

Ball Valve

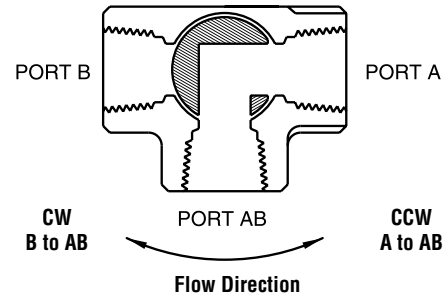
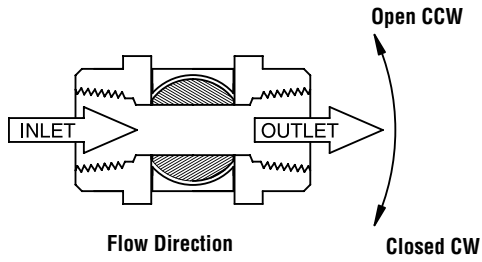
Features and Benefits

B2...VSA/VSS, B3...VS, B6...VS



- 2-way and 3-Way configuration
- Bronze with stainless steel trim
- Reduced and full port capacities
- Two piece construction
- Electronic actuation
- NPT and Flanged connections
- Wide C_v range
- Air gap for use with hot water and steam systems
- Live load low maintenance stem packing
- 2 Year Warranty

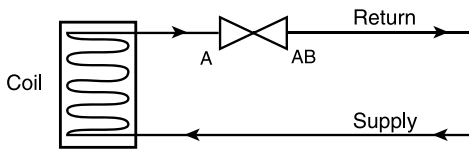
FLOW PATTERN



NOTE: B3...VS are piped differently than B3 CCV Valves.

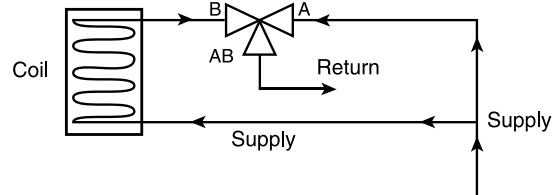
VS SERIES BALL VALVE PIPING DIAGRAMS

2-way Valve Piping Diagram

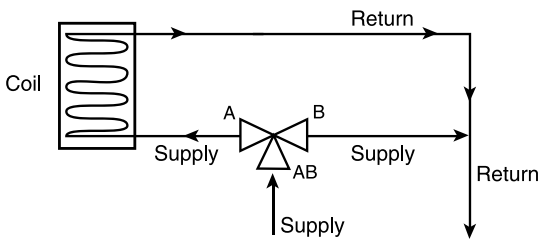


3-way Mixing Valve Piping Diagram

(N.C. TO COIL @ 0 VDC)

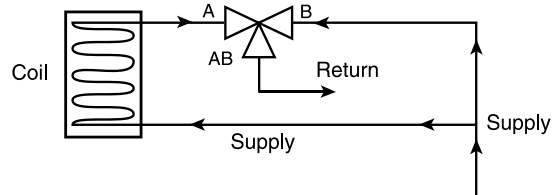


3-way Diverting Valve Piping Diagram



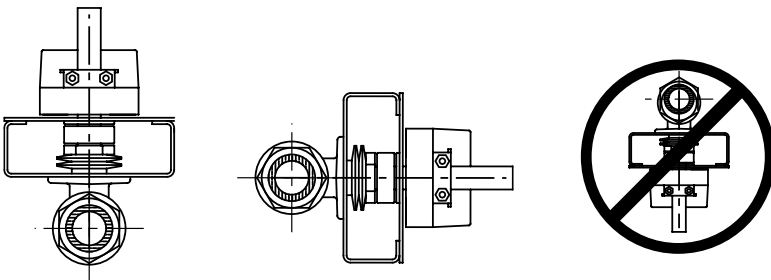
3-way Mixing Valve Piping Diagram

(N.O. TO COIL @ 0 VDC)



PIPING/MOUNTING ORIENTATION

Assembly can be mounted horizontally or vertically.
 Do not install with actuator below pipe.



