



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...6"), 150 psid (14"+) L = Stainless Disc, Ductile Iron Body, EPDM Liner, 0% Leakage to 200 psid (8...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 DRB, DRX DR.. N4 PRB, PRX SY Fail-Safe Electronic GKB, GKX GK..N4 DKRB, DKRX DKR..N4 PKRX Spring Return AFB, AFX AFRB, AFRX | 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" |

*X" models are customizable.
Refer to page 17 for programming options.

Ordering Example

1 Choose the valve actuator combination.

F6200L+PRBUP-3-T-200

2 Specify preference or configuration.

NO

3 For MFT orders only - select programming code (consult factory)
Programming codes, refer to page 17

NO **Tagging (if needed)**

2-way Configuration

| | | | | | |
|---------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------|----|
| Non Fail-Safe | 2 Pos. | No Set Up Required Field Logic Determines Normal Position | | | |
| | Modulating | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">NC</td> <td>(Normally Closed) 0.5 V/2 V/4 mA = Closed</td> </tr> <tr> <td>NO</td> <td>(Normally Open) 0.5 V/2 V/4 mA = Open</td> </tr> </table> | NC | (Normally Closed) 0.5 V/2 V/4 mA = Closed | NO |
| NC | (Normally Closed) 0.5 V/2 V/4 mA = Closed | | | | |
| NO | (Normally Open) 0.5 V/2 V/4 mA = Open | | | | |

| | | | | | | |
|-----------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------|
| Fail-Safe | 2 Pos. | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>NO/FO</td> <td>(Normally Open/Fail Open) Field Logic Determines Normal Position Valve Fails OPEN</td> </tr> <tr> <td>NC/FC</td> <td>(Normally Closed/Fail Closed) Field Logic Determines Normal Position Valve Fails CLOSED</td> </tr> </table> | 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 |
| | 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 = Master Valve Open Master (Actuated) Valve Fails OPEN | | | | | |
| NC/FC | (Normally Closed/Fail Closed) 0.5 V/2 V/4 mA = Master Valve Closed Master (Actuated) Valve Fails CLOSED | | | | | |

Set-Up **3-way Configuration**

| | | | | | |
|---------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------|----|
| Non Fail-Safe | 2 Pos. | No Set Up Required Field Logic Determines Normal Position | | | |
| | Modulating | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">NC</td> <td>Master (Actuated) Valve (Normally Closed) 0.5 V/2 V/4 mA = Closed</td> </tr> <tr> <td>NO</td> <td>Master (Actuated) Valve (Normally Open) 0.5 V/2 V/4 mA = Open</td> </tr> </table> | NC | Master (Actuated) Valve (Normally Closed) 0.5 V/2 V/4 mA = Closed | NO |
| NC | Master (Actuated) Valve (Normally Closed) 0.5 V/2 V/4 mA = Closed | | | | |
| NO | Master (Actuated) Valve (Normally Open) 0.5 V/2 V/4 mA = Open | | | | |

| | | | | | | |
|-----------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------|
| Fail-Safe | 2 Pos. | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>NO/FO</td> <td>(Normally Open/Fail Open) Field Logic Determines Normal Position Master (Actuated) Valve Fails OPEN</td> </tr> <tr> <td>NC/FC</td> <td>(Normally Closed/Fail Closed) Field Logic Determines Normal Position Master (Actuated) Valve Fails CLOSED</td> </tr> </table> | NO/FO | (Normally Open/Fail Open) Field Logic Determines Normal Position Master (Actuated) Valve Fails OPEN | NC/FC | (Normally Closed/Fail Closed) Field Logic Determines Normal Position Master (Actuated) Valve Fails CLOSED |
| | NO/FO | (Normally Open/Fail Open) Field Logic Determines Normal Position Master (Actuated) Valve Fails OPEN | | | | |
| | NC/FC | (Normally Closed/Fail Closed) Field Logic Determines Normal Position Master (Actuated) Valve Fails CLOSED | | | | |
| | Modulating | NO/FO | (Normally Open/Fail Open) 0.5 V/2 V/4 mA = Master Valve Open Master (Actuated) Valve Fails OPEN | | | |
| NC/FC | | (Normally Closed/Fail Closed) 0.5 V/2 V/4 mA = Maser Valve Open Master (Actuated) Valve Fails CLOSED | | | | |
| NO/FO | (Normally Open/Fail Open) 0.5 V/2 V/4 mA = Master Valve Closed Master (Actuated) Valve Fails OPEN | | | | | |
| NC/FC | (Normally Closed/Fail Closed) 0.5 V/2 V/4 mA = Master Valve Closed Master (Actuated) Valve Fails CLOSED | | | | | |

4 Does order require tagging?

Tagging:
Valves may be tagged per customer specification.

Example:
Chiller 1
3rd Floor East

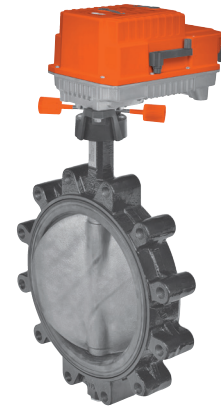
Part number for tagging:
99981-00101

5 Complete Ordering Example: **F6200L+PRBUP-3-T-200**
Configuration: **NO**
Programming: **X10**

Resilient Seat Butterfly Valve Product Range

| | | 2-way | | Suitable Actuators | | | | | | | |
|--------------------|--------------------|--------------------|---------|--------------------|---------------|----|----|-----------------------------|---------------|-----------|------------|
| | | Valve Nominal Size | | Type | Non Fail-Safe | | | | Spring Return | Fail-Safe | |
| C _v 90° | C _v 60° | IN | DN [mm] | 2-way | HDU LU | L | HD | | HD | L | HD |
| 115 | 44 | 2 | 50 | F650 | | | AR | | AF Series | | |
| 196 | 75 | 2½ | 65 | F665 | | | | GR Series | | | |
| 302 | 116 | 3 | 80 | F680 | AR GR | | | | | | GK |
| 600 | 230 | 4 | 100 | F6100 | GR | | DR | | | | DKR |
| 1022 | 392 | 5 | 125 | F6125 | | | | PR Series | | | PKR Series |
| 1579 | 605 | 6 | 150 | F6150 | DR | | | | | | |
| 3136 | 1202 | 8 | 200 | F6200 | PR | PR | | | | PKR | |
| 5340 | 2047 | 10 | 250 | F6250 | | | | | | | |
| 8250 | 3162 | 12 | 300 | F6300 | | | | | | | |
| 11917 | 4568 | 14 | 350 | F6350 | | | | | | | |
| 16388 | 6282 | 16 | 400 | F6400 | | | | SY Series (2 Year Warranty) | | | |
| 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 | | | | Spring Return | Fail-Safe | |
| C _v 90° | C _v 60° | IN | DN [mm] | 3-way | HDU | L | HD | | HD | L | HD |
| 115 | 44 | 2 | 50 | F750 | | | AM | | AF | | |
| 196 | 75 | 2½ | 65 | F765 | | | | | | | GK Series |
| 302 | 116 | 3 | 80 | F780 | | | | | | | |
| 600 | 230 | 4 | 100 | F7100 | GM Series | | | | | | PKR Series |
| 1022 | 392 | 5 | 125 | F7125 | | | | PR Series | | | |
| 1579 | 605 | 6 | 150 | F7150 | | | | | | | |
| 3136 | 1202 | 8 | 200 | F7200 | | | | | | | |
| 5340 | 2047 | 10 | 250 | F7250 | | PR | | | | PKR | |
| 8250 | 3162 | 12 | 300 | F7300 | | | | | | | |
| 11917 | 4568 | 14 | 350 | F7350 | | | | | | | |
| 16388 | 6282 | 16 | 400 | F7400 | | | | SY Series (2 Year Warranty) | | | |
| 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) |
| Communication (PR) | BACnet MS/TP, NFC, listed by BTL, Modbus |

