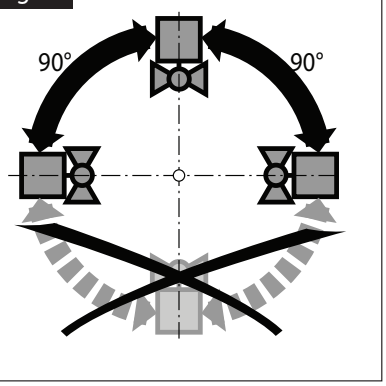


Fig. 7

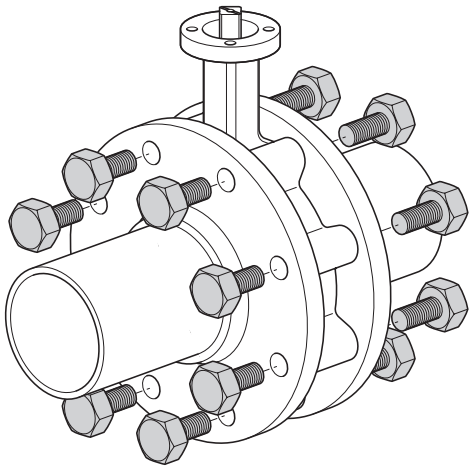


Fig. 8

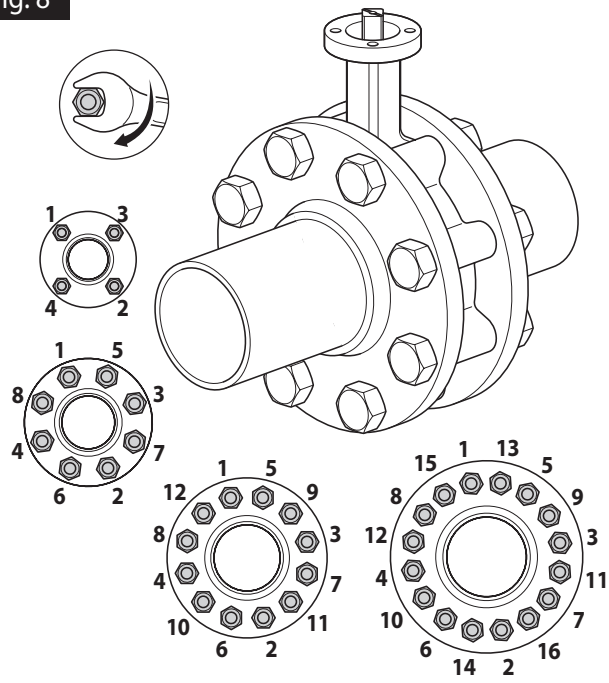
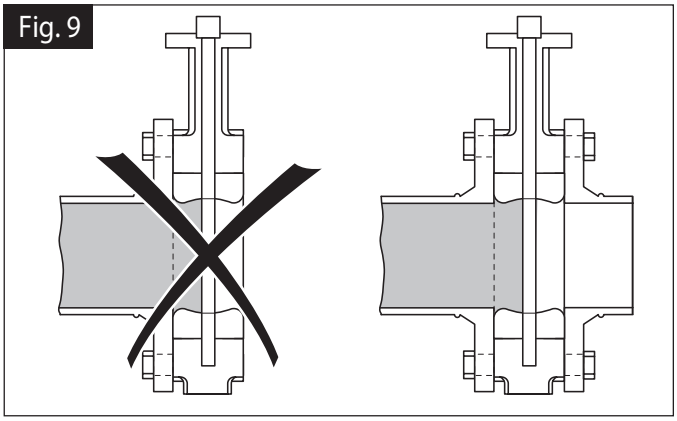


Fig. 9



INSTALLATION NOTES

1. Follow previously described pre-installation and installation procedures.
2. To achieve the full close-off pressure of the HD 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.
5. If not in use, exercise the butterfly valve (full open and close) at least once a month.

L Series
Ductile Butterfly Valves

Technical Data		
Service		chilled,hot water, 60% glycol
Flow characteristic	F6	modified equal percentage
	F7	linear
Controllable flow range		90°
Sizes		8" to 12"
Type of end fitting		for use with ANSI Class 125/150 flanges
Materials		
Body		ductile iron ASTM A536
Bodyfinish		epoxy powder coated
Disc		304 stainless steel
Seat		EPDM
Shaft		420 stainless steel
O-ring		EPDM
Bushings		Steel, PTFE, Bronze
Media temperature range		-4°F to 250°F [-20°C to 120°C]
Body pressure rating		232 psi
Close-off pressure		200 psi
Rangeability		10:1 (for 30° to 70° range)
Maximum velocity		12 FPS
Leakage		0%
Warranty		5 Years