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| VALVE SIZE | C _v | TYPE | PART NUMBER | PIPE VALVE | | | | | | | | | | | | |
|------------|----------------|--------|-------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|----------|
| | | | | 0.75 FpCv | 1.00 FpCv | 1.25 FpCv | 1.50 FpCv | 2.00 FpCv | 2.50 FpCv | 3.00 FpCv | 4.00 FpCv | 5.00 FpCv | 6.00 FpCv | 8.00 FpCv | 10.00 FpCv | |
| ½" | 1 | 2W NPT | B2050VS-01 | 1.00 | 1.00 | — | — | — | — | — | — | — | — | — | — | — |
| ½" | 2 | 2W NPT | B2050VS-02 | 2.00 | 1.90 | — | — | — | — | — | — | — | — | — | — | — |
| ½" | 4 | 2W NPT | B2050VS-04 | 3.80 | 3.60 | — | — | — | — | — | — | — | — | — | — | — |
| ½" | 15 | 2W NPT | B2050VS-15 | 8.90 | 7.20 | — | — | — | — | — | — | — | — | — | — | — |
| ¾" | 30 | 2W NPT | B219VS | 30.00 | 21.60 | 17.40 | 15.60 | — | — | — | — | — | — | — | — | — |
| ¾" | 51 | 2W NPT | B220VS | 51.00 | 26.50 | 19.90 | 17.30 | — | — | — | — | — | — | — | — | — |
| 1" | 43 | 2W NPT | B224VS | — | 43.00 | 36.10 | 30.50 | 25.80 | — | — | — | — | — | — | — | — |
| 1" | 68 | 2W NPT | B225VS | — | 68.00 | 48.30 | 36.70 | 29.20 | — | — | — | — | — | — | — | — |
| 1¼" | 48 | 2W NPT | B232VS | — | — | 48.00 | 44.60 | 37.90 | 35.00 | — | — | — | — | — | — | — |
| 1½" | 84 | 2W NPT | B239VS | — | — | — | 84.00 | 69.70 | 59.60 | 55.40 | — | — | — | — | — | — |
| 1½" | 177 | 2W NPT | B240VS | — | — | — | 177.00 | 102.70 | 77.90 | 67.30 | — | — | — | — | — | — |
| 2" | 108 | 2W NPT | B249VS | — | — | — | — | 108.00 | 100.40 | 91.80 | 83.20 | — | — | — | — | — |
| 2" | 389 | 2W NPT | B250VS | — | — | — | — | 389.00 | 221.70 | 159.50 | 124.50 | — | — | — | — | — |
| 2½" | 503 | 2W NPT | B265VS | — | — | — | — | — | 503.00 | 352.10 | 221.30 | 186.10 | — | — | — | — |
| 3" | 370 | 2W NPT | B280VS | — | — | — | — | — | — | 370.00 | 296.00 | 251.60 | 229.40 | — | — | — |
| ½" | 5 | 3W NPT | B315VS | 4.40 | 4.10 | — | — | — | — | — | — | — | — | — | — | — |
| ¾" | 11 | 3W NPT | B320VS | 11.00 | 10.30 | — | — | — | — | — | — | — | — | — | — | — |
| 1" | 21 | 3W NPT | B325VS | — | 21.00 | 20.20 | 18.90 | 17.60 | — | — | — | — | — | — | — | — |
| 1¼" | 33 | 3W NPT | B332VS | — | — | 33.00 | 32.00 | 29.00 | 27.70 | — | — | — | — | — | — | — |
| 1½" | 49 | 3W NPT | B340VS | — | — | — | 49.00 | 45.60 | 42.60 | 40.70 | — | — | — | — | — | — |
| 2" | 91 | 3W NPT | B350VS | — | — | — | — | 91.00 | 86.50 | 81.00 | 74.60 | — | — | — | — | — |
| 2" | 330 | 2W FLG | B650VS | — | — | — | — | 330.00 | 207.90 | 155.10 | 122.10 | — | — | — | — | — |
| 2½" | 420 | 2W FLG | B665VS | — | — | — | — | — | 420.00 | 319.20 | 214.20 | 184.80 | — | — | — | — |
| 3" | 600 | 2W FLG | B680VS | — | — | — | — | — | — | 600.00 | 384.00 | 300.00 | 264.00 | — | — | — |
| 4" | 1200 | 2W FLG | B6100VS | — | — | — | — | — | — | — | 1200.00 | 804.00 | 600.00 | 480.00 | — | — |
| 6" | 3300 | 2W FLG | B6150VS | — | — | — | — | — | — | — | — | — | 3300.00 | 1716.00 | 1254.00 | — |
| 8" | 9000 | 2W FLG | B6200VS | — | — | — | — | — | — | — | — | — | — | 9000.00 | 3870.00 | — |
| 10" | 12400 | 2W FLG | B6250VS | — | — | — | — | — | — | — | — | — | — | — | — | 12400.00 |