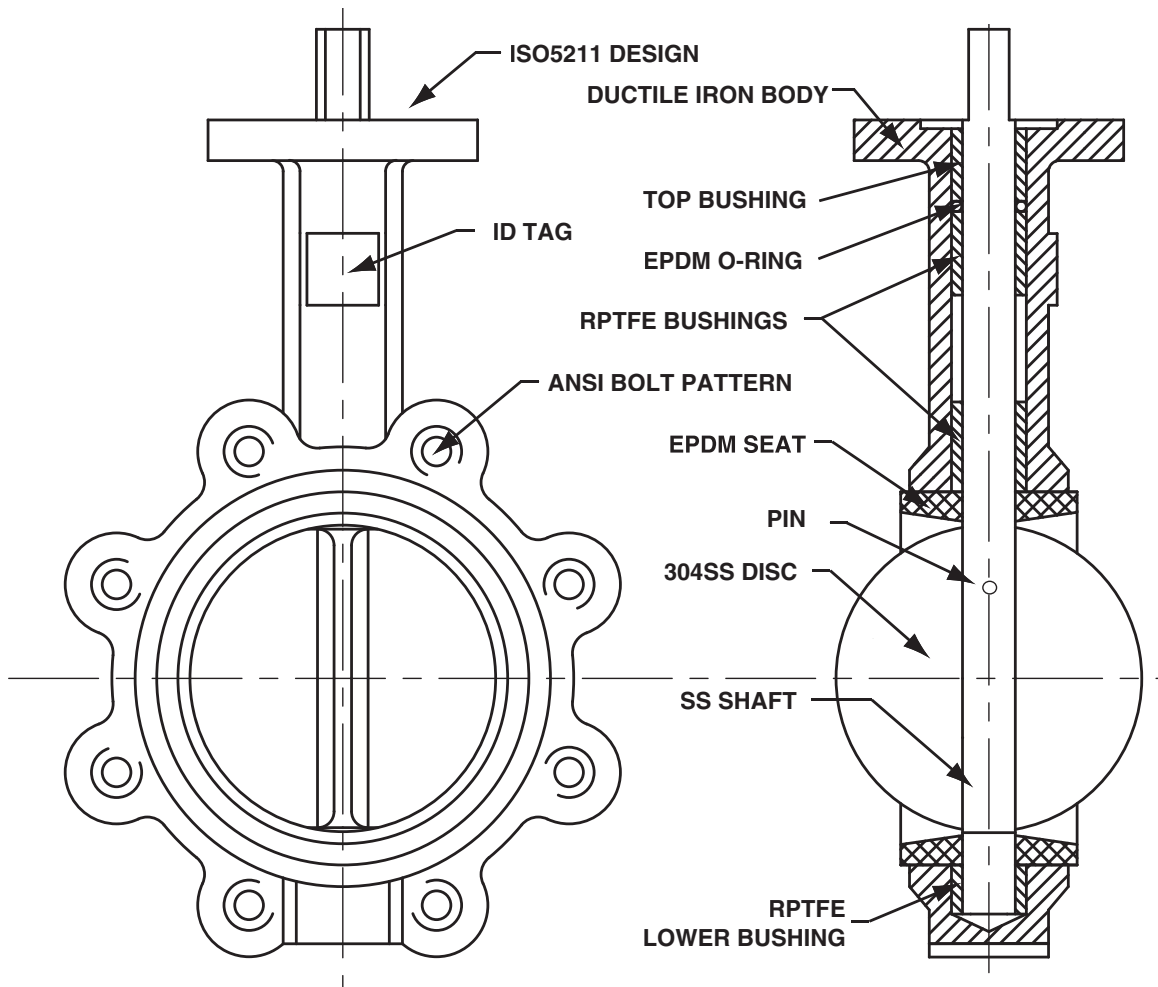
Valve Specifications

| | |
|---------------------------|-----------------------------------------------------------------------------------------------------------|
| Fluid | chilled, hot water, 60% glycol |
| 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, 630 stainless steel (14...24") L Series: 420 stainless steel |
| Seat | EPDM |
| O-rings | EPDM |
| Bushings | HD Series: RPTFE L Series: bronze, steel, PTFE |
| Fluid (water) temp. range | -22...+250°F [-30...+120°C] |
| Body pressure rating | 232 psi cold working pressure (CWP) |
| Close-off pressure | HDU, LU: 50 psid, 3...10" HD: 200 psid, 2...6" HD: 150 psid, 14...24" L Series: 200 psid 8...12" |
| Rangeability | 10:1 |
| 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

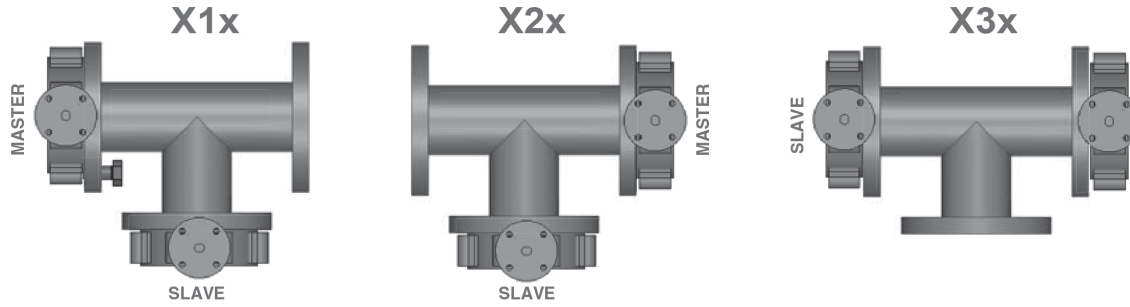
- Unique seat and disc design ensures positive valve sealing while maintaining low seating torque
- Butterfly valve discs are precision machined to half ball profile, providing a precise disc-to-seat relationship
- Cartridge style seat incorporates an elastomer bonded to a phenolic stabilizing ring, 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 6") or 150 psi (12" to 24")
 - L Series provides full-rated close-off to 200 psi (8" to 12")
- 2-way and 3-way applications



Butterfly Valve Selection

HD, L Series Valves, 3-way Configuration

D163_12



| CONFIG CODE | ON/OFF OR MOD@2 VDC MASTER VALVE IS | MASTER 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 MASTER VALVE IS | MASTER 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 MASTER VALVE IS | MASTER 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. Slave Valve operates inversely of the Master Valve.
2. The Master Valve is always located on the run.
3. The Slave 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 or field programming via NFC app.
6. All 3-way assemblies are designed for 90 degree actuator rotation.
7. **Actuators installed default over Master Valve.**

| 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.

| SERIES | MODEL # | Run Time(s) 90° @60Hz | Power Supply | Duty Cycle | CONTROL TYPE | | | Feedback |
|--------|---------------|--------------------------|----------------------------------|------------|--------------|---------|--------|----------|
| | | | | | Modulating | 3 Point | On/Off | |
| PR | PRBUP-3-T* | 35 seconds (default) | 24-240 VAC/ 24-125 VDC, 50/60 Hz | 100% | | • | • | none |
| | PRXUP-3-T* | 35, 30 - 120 seconds | 24-240 VAC/ 24-125 VDC, 50/60 Hz | 100% | | • | • | none |
| | PRBUP-MFT-T* | 35 seconds (default) | 24-240 VAC/ 24-125 VDC, 50/60 Hz | 100% | • | • | • | 2-10 VDC |
| | PRXUP-MFT-T* | 35, 30 - 120 seconds | 24-240 VAC/ 24-125 VDC, 50/60 Hz | 100% | • | • | • | 2-10 VDC |
| PKR | PKRXUP-MFT-T* | 35, 30 - 120 seconds | 24-240 VAC/ 24-125 VDC, 50/60 Hz | 100% | • | • | • | 2-10 VDC |
| SY4 | SY4-110 | 19 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY4-24 | 20 seconds | 24 VAC/DC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY4-220 | 20 seconds | 230 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY4-24MFT | 20 seconds | 24 VAC/DC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY4-120MFT | 24 seconds | 120 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY4-230MFT | 22 seconds | 230 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| SY5 | SY5-110 | 26 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY5-24 | 26 seconds | 24 VAC/DC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY5-220 | 26 seconds | 230 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY5-24MFT | 26 seconds | 24 VAC/DC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY5-120MFT | 28 seconds | 120 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY5-230MFT | 28 seconds | 230 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| SY6 | SY6-110 | 34 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY6-220 | 34 seconds | 230 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY6-120MFT | 38 seconds | 120 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY6-230MFT | 35 seconds | 230 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| SY7 | SY7-110 | 50 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY7-120MFT | 59 seconds | 120 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY7-230MFT | 59 seconds | 230 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| SY8 | SY8-110 | 51 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY8-120MFT | 79 seconds | 120 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| | SY8-230MFT | 79 seconds | 230 VAC ±10%, 50/60 Hz | 75% | • | | | 2-10 VDC |
| SY9 | SY9-110 | 62 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY9-120MFT | 65 seconds | 120 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| | SY9-230MFT | 72 seconds | 230 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| SY10 | SY10-110 | 62 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY10-120MFT | 76 seconds | 120 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| | SY10-230MFT | 85 seconds | 230 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| SY11 | SY11-110 | 62 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY11-120MFT | 71 seconds | 120 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| | SY11-230MFT | 61 seconds | 230 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| SY12 | SY12-110 | 62 seconds | 120 VAC ±10%, 50/60 Hz | 30% | | • | • | none |
| | SY12-120MFT | 76 seconds | 120 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |
| | SY12-230MFT | 65 seconds | 230 VAC ±10%, 50/60 Hz | 50% | • | | | 2-10 VDC |