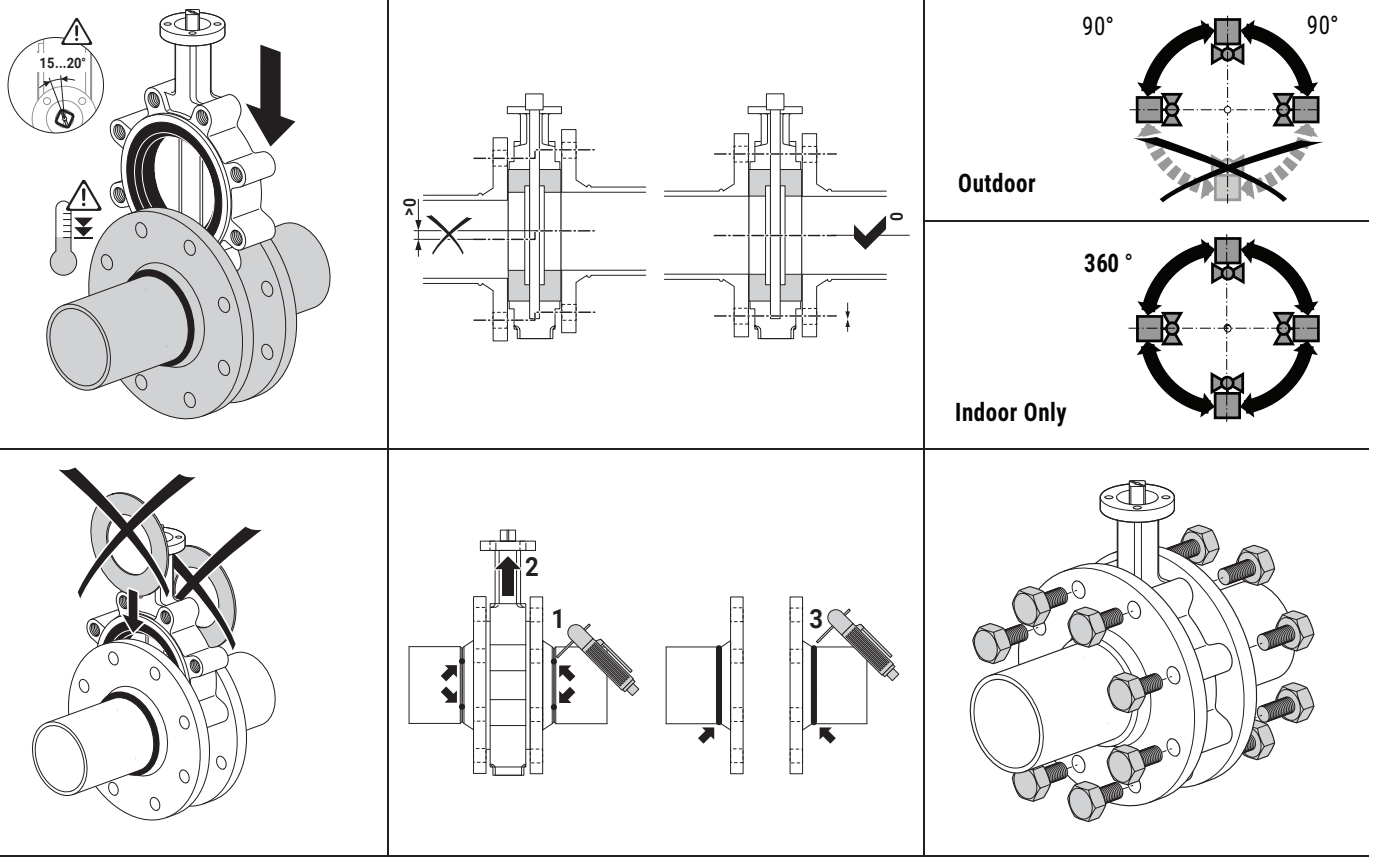
Smart Heating

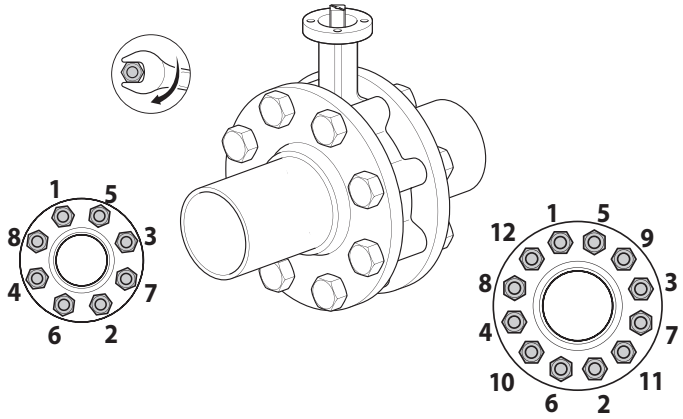
When the actuator is idle; the onboard temperature and humidity sensors and logic within the actuator activate heating elements when needed to prevent condensation within the housing. The heater switches on when the ambient temperature drops below 50°F (10°C) or the relative humidity is higher than 65% and the temperature is below 86°F (30°C).

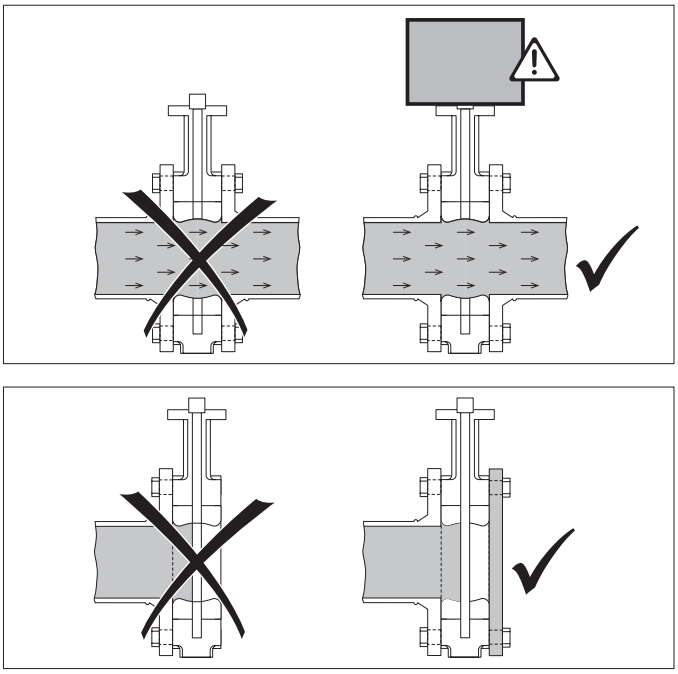
Self-adjusting End Stops

The intelligent self-adjusting end stops close the valve based on torque or travel over the entire lifespan of the valve.

Installation Recommendations







Max Torque for Bolts		
Valve Size	Bolt Size	Max Torque [ft-lbs]
8”	3/4-10”	120
10”-12”	7/8-9”	200

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.

1. When installing in Victaulic piping systems, use Victaulic 41 series flange nipples. 741 flanges not recommended without the use of adapter rings.
2. L-Series Butterfly valves are designed to be installed between ANSI 125/150 flat-faced, raised face, slip-on or weld neck flanges.
3. Do NOT use flange gaskets on L-Series Butterfly valves. Valve should be installed a minimum of 6 pipe diameters from upstream or downstream elbows, strainers, pumps, etc.
4. 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.
5. 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.
6. Using the sequence, tighten the flange bolts evenly to assure uniform compression. In assembling flange joints, the resilient seating surface shall be uniformly compressed. A small gap may be present if max torque is reached. Do not over tighten bolts or stripping may occur. (Fig. 5)
7. If an actuator is to be operated, electricity should be connected to the unit in accordance with the local electrical codes.
8. 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.
9. The valve is now ready for operation.