Fp C_v also apply to VSS where applicable.

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)

Typically actuators require a 24 VAC class 2 transformer and draw a maximum of 10 VA per actuator. The actuator enclosure cannot be opened in the field, there are no parts or components to be replaced or repaired.

- EMC directive: 89/336/EEC
- Software class A: Mode of operation type 1
- Low voltage directive: 73/23/EEC

| Typical transformer sizing | | |
|----------------------------|---------|----------------------|
| Actuator Series | Voltage | Max. VA Per Actuator |
| AF | 24 | 10 |
| NF | 24 | 10 |
| LF | 24 | 6 |
| GM | 24 | 7 |
| AM | 24 | 6 |
| NM | 24 | 4 |
| LM | 24 | 3 |

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. 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.

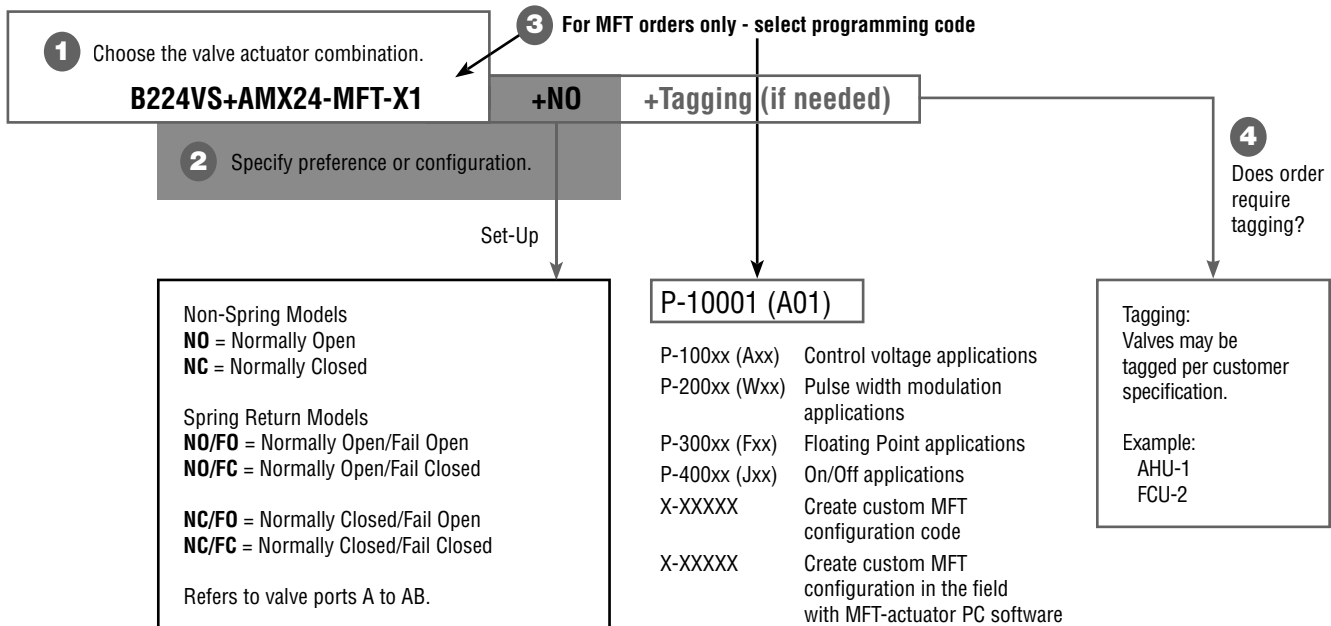
Wire length for actuator installation

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. See section 1 for specific transformer sizing information for the actuator selected.