Modulating actuators will accept 0-10 VDC or 2-10 VDC 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.

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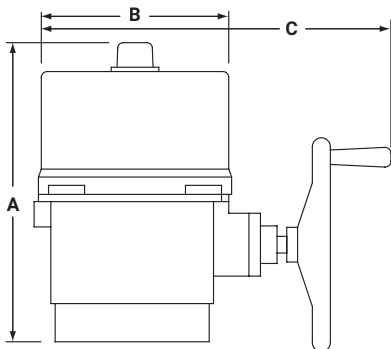
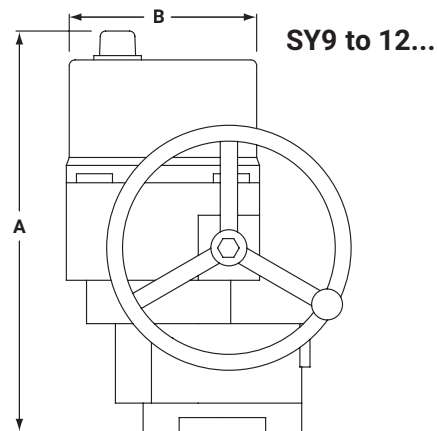
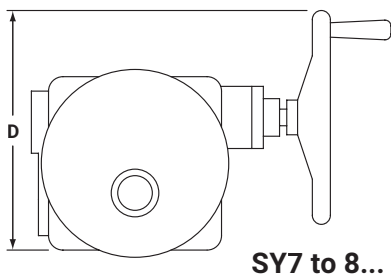
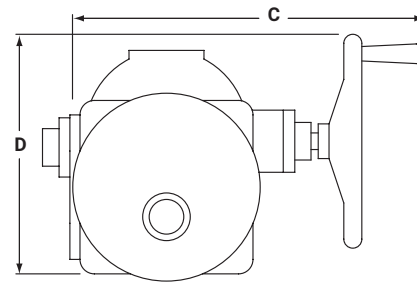
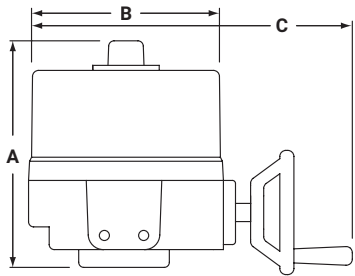
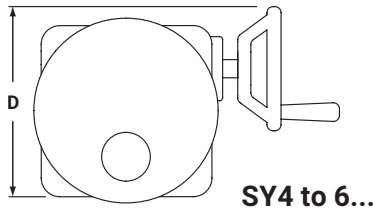
| 24 VAC | | | | | | |
|--------------------------------------------------------|-----|-----|-----|-----|-----|-----|
| | SY1 | SY2 | SY3 | SY4 | SY5 | SY6 |
| current | [A] | [A] | [A] | [A] | [A] | [A] |
| wire gauge | 2.8 | 3.4 | 3.1 | 3.1 | 3.1 | 3.1 |
| MAX distance between actuator and supply [feet] | | | | | | |
| 18 | 55 | 45 | 50 | 50 | 50 | 50 |
| 16 | 88 | 72 | 79 | 79 | 79 | 79 |
| 14 | 139 | 115 | 126 | 126 | 126 | 126 |
| 12 | 221 | 182 | 200 | 200 | 200 | 200 |
| 10 | 352 | 290 | 318 | 318 | 318 | 318 |
| 8 | 560 | 461 | 506 | 506 | 506 | 506 |

| 120 VAC | | | | | | | | | | | | |
|--------------------------------------------------------|--------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | SY1 | SY2 | SY3 | SY4 | SY5 | SY6 | SY7 | SY8 | SY9 | SY10 | SY11 | SY12 |
| current | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] |
| wire gauge | 0.6 | 0.8 | 0.7 | 2.1 | 1.9 | 2 | 2 | 2.8 | 2.7 | 3 | 4.3 | 4.5 |
| 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 |

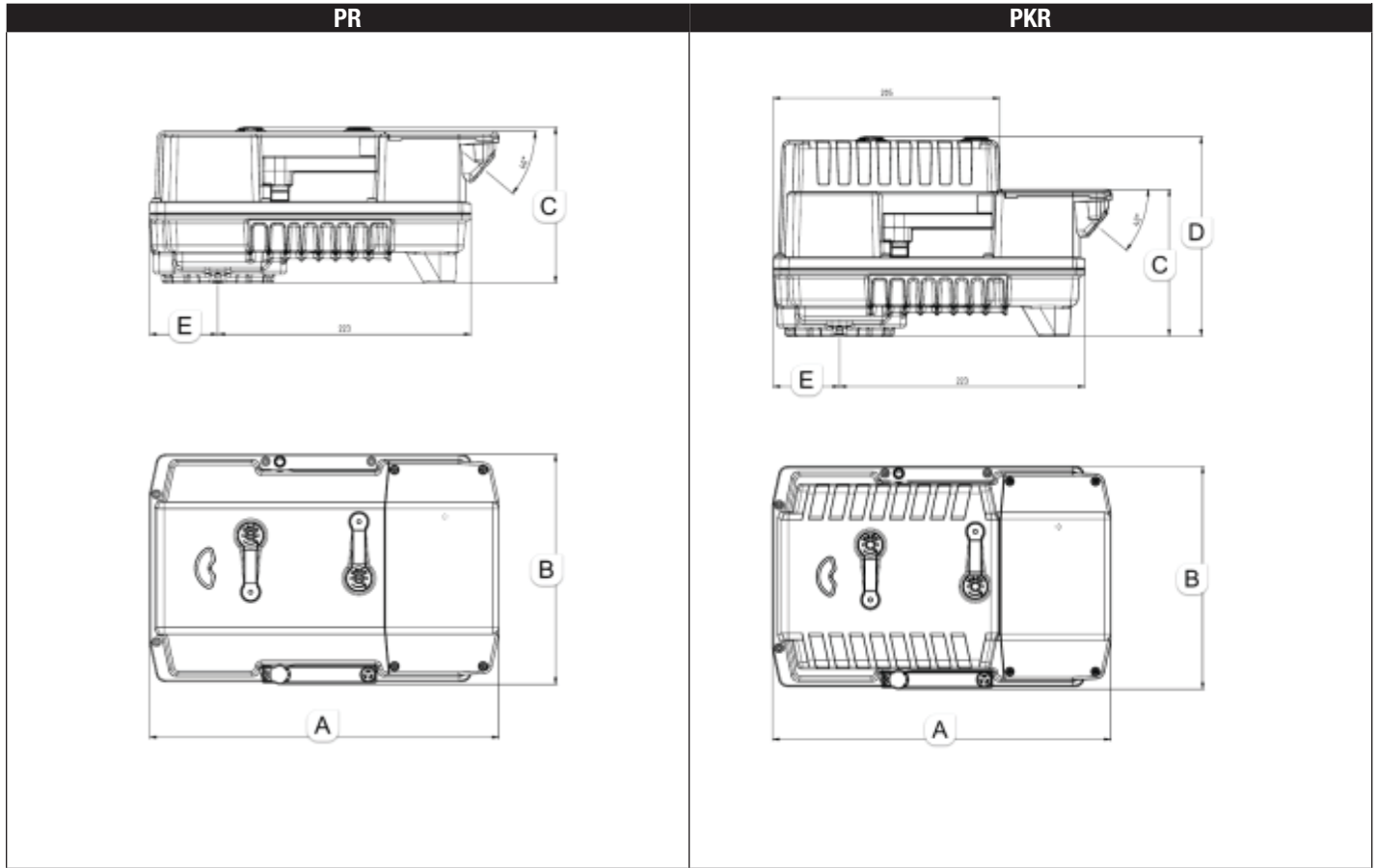
| 230 VAC | | | | | | | | | | | | |
|--------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|-------|-------|
| | SY1 | SY2 | SY3 | SY4 | SY5 | SY6 | SY7 | SY8 | SY9 | SY10 | SY11 | SY12 |
| current | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] | [A] |
| wire gauge | 0.4 | 0.4 | 0.4 | 1.1 | 1 | 1 | 1.2 | 1.6 | 1.1 | 1.4 | 2.2 | 2.5 |
| 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.