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.
5. If not in use, exercise the butterfly valve (full open and close) at least once a month.

Safety Precautions

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

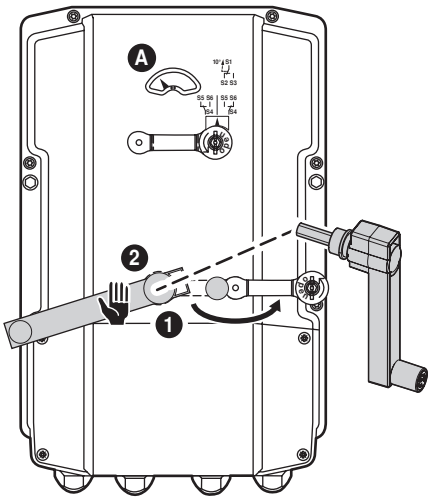
1. Be sure the line is depressurized and drained.
2. Be sure of the pipeline media. Proper care should be taken for protection against toxic and/or flammable fluids.
3. Never remove the valve without an Operator (Manual or Automatic) already attached to the valve shaft.
4. Never remove the Operator from 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.

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.
- Valve faces must be protected from abrasion, cutting and nicking, as this will damage the face 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.

Auxiliary Switch Setup for PR and PKR Actuators

The setting of the auxiliary switches work like the S2A module.
The first auxiliary switch is fixed at 10°, the second auxiliary switch can be set between 0° and 90°. A YouTube® video is available to further help explain the auxiliary switch settings.

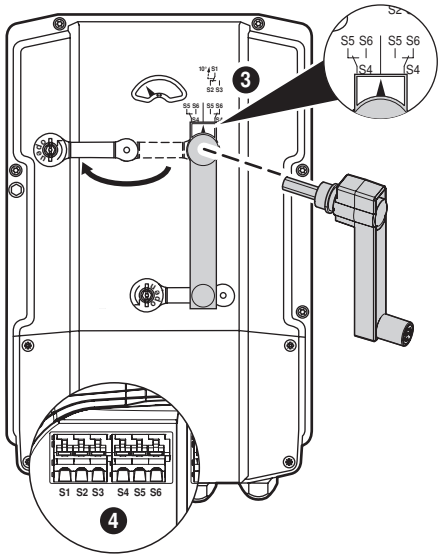


Note: Perform settings on the actuator only in deenergised state.

For the auxiliary switch position settings, carry out points ❶ to ❹ successively.

❶ **Gear disengagement**
Opening the manual override cover and adjusting the hand crank.
Manual override is possible.

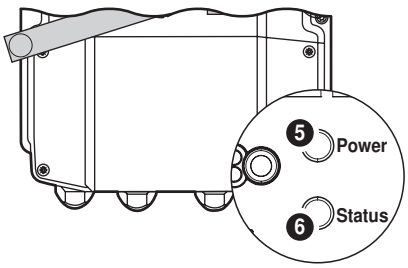
❷ **Manual override control**
Turn the hand crank until the desired switching position Ⓐ is indicated and then remove the crank.



❸ **Auxiliary switch**
For the auxiliary switch position settings, carry out points ❶ to ❹ successively.
Opening the auxiliary switch adjustment cover and adjusting the hand crank.
Turn the crank until the arrow points to the vertical line

❹ **Terminals**
Connect continuity tester to S4 + S5 or to S4 + S6.
If the auxiliary switch should switch in the opposite direction, rotate the hand crank by 180°.

Push-button and display



❺ **Push-button and LED display green**

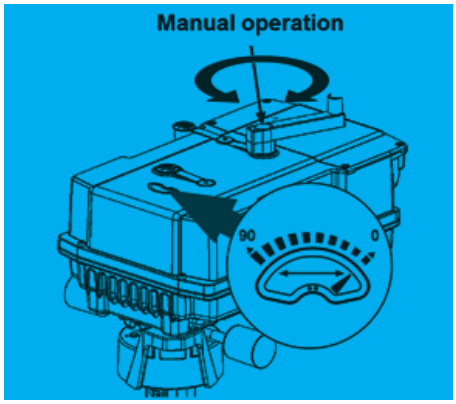
Off:	No power supply or malfunction
On:	In operation
Press button:	Triggers test run, followed by standard mode

❻ **Push-button and LED display yellow**

Off:	Standard mode
On:	Test run active
Flickering:	BACnet / Modbus communication active
Flashing:	Request for addressing from MP master
Press button:	Confirmation of the MP addressing

Manual Override Function for PR and PKR Actuator

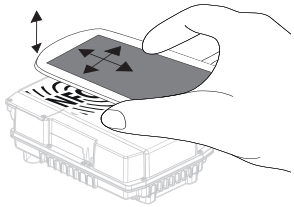
The PR actuator offers a hand crank connection. When the hand crank is placed correctly then the actuator is disengaged.



When handcrank is connected to actuator, the motor & signal control will be disabled

After removing the handcrank, the actuator drives to its control signal

Commissioning with Near Field Communication (NFC)



The PR actuator with Near Field Communication (NFC) allows for easy commissioning, programming and troubleshooting directly from your smartphone, even when the actuator is not powered. Settings can also be changed with the ZTH-US handheld tool.

The following table shows the factory settings and settings that can be changed with NFC and ZTH-US.