Example: 3 actuators, 16 Ga wire
350 Ft ÷ 3 Actuators = 117 Ft. Maximum wire run

| | | | | | | |
|---|---|--|--|--|--|---------------------------------------|
| B2 | 24 | VS | AMX | 24 | -MFT-X1 | |
| <p>Valve B2 = 2-way B3 = 3-way B6 = 2-way Flanged</p> | <p>Valve Size 12-80 = 1/2"-3" 50-250 = 2"-10" (Flanged)</p> | <p>Trim Material VS = Bronze or Cast Iron Body, Stainless Steel Ball and Stem VSS = Stainless Steel Body, Ball and Stem</p> | <p>Actuator Type Non-Spring Return LM... NM... AM... GM... SY... SY...P Spring Return LF... NF... AF... SY...</p> | <p>Power Supply 24 = 24 VAC/DC 120 = 120 VAC 230 = 230 VAC</p> | <p>Control -3-X1 = On/Off, Floating Point -MFT-X1 = Multi-Function Technology -MFT95 = 0-135 Ω</p> | <p>-S = Built-in Auxiliary Switch</p> |

ORDERING EXAMPLE



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B2...VS Series, 2-Way, Ball Valve Bronze Body, Stainless Steel Ball and Stem



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

Application

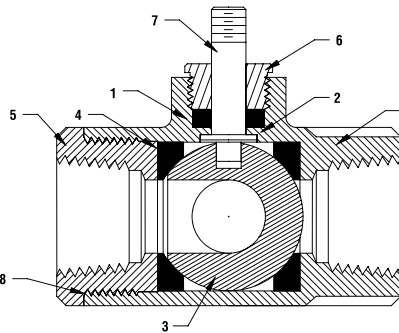
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV Box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

This valve is designed with MFT functionality which facilitates the use of various control input.

- Up to 35 psi steam
- 1/2" - 600 PSIG WOG, Cold Non-Shock.
- Federal Specification: WW-V-35C, Type II
Composition: BZ
Style: 3

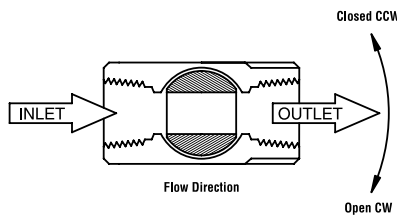
| Technical Data | |
|---------------------|---|
| Media | Chilled or hot water, glycol, 35# steam |
| Flow Characteristic | Modified equal percentage |
| Action | 90° rotation valve open CW, valve closed CCW |
| Sizes | 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3" |
| Type of end fitting | SAE NPT (Female Connections) |
| Materials: | |
| 1 Stem Packing | Reinforced PTFE |
| 2 Stem Bearing | Reinforced PTFE |
| 3 Ball | 316 Stainless Steel |
| 4 Seat (x2) | Reinforced PTFE w/ Durafill |
| 5 Retainer | B16 (3/4" - 1") Brass B584 (1 1/4" - 3") Brass |
| 6 Gland | B16 Brass |
| 7 Stem | 316 Stainless Steel |
| 8 Jam Nut | Stainless Steel |
| 9 Body Seal | PTFE (1-1/4" to 3") |
| 10 Body | B584-C84400 Bronze |

| Cv | Valve Nominal Size | | Type | Suitable Return Actuators | |
|-----|--------------------|---------|------------|---------------------------|------------|
| | Inches | DN [mm] | 2-way NPT | Spring | Non-Spring |
| 1 | 1/2 | 15 | B2050VS-01 | LF Series | LM Series |
| 2 | 1/2 | 15 | B2050VS-02 | | |
| 4 | 1/2 | 15 | B2050VS-04 | | |
| 15 | 1/2 | 15 | B2050VS-15 | NF | NM |
| 30 | 3/4 | 20 | B219VS | | |
| 51 | 3/4 | 20 | B220VS | AF Series | AM Series |
| 43 | 1 | 25 | B224VS | | |
| 68 | 1 | 25 | B225VS | | |
| 48 | 1 1/4 | 32 | B232VS | | |
| 84 | 1 1/2 | 40 | B239VS | | |
| 177 | 1 1/2 | 40 | B240VS | | |
| 108 | 2 | 50 | B249VS | GM Series | SY Series |
| 389 | 2 | 50 | B250VS | | |
| 503 | 2 1/2 | 65 | B265VS | | |
| 370 | 3 | 80 | B280VS | | |