SY... Series Non-Spring Return Actuator Dimensions



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



| MODEL | DIM A | DIM B | DIM C | DIM D | DIM E | Weight (Actuator Only) |
|-------|-------------|-------------|-------------|-------------|-------------|---------------------------|
| | Inches [mm] | Inches [mm] | Inches [mm] | Inches [mm] | Inches [mm] | |
| 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] |

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Customize Products

Default and MFT Programming Codes



| | | | CONTROL | | | | | |
|-------------------------------------------------------------|---------------------------|----------------------|---------------------------|-------------------|----------------|------------------------|------------------------|------------|
| ACTUATOR TYPE | CONFIGURATION DESCRIPTION | CODE | CONTROL INPUT | FEEDBACK POSITION | RUNNING TIME** | | | |
| Standard Actuator Series: AR, AM, GR, GM, GKR, AFR, AF, DKR | -MFT | A01* | 2-10 VDC | 2-10 VDC | 150 seconds | | | |
| | | A02 | 0.5-10 VDC | 0-10 VDC | 150 seconds | | | |
| | | A03 | 2-10 VDC | 0-5.10 VDC | 150 seconds | | | |
| | | A19 | 2-10 VDC | 2-10 VDC | 100 seconds | | | |
| | | A28 | 0.5-10 VDC | 0.5-10 VDC | 100 seconds | | | |
| | | A63 | 0.5-4.5 VDC | 0.5- 4.5 VDC | 150 seconds | | | |
| | | A64 | 5.5-10 VDC | 5.5-10.0 VDC | 150 seconds | | | |
| | | W02 | 0.02 to 5.00 seconds PWM | 2-10 VDC | 150 seconds | | | |
| | | W03 | 0.10 to 25.50 seconds PWM | 2-10 VDC | 150 seconds | | | |
| | | F01 | Floating Point | 2-10 VDC | 150 seconds | | | |
| | | J02 | On/Off | 2-10 VDC | 150 seconds | | | |
| PR Series | -3, -T | N/A | L01* | On/Off | N/A | 35 seconds | | |
| | | N/A | L02 | On/Off | N/A | 60 seconds | | |
| | -MFT | NC | L05* | 2-10 VDC | 2-10 VDC | 35 seconds | | |
| | | NC | L06 | 2-10 VDC | 2-10 VDC | 60 seconds | | |
| | | NC | L09 | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NC | L0A | 0.5-10 VDC | 0.5-10 VDC | 60 seconds | | |
| | | NC | L0D | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | NC | L0E | 4-20 mA | 2-10 VDC | 60 seconds | | |
| | | NO | L0H | 2-10 VDC | 2-10 VDC | 35 seconds | | |
| | | NO | L0J | 2-10 VDC | 2-10 VDC | 60 seconds | | |
| | | NO | L0M | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NO | L0R | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | | | NC-FC | L21 | On/Off, Floating Point | 2-10 VDC | 35 seconds |
| | | | | NC-FO | L25 | On/Off, Floating Point | 2-10 VDC | 35 seconds |
| | | | | NO-FC | L29 | On/Off, Floating Point | 2-10 VDC | 35 seconds |
| | | | | NO-FO | L2D | On/Off, Floating Point | 2-10 VDC | 35 seconds |
| | | | | NC-FC | L31* | 2-10 VDC | 2-10 VDC | 35 seconds |
| | | | | NC-FO | L35 | 2-10 VDC | 2-10 VDC | 35 seconds |
| | | NO-FC | L39 | 2-10 VDC | 2-10 VDC | 35 seconds | | |
| | | NO-FO | L3D | 2-10 VDC | 2-10 VDC | 35 seconds | | |
| PKR Series | | NC-FC | L41 | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NC-FO | L45 | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NO-FC | L49 | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NO-FO | L4D | 0.5-10 VDC | 0.5-10 VDC | 35 seconds | | |
| | | NC-FC | L51 | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | NC-FO | L55 | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | NO-FC | L59 | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | NO-FO | L5D | 4-20 mA | 2-10 VDC | 35 seconds | | |
| | | NO-FO | L5E | 4-20 mA | 2-10 VDC | 60 seconds | | |
| | SY Series | -MFT | Loss of Signal Stop | ACE* | 2-10 VDC | 2-10 VDC | Varies (15-20 seconds) | |
| Loss of Signal Stop | | | ACF | 0.5-10 VDC | 0.5-10 VDC | Varies (15-20 seconds) | | |
| Loss of Signal Stop | | | ACG | 4-20 mA | 4-20 mA | Varies (15-20 seconds) | | |
| Loss of Signal Open | | | ACJ | 2-10 VDC | 2-10 VDC | Varies (15-20 seconds) | | |
| Loss of Signal Open | | | ACK | 0.5-10 VDC | 0.5-10 VDC | Varies (15-20 seconds) | | |
| Loss of Signal Open | | | ACL | 4-20 mA | 4-20 mA | Varies (15-20 seconds) | | |
| Loss of Signal Close | | | ACN | 2-10 VDC | 2-10 VDC | Varies (15-20 seconds) | | |
| Loss of Signal Close | | | ACP | 0.5-10 VDC | 0.5-10 VDC | Varies (15-20 seconds) | | |
| | | Loss of Signal Close | ACR | 4-20 mA | 4-20 mA | Varies (15-20 seconds) | | |

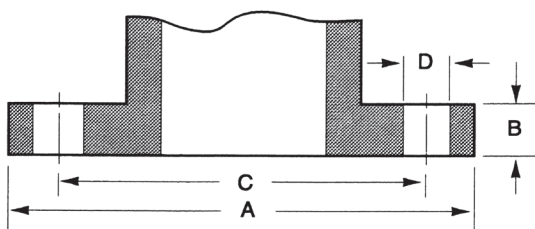
*Default configuration

**More running times available upon request

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" |



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.