Values & Settings	Factory Setting	Manual	Power On NFC	Power Off NFC	Power On ZTH
Running time setting [30-120 s]	35 s	-	RW	RW	RW
Max angle of rotation	100%	-	RW	RW	RW
Actuator Position [0-100%]	-	Position Indicator	R	-	R
Setting for auxiliary switch s2 [0-90°]	85%	Hand crank	-	-	-
Display of input signal voltage (Power supply)	-	-	R	-	-
Valve Setting [Regular, 8”, 10”, 12”]	Type specific	-	RW	RW	-
Override Control (Force Position)	-	Hand crank	RW	-	RW
Location String	-	-	RW	RW	-
Control [Floating Point, On/Off, 0.5 - 10V, 2 - 10V, 4 - 20 mA]	2..10V	-	RW	RW	RW
Feedback Mode [2 - 10V, 0.5 - 10V, inverted]	2..10V	-	RW	RW	RW
Feedback Mode [DC variable]	-	-	-	-	RW
Control Signal [DC variable]	-	-	-	-	RW
Control Signal Fail Position [None, On/Off]	None	-	RW	RW	-
Hybrid Mode - Setpoint [MP-Bus, Analog]	Bus	-	RW	RW	-
Bus Setting [MP-Bus, BACnet]	MP, PP	-	RW	RW	-
Power Off Position [0 - 100%]	0%		RW	RW	RW
Power Fail Delay [0 - 10 s]	2 s		RW	RW	RW

[R=reading; W=writing]

General information

Date: 3. April 2017

Vendor Name: BELIMO Automation AG
Vendor ID: 423

Product Name: Rotary actuator for butterfly valves
Product Model Number: BACMFT for xy,
e.g. PRBUP-MFT-T, PKRBUP-MFT-T

Applications Software Version: 02.04.0000
Firmware Revision: 07.03.0002
BACnet Protocol Revision: 1.12

Product Description:
Actuator for butterfly valves providing two sensor inputs

BACnet Standard Device Profile: BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks supported:
Data Sharing - ReadProperty-B (DS-RP-B)
Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
Data Sharing - WriteProperty-B (DS-WP-B)
Data Sharing - Write Property Multiple-B (DS-WPM-B)
Data Sharing - COV-B (DS-COV-B)
Device Management - DynamicDeviceBinding-B (DM-DDB-B)
Device Management - DynamicObjectBinding-B (DM-DOB-B)
Device Management - DeviceCommunicationControl-B (DM-DCC-B)

Segmentation Capability: No

Data Link Layer Options: MS/TP master,
baud rates: 9'600, 19'200, 38'400, 76'800, 115'200

Device Address Binding: No static device binding supported

Networking Options: None

Character Sets Supported: ISO 10646 (UTF-8)

Gateway Options: None

Network Security Options: Non-secure Device

PICS *(continued)*

Standard objects

The device provides datapoints for common operation as well as datapoints for parameterization.

Datapoint	BACnet Object
Relative Setpoint in %	AO [1]
Override Control	MO [1]
Relative Position in %	AI [1]
Absolute Position in °	AI [2]
Analog Setpoint in %	AI [6]
Sensor 1 Type	MV [220]
Sensor 1 as analog value	AI [20]
Sensor 2 Type	MV [221]
Sensor 2 as analog value	AI [21]
Summary Status	BI [101]
Command: Initiate Function	MV [120]
Max Setpoint in %	AV [98]
Bus Watchdog in s	AV [130]

Object processing

Object type	Optional properties	Writeable properties
Analog Input	Description COV_Increment	COV_Increment
Analog Output	Description COV_Increment	COV_Increment Present_Value Relinquish_Default
Analog Value	Description	Present_Value
Binary Input	Description Active_Text Inactive_Text	
Device	Description Location Active_COV_Subscription	Object_Identifier Object_Name (max. 32 char) Location (max. 64 char) Description (max. 64 char) APDU_Timeout Number_Of_APDU_Retries Max_Master Max_Info_Frames
Multi-state Output	Description State_Text	Present_Value Relinquish_Default
Multi-state Value	Description State_Text	Present_Value

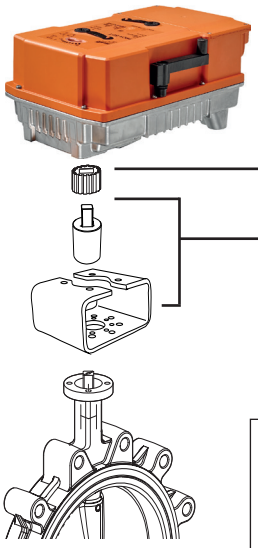
- The device does not support the CreateObject and DeleteObject service.
- The specified maximum length of writable strings is based on single-byte characters.
- No support of COV subscription on Analog Value objects.

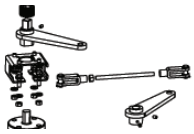
Service processing

- The device supports DeviceCommunicationControl service. No password is required.
- Max. 6 active COV subscriptions with lifetime up to 8 h supported

Object Name	Object Type / Instance	Description	Values	Default
Device_Name	Device [x]			
SpRel	Analog Output [1]	Relative Setpoint in % If analog control is enabled, the Present_Value is not evaluated and Out_of_Service is TRUE and.	0 - 100	0
Override	Multi-state Output[1]	Override Control Override control is possible in analog or digital control. Min/Mid are not supported by the device and interpreted as 0%	None Open Close Min Mid Max	None
RelPos	Analog Input [1]	Relative Position in % If the gear is disengaged, it is signaled in the Status_Flags:OVERRIDDEN=TRUE.	0 - 100	-
AbsPos	Analog Input [2]	Absolute Position in ° If the gear is disengaged, it is signaled in the Status_Flags:OVERRIDDEN=TRUE.	0 - 90	-
SpAnalog	Analog Input [6]	Analog Setpoint in % The Present_Value represents the relative value calculated from the analog signal (3-point, 0-10 V, 4-20 mA). If analog control is disabled, the Present_Value is not updated and Out_of_Service is TRUE and.	-10, 0 - 100, 110%	-
Sens1Type	Multi-state Value [220]	Sensor 1 Type The sensor input T1 supports passive temperature sensors only. The measured signal is provided by Sens1Analog either as resistance value (Passive 1K, Passive 20K) or as converted temperature (PT1000, NI1000, NTC10K) in °C or °F.	None - Passive_1K Passive_20K - PT1000_C NI1000_C NTC10K_C PT1000_F NI1000_F NTC10K_F	None
Sens1Analog	Analog Input [20]	Sensor 1 as analog value in Ω or °C/°F	200 - 50 kΩ -50 - 200°C -60 - 400°F	-
Sens2Type	Multi-state Value [221]	Sensor 2 Type, according Sens1Type	…	None
Sens2Analog	Analog Input [21]	Sens1Analog, according Sens1Analog	…	-
SummaryStatus	Binary Input [101]	Summary Status	None Fault	-
Command	Multi-state Value [120]	Initiate Function	None - Test Reset	-
MaxSp	Analog Value [98]	Max setpoint in %	20 - 100	-
BusWatchdog	Analog Value [130]	Timeout for Bus Watchdog in s 0s = watchdog deactivated If neither the Present_Value for AO[1] nor MV[1] is updated within the period, the Priority_Array of both objects is cleared and the Relinquish_Default becomes valid.	0 - 3600	0

PR actuators can be used for retrofitting competitor butterfly valves that require under 1400 in-lbs. Until released, contact Technical Support for a custom linkage. 1, 2, and 3 are required to retrofit. Refer below for required parts for custom retrofit.