| | |
|------------------------------------|---------------------------------|
| Pressure rating | 600 psig WOG |
| Media temp. range | -22°F to 280°F (-30°C to 138°C) |
| Close-off pressure | 600 psig @ 100°F |
| Maximum differential pressure (ΔP) | <600 psig |

Flow Patterns



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

Application

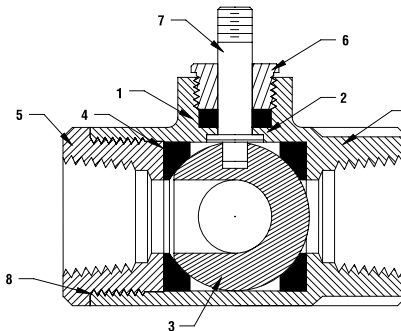
These threaded valves are designed to provide modulating or two position control of hot or chilled water and saturated steam systems under 50 psi.

Typical applications include reheat coils, vav terminal control, unit ventilators, and air handlers, especially in areas which have minimum profile requirements.

- Up to 50 psi steam
- 1/2" - 2000 PSIG WOG, Cold Non-Shock.
- Federal Specification: WW-V-35C, Type II,
Composition: SS
Style: 3

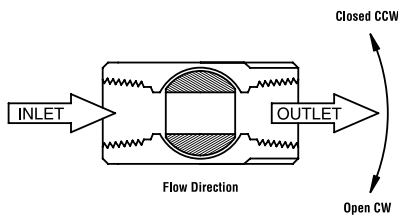
| Technical Data | |
|---------------------|---|
| Media | Chilled or hot water, glycol, 50# steam |
| Flow Characteristic | Modified equal percentage |
| Action | 90° rotation valve open CW, valve closed CCW |
| Sizes | 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2" |
| Type of end fitting | SAE NPT (Female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

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



| | |
|------------------------------------|---------------------------------|
| Pressure rating | 2000 psig WOG (1/2" - 1") |
| Media temp. range | -22°F to 298°F (-30°C to 148°C) |
| Close-off pressure | 600 psig @ 100°F |
| Maximum differential pressure (ΔP) | <600 psig |

Flow Patterns



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B3...VS Series, 3-Way, Ball Valve Bronze Body, Stainless Steel Ball and Stem



- 316 Stainless Ball and Stem
- Reinforced PTFE seats and stuffing box
- Blow-out proof stem design
- Adjustable packing gland

Application

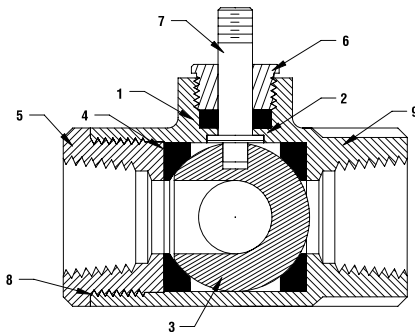
These threaded valves are designed to provide modulating or two position control of hot or chilled water.

Typical applications include reheat coils, vav terminal control, unit ventilators, and air handlers, especially in areas which have minimum profile requirements.