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

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 18 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 1/4 |
| 2 1/2" | 5/8 - 11 | 4 | 1 1/2 |
| 3" | 5/8 - 11 | 4 | 1 1/2 |
| 4" | 5/8 - 11 | 8 | 1 3/4 |
| 5" | 3/4 - 10 | 8 | 1 3/4 |
| 6" | 3/4 - 10 | 8 | 2 |
| 8" | 3/4 - 10 | 8 | 2 1/4 |
| 10" | 7/8 - 9 | 12 | 2 1/4 |
| 12" | 7/8 - 9 | 12 | 2 1/2 |
| 14" | 1 - 8 | 12 | 2 3/4 |
| 16" | 1 - 8 | 16 | 2 3/4 |
| 18" | 1 1/8 - 7 | 16 | 3 1/2 |
| 20" | 1 1/8 - 7 | 20 | 4 1/4 |
| 24" | 1 1/4 - 7 | 20 | 4 3/4 |
| 30" | 1 1/4 - 7 | 24 | 4 1/2 |

F6, F7 HD, L Ductile Butterfly Valves

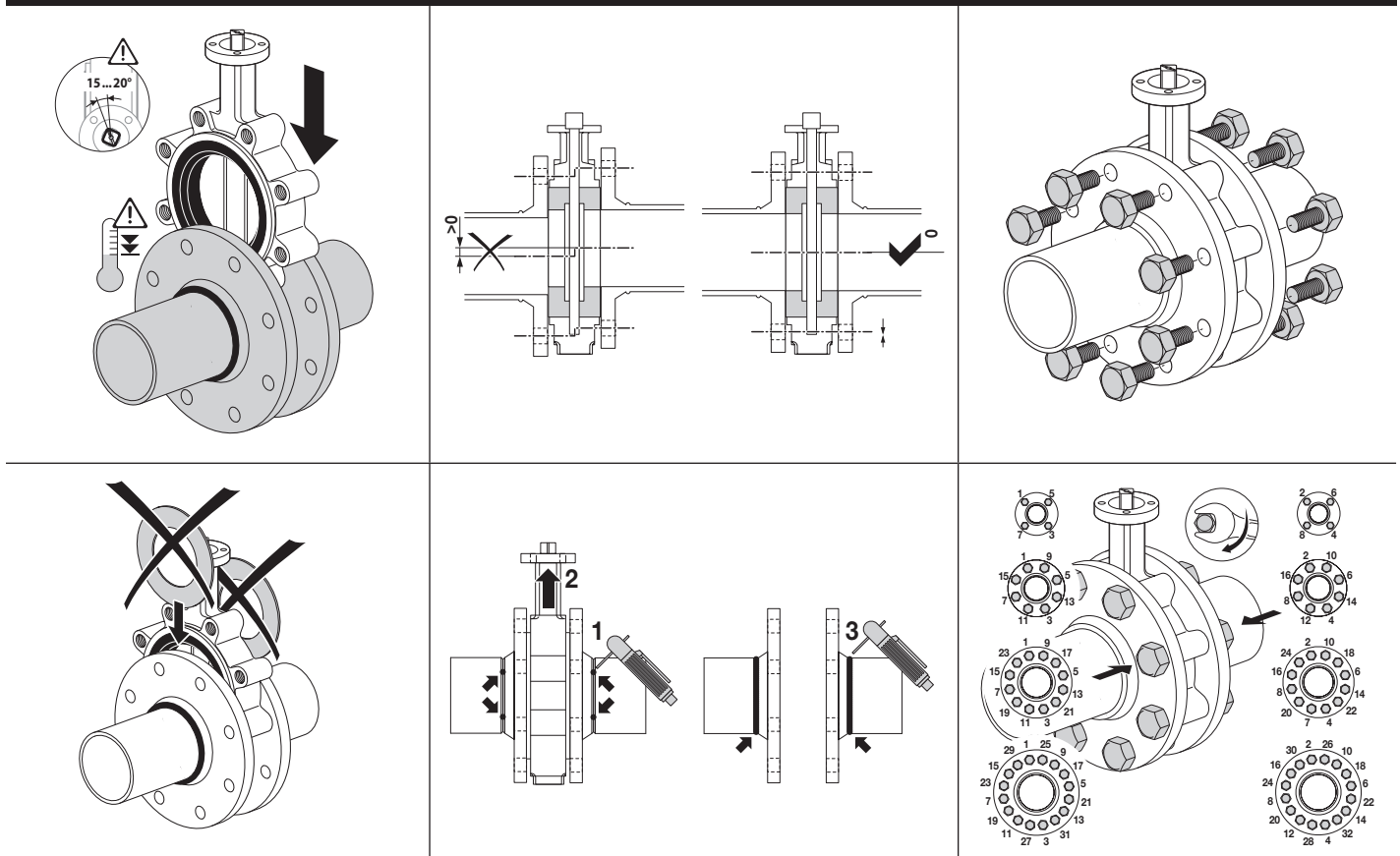
| Technical Data | |
|-------------------------|---------------------------------------------------|
| Service | chilled, hot water, 60% glycol |
| Flow characteristic | F6 modified equal percentage |
| | F7 linear |
| Sizes | F6 2...24" |
| | F7 2...18" |
| Type of end fitting | for use with ANSI 125/150 flanges |
| Materials | |
| Body | ductile iron ASTM A536 |
| Body finish | polyester powder coat |
| Disc | 304 stainless steel |
| Seat | EPDM standard |
| Shaft | 420 stainless steel |
| O-ring | EPDM |
| Bushings | HD Series: RPTFE L Series: bronze, steel, PTFE |
| Media temperature range | -22°F to 250°F [-30°C to 120°C] |
| Body pressure rating | 232 psi cold working pressure (CWP) |
| Rangeability | 10:1 (for 30° to 70° range) |
| Maximum velocity | 12 FPS |
| Leakage | 0% |

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.

- When installing in Victaulic piping systems, use Victaulic 41 series flange nipples. 741 flanges not recommended.
- HD/L-Series Butterfly valves are designed to be installed between ANSI 125/150 flat-faced, raised face, slip-on or weld neck flanges.
- Do NOT use flange gaskets on HD/L-Series Butterfly valves.
- For Lug style valves:
 - Place the valve between the flanges.
 - Install all bolts between the valve and the mating flanges. Hand tighten bolts as necessary.
- Using the sequence, tighten the flange bolts evenly to assure uniform compression. Make multiple tightening rounds, 1st to 30%, 60%, then 100%. 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 liner damage, liner shifting or stripping may occur.
- 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.

Installation Recommendations

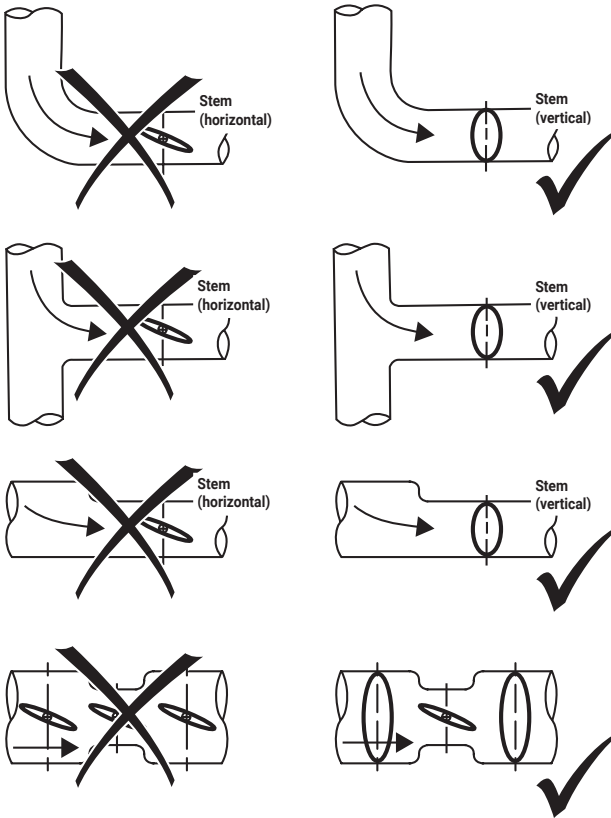


Max Torque for Bolts

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

Valve Installation Procedure Continued

7. Valve should be installed a minimum of 6 pipe diameters from upstream or downstream elbows, strainers, pumps, etc. If not practical due to space constraints, the system should be designed to locate and orient the valve to minimize the impact of dynamic torque on valve life.



8. If an actuator is to be operated, electricity should be connected to the unit in accordance with the local electrical codes.
9. 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.
10. The valve is now ready for operation.

General Maintenance

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

- Operate the valve from full open to full closed to assure operability.
- Check flange bolting, actuator mounts and hangers for evidence of loosening and correct as needed.
- Inspect the valve and surrounding area for previous or existing leakage at flange faces or shaft connections.
- Check piping and/or wiring to actuators and related equipment for looseness and correct as needed.
- If not in use, exercise the butterfly valve (full open and close) at least once a month.