Valve Size	Valve Series	2-way Valve Linkage with Position Indicator	2-way Valve Linkage without Position Indicator	3-way Valve Linkage without Position Indicator
4” - 6”	HD	IND-PR01	IND-PR02	UFLK6924
8”	HD	Not Available - Use SY Series*	Not Available - Use SY Series*	Not Available - Use SY Series*
8”, 10”, 12”	L	IND-PR03	IND-PR04	UFLK6925
10”, 12”	HD	Not Available - Use SY Series*	Not Available - Use SY Series*	Not Available - Use SY Series*

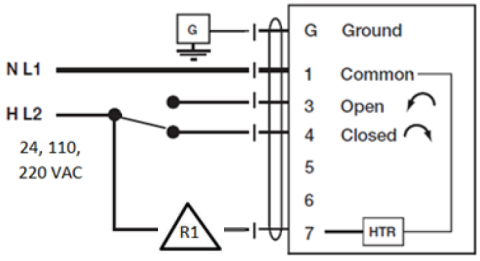
* Contact Technical Support for details.

In case an SY3 on/off is replaced with a PR actuator, the following changes are needed.

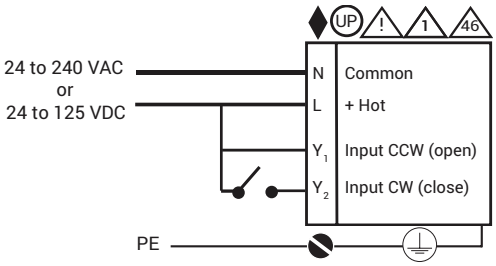
The SY is a 3-wire device and the PR actuator is a 4-wire device and additional wiring changes to the auxiliary switches are required. See below.

Ground power and control signal wiring revisions.

Replace an SY series on/off control actuator with a PR, PKR series actuator with noted R1, R2 revisions. See table 1 for terminal cross reference



SY On/Off Wiring (original)
(see submittal document for details)



PR, PKR On/Off Wiring (replacement)
(see submittal document for details)

R1

Revision 1: Relocate SY hot wire #7 (heater) to PR and PKR actuator terminal L. Terminal L must be always hot. Smart heater is integrated for PR, PKR models and requires no additional wiring connections.

On/Off Control Wiring Cross Reference		
Series	SY	PR/PKR
Terminal	G	PE
	1	N
	3	Y1
	4	Y2
	5	-
	6	-
	7	L

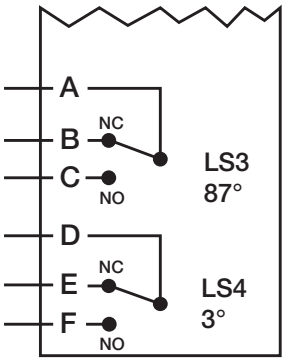
Table 1

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

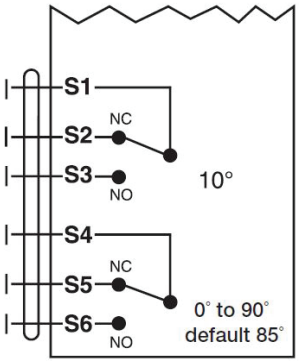
Auxiliary Switch Wiring Modifications for PR Replacement of SY Actuators

Refer to table 2 for terminal cross reference.

When travel setpoint is achieved the SPDT normally open (NO) contact becomes closed. For example; when the original SY actuator travel is 87° the A-C contact is closed. When PR, PKR actuator travel is 85° (default) the S4-S6 contact is closed.



SY Series (original)
See submittal document for details



PR, PKR Series (replacement)
See submittal document for details

Auxiliary Switch Wiring Cross Reference		
Series	SY	PR/PKR
SPDT (Normal)	Terminal	
Com	A	S4
NC	B	S5
NO	C	S6
Com	D	S1
NC	E	S2
NO	F	S3

Table 2

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

Does the PR actuator make an adaptation during the first commissioning?

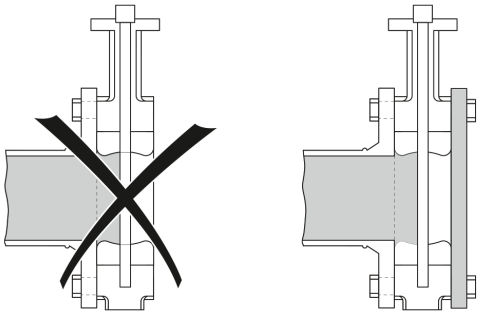
The PR actuator comes with an integrated potentiometer, therefore an adaptation is not necessary. The actuator always knows its position.

Is it allowed to mount the PR actuator upside down?

Yes, for indoor applications only.

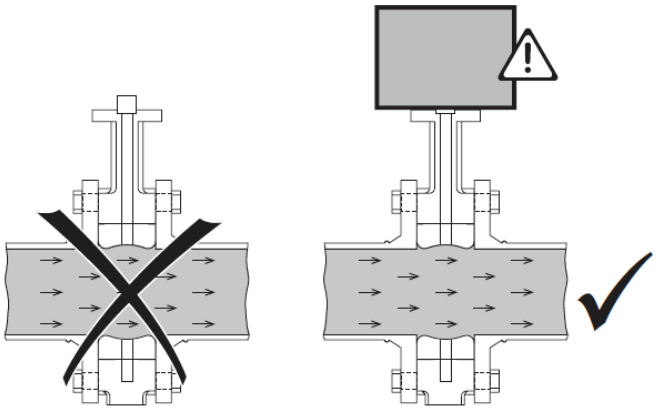
Can the new 8" and 12" butterfly valves also be used for dead-end service?

The new butterfly valves can only be used with a closed counter-flange for dead-end service.



Is it possible for a butterfly valve to be installed in the line without an actuator?