- 400 PSIG WOG, Cold Non-Shock

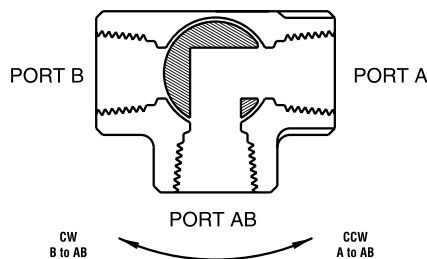
| Technical Data | |
|---------------------|---|
| Media | Chilled or hot water, glycol |
| Flow Characteristic | Modified equal percentage |
| Action | 90° rotation A to AB open CCW, B to AB open CW |
| Sizes | ½", ¾", 1", 1¼", 1½", 2" |
| Type of end fitting | SAE NPT (Female Connection) |
| Materials: | |
| 1 Stem Packing | PTFE |
| 2 Stem Bearing | PTFE |
| 3 Ball | 316 Stainless Steel |
| 4 Seat (x2) | PTFE w/ Durafill |
| 5 Retainer | B16 (½" - 1") Brass B584 (1¼" - 2") Brass |
| 6 Gland | ASTM B16 Brass |
| 7 Stem | 316 Stainless steel |
| 8 Jam Nut | PTFE (1¼" - 2") |
| 9 Body Seal | B584-C84400 Bronze |

| C _v | Valve Nominal Size | | Type | Suitable Return Actuators | | |
|----------------|--------------------|---------|--------|---------------------------|----|------------|
| | Inches | DN [mm] | | Spring | | Non-Spring |
| 4.8 | ½ | 15 | B315VS | LF | NF | LM |
| 11 | ¾ | 20 | B320VS | AF Series | | NM Series |
| 21 | 1 | 25 | B325VS | | | |
| 33 | 1¼ | 32 | B332VS | | | |
| 49 | 1½ | 40 | B340VS | | | |
| 91 | 2 | 50 | B350VS | | | GM Series |



| | |
|------------------------------------|---------------------------------|
| Pressure rating | 400 psig WOG |
| Media temp. range | -22°F to 250°F (-30°C to 120°C) |
| Close-off pressure | 400 psig @ 100°F |
| Maximum differential pressure (ΔP) | <75 psig |

Flow Patterns



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- Same end to end dimension as conventional flanged iron gate valve
- Fast quarter turn open or closed operation
- Stainless steel ball and stem
- Positive shut-off
- Two-piece body construction

Application

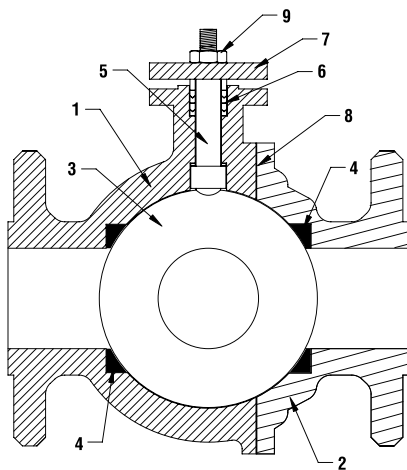
- Ideal for water service where a non-corrosive, clean cosmetic appearance is required.
- Optional FDA approval, suitable for potable water and food contact.
- Sizes: 2"-10" (50-250mm)
- 200 psi CWP (cold water pressure) (non-shock)

Approved valves shall comply with the American Standard for face-to-face dimensions (ANSI B16.10) for Class 125 cast iron flanged gate valves.

The dimensions and drilling of end flanges conform to the American cast iron flange standard, Class 125 (ANSI B16.1).

| Technical Data | |
|----------------------|---|
| Media | Chilled or hot water, glycol, 50# steam |
| Flow Characteristic | Modified equal percentage |
| Action | 90% rotation valve open CW, valve closed CCW |
| Sizes | 2", 2½", 3", 4", 6", 8", 10" |
| Type of end fittings | Flanged 125# ANSI Bolt Pattern |
| Materials: | |
| 1 Body | Cast Iron - ASTM A126 Class B |
| 2 End Cap | Cast Iron - ASTM A126 Class B |
| 3 Ball | 304 Stainless Steel - ASTM A351 |
| 4 Seats | PTFE |
| 5 Stem | 304 Stainless Steel - AISI 304 |
| 6 Packing | PTFE |
| 7 Gland | Cast Iron - ASTM A126 Class B |
| 8 Gasket | PTFE |
| 9 Nut | Steel - ASTM A6 |