Note: Run an adaptation when a new MFT actuator is installed.

Safety Precautions

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

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

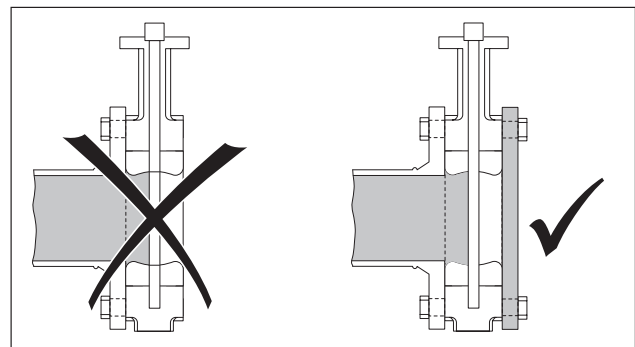
Storage of Butterfly Valve Assemblies

- 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.

Valve Installation- Dead End Service

INSTALLATION NOTES

- Follow previously described pre-installation and installation procedures.
- To achieve the full close-off pressure of the HD/L series, a flange is required on the open or down stream side of the valve (See diagram below)



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 position

is indicated and then remove the crank.

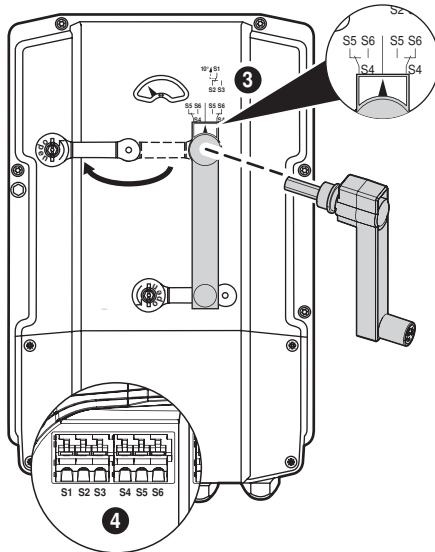
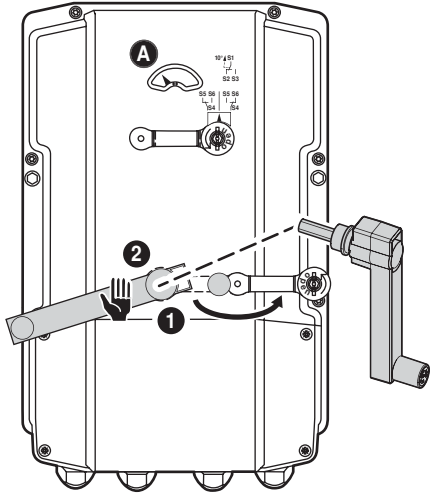
❸ Auxiliary switch

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

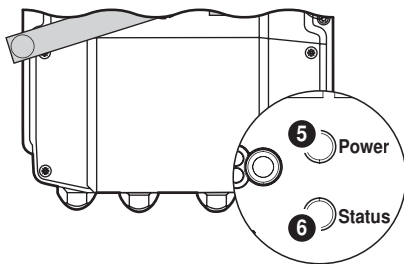
Terminals

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

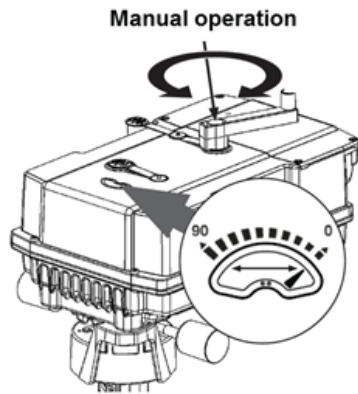
Off: No power supply or malfunction
On: In operation
Press button: Triggers test run, followed by standard mode

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.



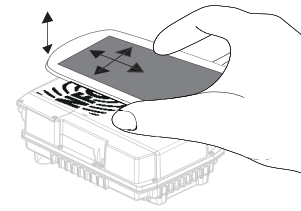
When handcrank is connected to actuator,
the motor & signal control will be disabled

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 | Power Off | Power On |
|-----------------------------------------------------------------|-----------------|--------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| | | |  |  |  |
| 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 | <p>Date: 3. April 2017</p> <p>Vendor Name: BELIMO Automation AG</p> <p>Vendor ID: 423</p> <p>Product Name: Rotary actuator for butterfly valves</p> <p>Product Model Number: BACMFT for xy, e.g. PRBUP-MFT-T, PKRBUP-MFT-T</p> <p>Applications Software Version: 02.04.0000</p> <p>Firmware Revision: 07.03.0002</p> <p>BACnet Protocol Revision: 1.12</p> <p>Product Description: Actuator for butterfly valves providing two sensor inputs</p> <p>BACnet Standard Device Profile: BACnet Application Specific Controller (B-ASC)</p> <p>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)</p> <p>Segmentation Capability: No</p> <p>Data Link Layer Options: MS/TP master, baud rates: 9'600, 19'200, 38'400, 76'800, 115'200</p> <p>Device Address Binding: No static device binding supported</p> <p>Networking Options: None</p> <p>Character Sets Supported: ISO 10646 (UTF-8)</p> <p>Gateway Options: None</p> <p>Network Security Options: Non-secure Device</p> |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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 |

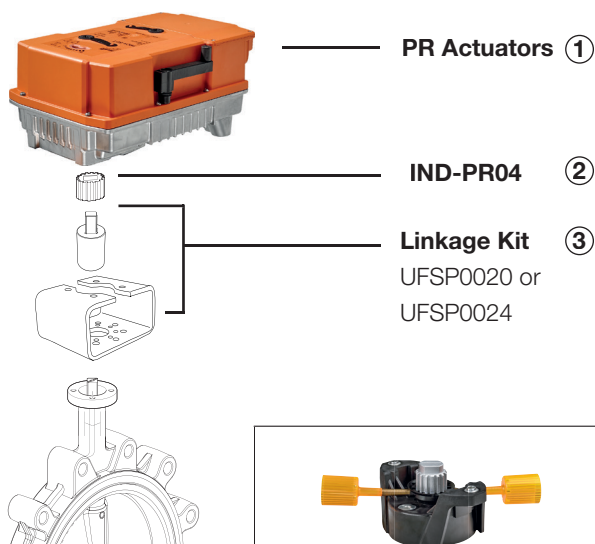
- The device does not support the CreateObject and DeleteObject service.
- The specified maximum length of writable strings is based on single-byte characters.
- No support of COV subscription on Analog Value objects.

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 |
|--------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------|
| <i>Device_Name</i> | 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* |

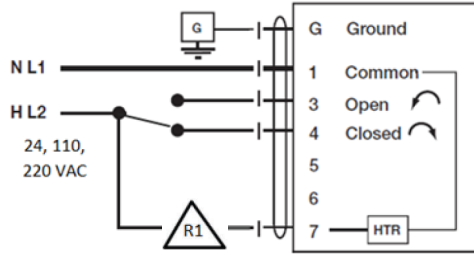
* Contact Technical Support for details.

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

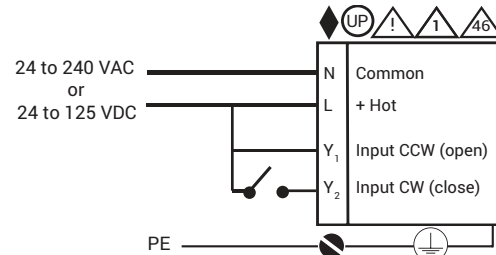
The SY is a 3-wire device and the PR actuator is a 4-wire device and additional wiring changes to the auxiliary switches are required. See below.