Yes, but not for long periods of time. The butterfly valve may not be operated without an actuator or gear operator if there is flow in the line. In the absence of an actuator or gear operator, the butterfly valve might close and cause damage (water hammer).



Why is there no possibility to use the PC-Tool for parameterization?

The future tool for parameterization is the Belimo Assistant App. In a long term perspective the PC-Tool will not be supported.

Can the new butterfly valves also be used for district heating and cooling applications or for ANSI 250/300 applications?

The new butterfly valves are not suitable for these applications, due to longer pipes and the high pressure drops associated with them. These valves are ANSI 125/150 type flanges.

Can we motorize an existing F6200HD butterfly valve with a PR actuator?

The PR actuator is NOT available for the F6200HD butterfly valve. The reason is that the SY3 actuator has a nominal torque of 150 Nm but can shortly develop a higher torque. The PR actuator has a constant 160 Nm torque. If a replacement for a SY3 is needed, the SY3 is still available until end of 2018 and afterwards a SY4 can be delivered as a replacement.

Terms and Conditions of Sale and Warranty

1. Scope

These General Terms and Conditions are applicable to the purchase and sale of BELIMO Aircontrols USA, Inc., (hereinafter "BELIMO") products and services by the Client. As used herein, Client refers to the individual or entity that purchases BELIMO products or services directly from BELIMO. If the Client requests a delivery or service abroad, the contract will be concluded with the local BELIMO company in that country or with a BELIMO company named by BELIMO in the order confirmation. In such case, the General Terms and Conditions of the BELIMO company appointed in the order confirmation will be applicable. In case our delivery includes software and accompanying documentation, the terms of the license agreement are applicable in addition to these General Terms and Conditions. However, in case of any conflict between the two documents, the license agreement shall prevail.

Client's order of any BELIMO product, or BELIMO providing any service to Client, is expressly conditioned on Client's acceptance of these General Terms and Conditions, and the parties agree that Client's order of any BELIMO product, or BELIMO's performing of any service to Client, constitutes Client's acceptance of these General Terms and Conditions. No additional or different terms or conditions delivered to BELIMO from Client apply. BELIMO deems such additional or different terms or conditions material alterations to these General Terms and Conditions, and BELIMO hereby notifies Client of its objection to and rejection of such additional or different terms or conditions.

2. Conclusion of the contract

The contract is deemed to be concluded upon receipt of an order confirmation by the Client or, upon absence of such confirmation, upon the segregation of the ordered products by BELIMO. All catalogs, brochures and publications on the Internet are considered to be an offer from BELIMO to Client, which acceptance is expressly limited to these General Terms and Conditions.

Modifications or additions to these General Terms and Conditions or to the contract are not valid without written approval by BELIMO. Orders that deviate from the specifications published by BELIMO or contain additions or modifications made by the Client will only be effective if they have been expressly approved by BELIMO with a written order confirmation.

3. Cancellation of the contract

Orders of products according to catalog (standard products) may be cancelled by the Client until the segregation of the ordered products by BELIMO provided that BELIMO has received the statement of cancellation prior to the time of segregation.

Orders of customers' products (special designs etc.) may be cancelled only up to 4 hours after receipt of the order by BELIMO. In that case, a service charge of 10% of the net order amount will be invoiced to the Client. In case of customized products or configured actuators, a service charge of 20% of the net order amount will be invoiced to the Client.

4. Prices

If not expressly specified otherwise, all price information is net, excluding VAT.

The standard packaging of the ordered products is included in the net price. All other costs, such as for transport, insurance, taxes, customs duties as well as export, import or other necessary approvals will be invoiced as additional charges. The net price does not include any additional services performed by BELIMO, such as installation, commissioning and compilation of diagrams etc.

BELIMO reserves the right to change prices at any time until the conclusion of the contract.

5. Delivery conditions

All times, dates and delivery deadlines are considered non-binding, unless their binding nature has been expressly agreed in writing. Binding delivery deadlines and dates that have been agreed upon in writing are met when the product is made available in the distributing warehouse before the corresponding dates have passed. If BELIMO has a delay in delivery, it is assumed that the Client continues to demand the delivery. Compensation for late delivery or for replacement is excluded.

If not otherwise indicated on the order confirmation, delivery of the Goods shall be made in accordance with Incoterms® 2020 DAP Goods recipient (DAP = Delivered At Place, delivery address ship-to-party)

BELIMO reserves the right not to deliver the ordered products if they are unavailable; in this case, BELIMO will promptly notify the Client of the non-availability and, if necessary, reimburse any payment already made.

6. Payment conditions

BELIMO invoices must be paid in full within 30 days after the date of invoice. If the Client is in delay, BELIMO reserves the right to withhold further deliveries.

The Client is not entitled to offset outstanding accounts from BELIMO with any counterclaims.

7. Application, installation and use of BELIMO products

BELIMO products are intended for professional use only. BELIMO products may only be installed and replaced by skilled qualified personnel.

BELIMO products must be used in accordance with the specifications of the respective currently valid data and assembly sheet. The use of Belimo Cloud Services is subject to the "Terms of Use for Belimo Cloud Services" as amended from time to time (https://www.belimo.com/mam/corporate-communications/privacy/BELIMO-Cloud-Terms-of-use_EN.pdf).

8. Specifications

Except as provided in section 13, the non-technical specifications or technical specifications that are not part of the data sheets as provided for a particular product at the time of order, published by BELIMO in text or picture form (e.g. illustrations or drawings) in catalogs, brochures, websites, data and assembly sheets or other publications are only to be regarded as a guideline. The specific characteristics of the delivered products can deviate from that of images or samples in respect to material, color or shape. BELIMO reserves the right to change the communicated product specifications or to deliver corresponding products from third-party suppliers in place of the ordered products.

9. Reservation of title

The title of supplied products remains with BELIMO until the Client has fully paid all invoices.

10. Passing of risk

Benefit and risk with regard to the products purchased pass to the Client in accordance with agreed Incoterms® 2020.

11. Redemption of products

BELIMO may, upon prior agreement, redeem products according to catalog (standard products) provided that these products are still contained in the product range, virgin, i.e. not older that max. 6 months, unused, and originally packed at the time of return. BELIMO does not have any duty of redemption. Redemption of customers' products (special designs, Designed to Order, configured actuators), Openline-products or products that have been procured on Client's specific demand is excluded.