| C _v | Valve Nominal Size | | Type | Suitable Return Actuators |
|----------------|--------------------|---------|-----------|---------------------------|
| | Inches | DN [mm] | 2-way NPT | Non-Spring |
| 330 | 2 | 50 | B650VS | SY Series |
| 420 | 2½ | 65 | B665VS | |
| 600 | 3 | 80 | B680VS | |
| 1200 | 4 | 100 | B6100VS | |
| 3300 | 6 | 150 | B6150VS | |
| 9000 | 8 | 203 | B6200VS | |
| 12400 | 10 | 254 | B6250VS | |



| | |
|------------------------------------|---------------------------------|
| Pressure rating | 200 psig WOG |
| Media temp. range | -22°F to 298°F (-30°C to 148°C) |
| Close-off pressure | 200 psig @ 140°F |
| Maximum differential pressure (ΔP) | <200 psi |

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| C _v | Valve Nominal Size | | Type | | | Suitable Actuators | | SY Series |
|----------------|--------------------|---------|-------------|-----------|---------------|--------------------|-------------------|-----------|
| | Inches | DN [mm] | 2-way NPT | 3-way NPT | 2-Way Flanged | Spring Return | Non-Spring Return | |
| 1 | ½ | 15 | B2050VS-01 | | | LF Series | LM Series | SY Series |
| 2 | ½ | 15 | B2050VS-02 | | | | | |
| 4 | ½ | 15 | B2050VS-04 | | | | | |
| 15 | ½ | 15 | B2050VS-15 | | | | | |
| 30 | ¾ | 20 | B219VS | | | NF Series | NM Series | |
| 51 | ¾ | 20 | B220VS | | | | | |
| 43 | 1 | 25 | B224VS | | | AF Series | AM Series | |
| 68 | 1 | 25 | B225VS | | | | | |
| 48 | 1¼ | 32 | B232VS | | | | | |
| 84 | 1½ | 40 | B239VS | | | | GM Series | |
| 177 | 1½ | 40 | B240VS | | | | | |
| 108 | 2 | 50 | B249VS | | | | | |
| 389 | 2 | 50 | B250VS | | | LF Series | NM Series | |
| 503 | 2½ | 65 | B265VS | | | | | |
| 370 | 3 | 80 | B280VS | | | | | |
| 15 | ½ | 15 | B2050VSS-15 | | | AF Series | AM Series | |
| 30 | ¾ | 20 | B219VSS | | | | | |
| 43 | 1 | 25 | B224VSS | | | | | GM Series |
| 48 | 1¼ | 32 | B232VSS | | | | | |
| 84 | 1½ | 40 | B239VSS | | | | | |
| 108 | 2 | 50 | B249VSS | | | | | |
| 503 | 2½ | 65 | B265VSS | | | LF | LM | |
| 4.8 | ½ | 15 | | B315VS | | | | |
| 11 | ¾ | 20 | | B320VS | | NF | NM Series | |
| 21 | 1 | 25 | | B325VS | | | | |
| 33 | 1¼ | 32 | | B332VS | | AF Series | AM Series | |
| 49 | 1½ | 40 | | B340VS | | | | |
| 91 | 2 | 50 | | B350VS | | | | |
| 330 | 2 | 50 | | | B650VS | SY Series | | |
| 420 | 2½ | 65 | | | B665VS | | | |
| 600 | 3 | 80 | | | B680VS | | | |
| 1200 | 4 | 100 | | | B6100VS | | | |
| 3300 | 6 | 150 | | | B6150VS | | | |
| 9000 | 8 | 203 | | | B6200VS | | | |
| 12400 | 10 | 254 | | | B6250VS | | | |



Applications

- Water-side control of air handling apparatus in ventilation and air-conditioning systems
- Water/Steam control in heating systems

Mode of Operation

The control valve is operated by an electronic actuator that responds to a standard voltage for on/off control, by a proportional VDC/4...20 mA, or 3-point control system. The actuator will then move the ball to the valve to the position dictated by the control signal thus change the flow.