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)



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.

| Series | SY | PR/PKR |
|----------|----|--------|
| Terminal | G | PE |
| | 1 | N |
| | 3 | Y1 |
| | 4 | Y2 |
| | 5 | - |
| | 6 | - |
| | 7 | L |

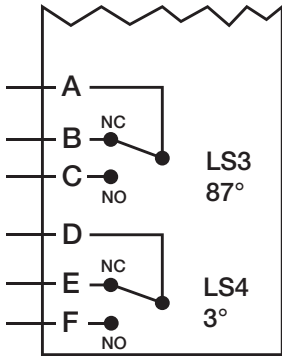
Table 1

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

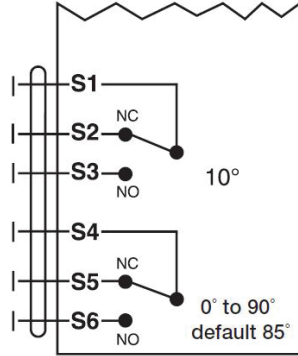
Refer to table 2 for terminal cross reference.

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?

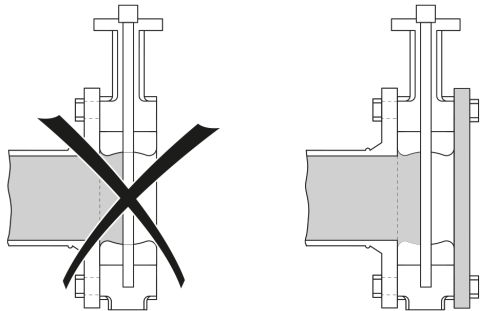
The PR actuator comes with an integrated potentiometer, therefore an adaptation is not necessary. The actuator always knows its position.

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.



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

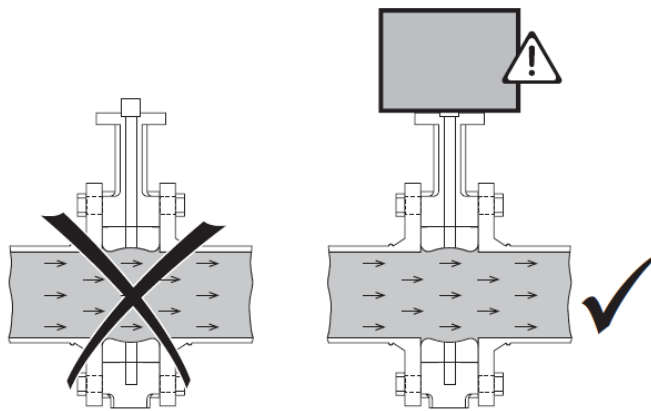
The new butterfly valves are not suitable for these applications, due to longer pipes and the high pressure drops associated with them. These valves are ANSI 125/150 type flanges.

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.

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.

Tech.Doc - 04/22 - Subject to change. © Belimo Aircontrols (USA), Inc.

I. General

1.1. The following Terms and Conditions of Sale and Warranty ("Terms") apply to the sale of products described in this Product Guide and products sold by Seller as an original equipment manufacturer ("OEM") which may not be included in this Product Guide ("Product" or "Products"). As used herein, "Seller" or "Belimo" refers to Belimo Aircontrols (USA), Inc., or Belimo Aircontrols (CAN), Inc., or Belimo Automation AG, or Belimo Brasil – Comércio de Automação Ltda. as applicable, and "Client" refers to the individual or business entity that purchases the Products directly from Seller. These Terms shall apply unless the Seller and Client mutually agree to different terms and memorialize such agreement in writing signed by both Client and Seller or (ii) unless Seller changes these Terms and publishes the Terms on its Website to be found at: www.belimo.us, in which case the most recent Terms published on the Website will prevail. In case Seller's delivery includes software and/or application software and accompanying documentation, the terms of the license agreement for such software and/or application software are applicable in addition to these Terms. However, in case of conflicts between the terms and conditions of the license agreement and the Terms, the terms and conditions of the license agreement shall prevail.

II. Price

2.1. The Seller's price for Products (the "Price") is net, F.O.B. Point of Origin, and is calculated in US currency for sales made by Belimo Aircontrols (USA), Inc., and calculated in Canadian currency for sales made by Belimo Aircontrols (CAN) Inc., and Brazilian currency for sales made by Belimo Automation AG or Belimo Brasil – Comércio de Automação Ltda. to Clients in Brazil.

2.2. The Price, unless otherwise agreed upon, does not include freight and packaging (wooden crates, pallets, etc.), the costs of which will be charged to Client at cost for each shipment and shall be payable with payment of the Price.

2.3. Orders for Products where the total order has a net value of less than US \$300 (CAN \$300) will be subject to a US \$20 (CAN \$20) handling fee (the "Handling Fee"). The Handling Fee will not be charged for orders of Products with a net value equal to or greater than US \$300 (CAN \$300) or for Products ordered through Seller's e-commerce ordering system at: www.belimo.us.

2.4. Seller reserves the right to make partial deliveries of orders of Products, each of which deliveries may be invoiced separately by Seller.

2.5. The Price does not include charges for wiring diagrams, installation, and commissioning, which will be charged to Client separately and will be payable on demand.

III. Payment

3.1. Invoices are payable in US currency for sales made by Belimo Aircontrols (USA), Inc., and in Canadian currency for sales made by Belimo Aircontrols (CAN); Inc., and in Brazilian currency for sales made by Belimo Automation AG on behalf of Brazil or Belimo Brasil – Comércio de Automação Ltda. Payments on invoices are due no later than 30 days from the date of invoice, without any deductions.

3.2. If Client maintains an outstanding balance for 45 days or more after the date of invoice, Client may be subject to restricted shipments of Products. A Client may also be required to pay for all future deliveries of Products on a cash-on-delivery only basis.

IV. Title and Risk

4.1. Title to Products will pass to Client from the Seller based upon the agreed Incoterms as stated on the Order Confirmation. The Seller retains the right to a return of the Product when payment is not received.

V. Damage or Loss in Transit

5.1. Seller assumes no liability for damage or loss of shipment of Products, which risk shall at all times remain with the carrier. All shipments must be unpacked and examined by Client immediately upon receipt. Any external evidence of loss or damage must be noted on the freight bill accompanying the shipment of Products or carrier's receipt and signed by the carrier's agent at the time of delivery. Failure to do so will result in the carrier's refusal to honor any claim relating to damage of Products. Client must also notify Seller within 5 days of such damage by providing Seller with a copy of the freight bill or damage report so that Seller can file a claim for loss or damage in transit with the carrier. If the damage does not become apparent until the shipment is unpacked, Client must make a request for inspection by the

carrier's agent and file with the carrier within 15 days after receipt of product and notify Seller of the same.

VI. Delivery

6.1. Seller undertakes to make every attempt to adhere to its stated delivery parameters and to make a timely delivery of the Products but does not guarantee any delivery specifications. Each contract entered into for the purchase of Products is not cancelable nor is Seller liable for any direct or indirect losses that may arise, for any reason whatsoever, due to Seller's failure to meet any stated or assumed delivery schedules.

VII. Inventory Overstock

7.1. If Client has an overstock of Product inventory, such Products received by Client cannot be returned unless and until: (i) Client alerts Seller that it intends to return some overstock of Products, (ii) Seller agrees to accept such return, (iii) Client obtains a Return Material Authorization ("RMA") number from Seller for such return of such Products, and (iv) Client follows all return instructions provided by the Seller. The RMA number must be clearly written on the outside of all packaging for any returned overstock of Products.

7.2. Only such Products returned in original packaging and shipped to Seller at Client's cost may be accepted for return under this Section. Client is also responsible for payment of a restocking charge for all returned overstocked Products in an amount no less than 20% of the invoice value of the Products ("Restocking Charges"). Any piping package or custom order returns carry a minimum restocking charge of 75% of the invoice value. Returns that result from Seller errors and not overstocking will be credited in full and will not be subject to Restocking Charges.

7.3. Any Product received damaged or showing evidence of having been installed will be refused or assessed a higher restocking charge.

7.4. If Client requests product to be returned to Client, the Client will be responsible for return shipping charges. See specific product literature for exclusions or exceptions.

7.5. Any products that are designed to a Client's unique specifications (e.g. retrofit) are not returnable.

VIII. Handling, Installation and Use of Products

8.1. Products are only intended for installation and commissioning by trained technicians.

8.2. The installation and exchange of Products may only be carried out by trained technicians. Products may only be handled by trained technicians and only in accordance with the most current valid data and installation sheets.