The return of products according to catalog shall be made enclosing a copy of the invoice and stating the reason for the return, free of all charges to BELIMO Aircontrols USA, Inc, 33 Turner Road, attn. Returns Dept., Danbury, CT 06810 for the east coast of USA and to BELIMO Aircontrols USA Inc, 1049 Fortunato Loop, attn. Returns Dept., Sparks, NV, 89436-8310 for the west coast of USA.

From the credit as agreed with the Client, a service charge of at least 20% of the net catalog price will be deducted. A payment of the credit in cash is excluded. It can only be credited against future orders.

12. Duty of examination/Acceptance

The Client shall examine all products for defects within 5 working days of receipt. Any defects are to be reported to BELIMO within 5 working days of receipt in writing; the product will otherwise be deemed to be accepted. Hidden defects must be reported in writing within 5 working days after they are discovered.

13. Warranty

With its warranty, BELIMO guarantees during the warranty period in accordance with this section 13, that the delivered products meet the technical specifications that are explicitly listed on the corresponding data sheets as at the time of order.

However, the applicable warranty for a Belimo product is null and void in the event of damage resulting from or partly caused by the Client or by third parties acting within the scope of responsibility of the Client when:

a) Products are used in areas that are not specified in the data and assembly sheets, especially in aircraft and any other airborne means of transport;
b) Products are used contrary to applicable laws, official regulations or the instructions of BELIMO (especially regarding installation, commissioning, operating regulations and information on the data and assembly sheets);
c) Products are used under special conditions, especially under the continuous influence of aggressive chemicals, gases or liquids or outside of the permissible operating parameters or conditions for use;
d) Products are assembled, handled or installed incorrectly or without due care or not according to the respective authoritative state-of-the-art or are not used or installed by skilled qualified personnel;
e) Products are modified or repaired without prior written approval of BELIMO;
f) Products become worn out as a result of inappropriate or unintended use or excessive stress;
g) Products are stored inappropriately; or
h) The Client or third parties are responsible for damage.
i) Belimo also provides no warranty for normal wear and tear, including all types of corrosion, operational or environmental wear and tear and the like, as long as this is not due to defects in materials or workmanship.

For Openline-products further limitations of liability according to the applicable framework agreement, concluded between BELIMO and the Client, will apply.

The Client is liable for actions or omissions of auxiliary personnel as if these were his own actions.

The warranty period is five years from the date of manufacture for BELIMO products. The warranty period is two years from the date of delivery for Openline-products. The warranty period for products that have not been manufactured by BELIMO (trade products) can be derived from the order confirmation. Trade products are specified as such, either by the name and/or by the logo of the manufacturer. The warranty period for trade products is generally one year from the date of delivery, in exceptional cases two years from the date of delivery.

The warranty period starts at the time of manufacture or delivery of the product, respectively, without requiring acceptance from or testing by the Client. The Client is obliged to immediately initiate all suitable measures to minimize damage. If a timely report has been made in accordance with Section 12 above, BELIMO has the sole and absolute discretion to replace, repair or refund by store credit or otherwise the net purchase price of a defective product. In case of repair or replacement, Belimo is obliged to either replace defective products with products that are equal or equivalent, or to have them repaired either by BELIMO or by third parties at BELIMO's expense. Client shall have no right to a preference or selection between a repair, replacement or refund, whether through store credit or otherwise, of a defective product.

The replacement of a defective product does not restart the warranty period for that product. BELIMO can require the Client to replace particular defective products or parts of products in a system to prevent damage, whereby reasonable Client expenditures in this context that are approved in advance in writing by BELIMO will be reimbursed by BELIMO.

WARRANTY DISCLAIMER: EXCEPT FOR THE WARRANTY SET FORTH IN THIS SECTION, BELIMO MAKES NO CONDITION OR WARRANTY, AND DISCLAIMS ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY (A) CONDITION OR IMPLIED WARRANTY OF MERCHANTABILITY; (B) CONDITION OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; C) CONDITION OR WARRANTY OF TITLE; OR (D) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.

14. Indemnification

CLIENT AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS BELIMO, ITS OFFICERS, DIRECTORS, EMPLOYEES, AGENTS, REPRESENTATIVES, ASSIGNS, AFFILIATES, PARENT, AND SUCCESSORS ("BELIMO INDEMNIFIED PARTIES") FROM AND AGAINST ALL CAUSES OF ACTION, COMPLAINTS, CLAIMS, DEMANDS, JUDGMENTS, SUITS, LOSSES, LIABILITIES, LIENS, DAMAGES, FINES, PENALTIES, ASSESSMENTS, COSTS, ATTORNEYS FEES, AND EXPENSES THAT ARISE OUT OF, RELATE TO, OR ARE CONNECTED WITH ANY THIRD-PARTY CLAIM, SUIT, ACTION, OR PROCEEDING, RELATING TO (I) CLIENT'S ADVERTISING, MARKETING, PURCHASE, SALE, OR USE OF BELIMO PRODUCTS AND SERVICES, (II) CLIENT'S ACTUAL OR ALLEGED BREACH OF ANY REPRESENTATION, WARRANTY, COVENANT, OR OBLIGATION UNDER THESE GENERAL TERMS AND CONDITIONS, AND (III) BELIMO OR THE BELIMO INDEMNIFIED PARTIES' NEGLIGENCE. AT ITS OPTION, BELIMO WILL HAVE THE RIGHT TO CONTROL THE DEFENSE OF ANY LEGAL PROCEEDING, AND CLIENT SHALL NOT ENTER INTO ANY SETTLEMENT WITHOUT THE PRIOR WRITTEN CONSENT OF BELIMO OR THE BELIMO INDEMNIFIED PARTIES, WHICH SHALL NOT BE REASONABLY WITHELD.

15. LIMITATION OF LIABILITY

IN NO EVENT SHALL BELIMO AND THE BELIMO INDEMNIFIED PARTIES, HAVE ANY LIABILITY TO CLIENT OR ANY THIRD PARTY FOR ANY (I) LOST PROFITS, LOST REVENUE, DIMINUTION IN VALUE, COSTS OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, OR (II) ANY DAMAGES WHATSOVER (INCLUDING BUT NOT LIMITED TO CONSEQUENTIAL AND PUNITIVE DAMAGES) RESULTING FROM THE PERFORMANCE OF A PRODUCT, A TEMPORARY OR PERMANENT LOSS OF USE OF A PRODUCT, OR ARISING OUT OF ANY SERVICE PROVIDED TO CLIENT OR A THIRD PARTY, HOWEVER CAUSED UNDER ANY THEORY OF LIABILITY, AND WHETHER BASED IN CONTRACT, TORT (INCLUDING BELIMO OR THE BELIMO INDEMNIFIED PARTIES' NEGLIGENCE), STATUTE, OR OTHERWISE. BELIMO'S MAXIMUM AGGREGATE LIABILITY UNDER, ARISING FROM, OR IN CONNECTION WITH THE SALE OF ITS PRODUCTS AND PROVIDING SERVICES TO CLIENT SHALL BE LIMITED TO THE AMOUNT PAID BY CLIENT FOR THE PRODUCT OR SERVICE DEEMED RESPONSIBLE FOR THE LOSS OR DAMAGE.

THE FOREGOING LIMITATION SHALL APPLY EVEN IF BELIMO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY STATED HEREIN.

16. Force majeure

Neither BELIMO nor the Client shall have any liability to the other party for damages of any kind that result from the failure or delay in the performance of its obligations under these General Terms and Conditions, if such failure or delay is due to obstacles that are beyond either party's reasonable control irrespective of whether these occur at BELIMO, the Client or a third party.

Such obstacles are, for example, epidemics, pandemics, mobilization, war, revolts, severe interruptions of operations, accidents, labor disputes, delayed or faulty delivery of the required raw materials, semi-finished or finished goods, non-availability of important work pieces, magisterial injunctions or omissions, embargos, export or import restrictions, acts of God or any other circumstances which are, to a large extent, beyond the control of BELIMO or the Client. In such cases, both parties shall, without delay, undertake all effective measures which can be expected of them to prevent damage, or if damage occurs, to minimize the degree of this damage as far as possible.
However, in no event shall payment of any money due to BELIMO be excused or delayed by reason of the foregoing.

17. Resale
If the product is resold, the Client must impose at least the same limitations of warranty restrictions upon the buyer.

18. Privacy policy
BELIMO places great value on the implementation of lawful data processing to protect your personal data. BELIMO is obliged to process your personal data in accordance with current legislation. We are dependent on the services of third parties for the provision of our services. These third parties will only process your data in connection with the services agreed with BELIMO, will ensure the same level of data protection as BELIMO, and will not pass on your data to other third parties without your agreement. When processing your data and transfer-ring your data to third parties, BELIMO will ensure that an appropriate level of data protec-tion is guaranteed and that appropriate organizational and technical measures are implemented to protect your data. More detailed information on our data protection guidelines is available from the following Internet address: www.belimo.com/privacy.

19. Modifications
BELIMO reserves the right to modify these General Terms and Conditions at any time.

20. Severability clause
The provisions of these General Terms and Conditions are severable, and if any provision is found to be illegal, invalid, or unenforceable, the validity of the remaining provisions shall not be affected, and the illegal, invalid, or unenforceable provisions shall be replaced by such valid provisions that reflect the purpose and intent of these General Terms and Conditions.

21. Applicable law and jurisdiction
Any matter or dispute (whether in contract, tort, or statute) based upon, arising out of, or relating to these General Terms and Conditions or BELIMO products, shall be governed by the laws of the State of Delaware, including its laws regarding the statute of limitations, without regard to the State of Delaware's conflicts of law principles. BELIMO and Client agree to submit to the exclusive jurisdiction of the federal and state courts located in the State of Connecticut with respect to any dispute arising from the subject matter hereof.

WAIVER OF JURY TRIAL: BELIMO AND CLIENT HEREBY WAIVE ALL RIGHTS TO A JURY TRIAL IN CONNECTION WITH ANY ACTION, PROCEEDING, OR CLAIM RELATING TO THESE GENERAL TERMS AND CONDITIONS OR BELIMO PRODUCTS. All causes of action arising out of or connected to the sales of Products under these General Terms and Conditions shall be resolved individually, with no right by Client to participate in a representative capacity, or as a member of any class action.

The UN Convention on the International Sale of Goods of 11 April 1980 (CISG) shall not apply to Client's purchase of BELIMO products.

22. Waiver
The failure of either party to enforce at any time any of the provisions of these General Terms and Conditions, or the failure to require, at any time, performance by the other party of any of the provisions of these General Terms and Conditions, will in no way be construed to be a present or future waiver of such provisions, nor in any way affect the validity of either party to enforce each and every such provision thereafter.

23. Intellectual Property
All intellectual property, included but not limited to, inventions, patents, copyrights, trade secrets, know-how, test results, tooling, jigs and fixtures, or other industrial property, associated with, discovered in, or used in or for, the manufacturing of the Products shall be identified herein as "Property." All Property owned by BELIMO prior to selling products or providing services to Client shall remain owned by BELIMO and nor rights, title or interest to such shall pass or be assigned to the Client at the time of the sale and/or delivery and any Property and intellectual property rights created by BELIMO or contributed by Client in connection with the customization or the sale of products and performing services for Client shall remain owned by BELIMO and the Client hereby as-signs any and all rights, title or interest to such to BELIMO, including a waiver of moral rights if applicable, and shall not be considered a work for hire.

24. Entire Agreement
These General Terms and Conditions, including the applicable BELIMO documents referenced herein, plus any accompanying BELIMO documentation relevant to Client's order for BELIMO products or BELIMO providing services to Client, constitutes the entire agreement between the parties with respect to the BELIMO products ordered by Client, or services provided by BELIMO. These General Terms and Conditions and applicable BELIMO documents supersede all of the parties prior and contemporaneous agreements, understandings, negotiations, inducements, representations, or conditions, whether oral or written, whether express or implied, with respect to the purchase and sale of BELIMO products and services.

25. California Proposition 65 ⚠
WARNING: Some Belimo Products can expose you to chemicals which are known to the State of California to cause cancer, birth defects, or other reproductive harm. Please refer to the Product specific Technical Data sheet at www.belimo.com for details. For more information see www.p65warnings.ca.gov