IX. Limited Warranty

A. 5-year Limited Warranty

9.1. Products that are designated by Seller as carrying a 5-year warranty to a location in the United States, Canada, or Latin America shall carry a 5-year warranty. The 5-year warranty is unconditional for the first two years from the date of sale of the Products to Client, subject to the Limitation On Warranty in Section 9C. After the first two years from the date of sale, the warranty coverage shall not apply to damage to Products not resulting from normal wear and tear (e.g. negligence, misuse, or failure to maintain). Product specific terms of warranty with regard to warranty period or conditions of warranty may apply to certain specified Products as stated in the documentation for those Products.

B. 2-year Conditional Warranty

9.2. Products that are designated by Seller as carrying a 2-year warranty to a location in the United States, Canada, or Latin America shall carry a 2-year warranty. The 2-year warranty is conditional from the date of sale of the Products to Client, and the warranty coverage shall not apply to damage to Products not resulting from normal wear and tear (e.g. negligence, misuse, or failure to maintain). Product specific terms of warranty with regard to warranty period or conditions of warranty may apply to certain specified Products as stated in the documentation for those Products.

C. Limitation On Warranty; Warranty Disclaimer

9.3. Seller's warranties hereunder shall be null and void in the event of any: (a) modification or unauthorized repairs of Products by Client; (b) unauthorized incorporation or integration of Products into or with Client's equipment; (c) use of Products in an unauthorized manner; or (d) damage to Products not caused by Seller.

9.4. These Terms constitute the entire understanding and agreement between Seller and Client regarding the warranties that cover Products and supersedes all previous understandings, agreements, communications and representations. All Seller warranties are extended only to Client and are non-transferrable. All Seller warranties shall extend only to HVAC use of the Products. If Products are used in non-HVAC applications (e.g., aircraft, industrial processes, etc.), Seller's warranties will not cover such Products. Client will be solely responsible for any damage to or malfunction of Products or for any damage resulting from such use of Products.

9.5. Both the conditional and unconditional warranties hereunder cover the Products only, and do NOT cover labor associated with the troubleshooting, removal or replacement of such Products.

9.6. EXCEPT FOR THE EXPRESS WARRANTIES SPECIFIED IN SECTION IX, SELLER MAKES NO OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, AND DISCLAIMS ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND IMPLIED WARRANTY OF MERCHANTABILITY.

D. Remedies

9.7. If a defect arises in the Product and an RMA is issued as provided in Section 9.8, Seller will, at its option and to the extent permitted by law, either (1) repair the Product at no charge, using new or refurbished replacement parts or (2) replace the Product with a new Product. In the event of such a defect, to the extent permitted by law, these are Client's sole and exclusive remedies.

9.8. Client cannot return Products to Seller unless: (i) Client notifies Seller that it intends to return such Products, (ii) Seller agrees to accept the return of such Products, (iii) Client obtains a RMA number from Seller for the return of such Products, and (iv) Client follows all return instructions provided by the Seller. Client shall promptly notify Seller of Products' alleged defect and provide Seller with other evidence and documentation reasonably requested by Seller. The RMA number must be clearly written on the outside of all packaging for any returned Products. Only Products returned to the proper location as instructed by Seller and identified with an RMA number will be considered for credit.

9.9. Returns that result from Seller's breach of these Terms will be credited in full and will not be subject to Restocking Charges.

9.10. Seller-authorized support technicians are available for troubleshooting before any shipments to Seller. The contact information for Belimo customer service is listed on the back page of Belimo's Product Guide and Price List ("PGPL") or may be found at www.belimo.us.

9.11. If Seller determines that a problem cannot be resolved without Product replacement, an RMA number will be issued by Seller for return of the Products. Prior to returning any Products under a warranty, Client must obtain an RMA number from Seller, along with shipping instructions for the return. The RMA number must be clearly written on the outside of the box containing the returned Products. Only Products returned to the proper location and identified with an RMA number will be accepted by the Seller.

9.12. All returned Products should be packaged appropriately to prevent further damage. Seller reserves the right to refuse any returned Product if improperly packaged or labeled (e.g. without an RMA number on the outside of packaging). Products returned without proper RMA documentation will void Seller's warranty. Seller is not responsible for charges that Client may incur as a result of the removal or replacement of Products.

9.13. Repaired or replacement Products are shipped from Seller via ground shipment. Other shipping methods are available at the sole expense of the Client.

9.14. Repaired, replaced or exchanged Products will carry a warranty for a period of time equal to the greater of: (i) the remainder of the original 5-year warranty or 2-year warranty that was applicable to the repaired, replaced or exchanged Products, or (ii) six months, effective from the date the repaired, exchanged or replaced Products are shipped by Seller (the "Replacement Warranty Period").

9.15. If Seller determines that Product under warranty is to be replaced, Seller may elect to send a replacement in advance of receiving the returned item. For valve products 2½" in diameter or greater, a purchase order is required. An invoice will be issued and shall be due and payable if the returned Products are not received by Seller within 60 days from the date that the replacement Products are shipped. Additional charges may apply if the nature of the problem has been misrepresented by Client.

9.16. New Products ordered in an attempt to circumvent the warranty process may NOT be reimbursed if, upon receipt of returned Products, it is determined that the defect in the returned Products is actually field related, or the Products have been returned for cosmetic reasons only.

X. Liability Disclaimer

10.1. IN NO EVENT SHALL SELLER HAVE ANY LIABILITY TO CLIENT OR ANY THIRD PARTY FOR ANY (a) LOST PROFITS OR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, OR FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, OR (b) ANY DAMAGES WHATSOEVER RESULTING FROM THE PERFORMANCE OR A TEMPORARY OR PERMANENT LOSS OF USE OF PRODUCTS, HOWEVER CAUSED UNDER ANY THEORY OF LIABILITY AND WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STATUTE OR OTHERWISE. THE FOREGOING LIMITATIONS SHALL APPLY EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY STATED HEREIN. SELLER'S MAXIMUM AGGREGATE LIABILITY UNDER, ARISING FROM OR IN CONNECTION WITH THE SALE OF ITS PRODUCTS TO CLIENT, SHALL BE LIMITED TO THE AMOUNT PAID BY CLIENT FOR THE PRODUCT DEEMED RESPONSIBLE FOR THE LOSS OR DAMAGE.

10.2. Client releases Seller in full from any possible third party claims resulting in connection with the circumstances listed above. This also applies to claims in connection with products liability.

10.3. If Client becomes aware that any third party has made or appears likely to make any claim regarding Products (including, without limitation, regarding Product defects or rights infringed by Products), then Client shall immediately inform Seller and afford to Seller all assistance that Seller may require to enforce its rights and defend such claim.


XI. Proper Law and Jurisdiction

11.1. All sales of Products under these Terms described herein shall be governed by the laws of the State of Connecticut, without regard to its conflicts of law principles, and Seller 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. The Seller and Client hereby waive all rights to a jury trial in connection with any claims relating to the subject matter hereof. All causes of action arising out of or connected to the sales of Products under these Terms shall be resolved individually, with no right by Seller or Client to participate in a representative capacity, or as a member of any class action.

XII. Privacy and Data

12.1 Seller places great value on the implementation of lawful data processing to protect Client's personal data. Seller is obliged to process Client's personal data in accordance with applicable law. Seller is dependent on the services of a third party for the provision of its services. Seller has obligated the third party to process Client's data only in connection with the services agreed with Seller, to ensure the same level of data protection as Seller, and to not pass on Client's data to other third parties without Client's consent. When processing Client's data and transferring Client's data to third parties, Seller will use reasonable commercial efforts to provide an appropriate level of data protection and that appropriate organizational and technical measures are implemented to protect Client's personal data. More detailed information on Seller's data protection guidelines is available from the following Internet address: www.belimo.com/privacy.

XIII. California Proposition 65

 13.1 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.us for details.

For more information see www.p65warnings.ca.gov

Belimo Americas

USA, Latin America, and the Caribbean: www.belimo.us

Canada: www.belimo.ca

Brazil: www.belimo.com.br

Belimo Worldwide: www.belimo.com