Product Features

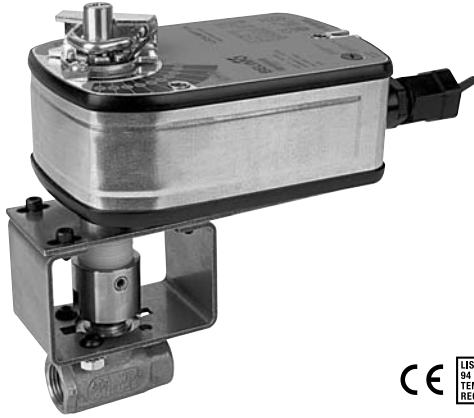
Modified equal percentage of flow for B2, B3 and B6. Modified linear flow for B3.

Actuator Specifications

| | |
|-----------------------|--|
| Control type | On/Off, Floating Point, Proportional, 2-10 VDC Multi-Function Technology (MFT) |
| Manual override | LM, NM, GM, AM, SY, NF, AF |
| Electrical connection | 3 ft [1m] cable with ½" conduit fitting |

Valve Specifications

| | |
|------------------------|---|
| Service | chilled or hot water, 60% glycol or steam |
| Flow characteristic | modified equal percentage (2-way), modified linear (3-way) |
| Sizes | 1" to 10" |
| Type of end fitting | NPT (B2 & B3 VS) flanged (B6VS) |
| Materials | |
| Body | bronze (B2 & B3VS), stainless steel (B2VSS), cast iron (B6VS) |
| Stem | stainless steel |
| Seats | PTFE |
| Packing | PTFE |
| Pressure rating | 600 psi |
| Media temp range | |
| B2, B3VS | -22°F to 280°F [-30°C to 138°C] |
| B2VSS | -22°F to 298°F [-30°C to 148°C] |
| Maximum inlet pressure | |
| Steam | 35 psi B2VS 50 psi B2VSS, B6VS |



Models

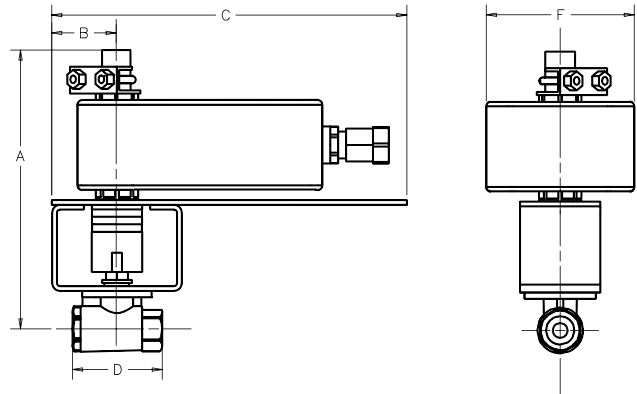
| | |
|------------|------------------------|
| LF24 US | |
| LF24-S US | w/built-in Aux. Switch |
| LF120 US | |
| LF120-S US | w/built-in Aux. Switch |

| Technical Data | |
|---------------------------|--|
| Control | On/Off, Floating |
| Power supply | |
| LF24(-S) US | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| LF120(-S) US | 120 VAC ± 10% 50/60 Hz |
| Power consumption | |
| LF24(-S) US | running 5 W holding 2.5 W |
| LF120(-S) US | running 5.5 W holding 3.5 W |
| Transformer sizing | |
| LF24(-S) US | 7 VA, class 2 power source |
| LF120(-S) US | |
| Electrical connection | ½" conduit connector |
| (-S models have 2 cables) | 3 ft [1m], 18 GA appliance cable |
| Electrical protection | 120V actuators double insulated |
| Overload protection | electronic throughout rotation |
| Angle of rotation | 95° |
| Spring return direction | reversible with CW/CCW mounting |
| Position indication | visual indicator 0° to 90° |
| Running time | <40 to 75 sec. (on-off) |
| spring | <25 sec. @-4°F to 122°F [-20°C to 50°C] <60 sec. @-22°F [-30°C] |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 |
| Agency listings† | UL 873, CSA C22.2 No. 24 certified, CE |
| Quality standard | ISO 9001 |
| Noise level | max. 62 dB(A) |

| LF...S US | |
|------------------|---|
| Auxiliary switch | 1 x SPDT, 6A (1.5A) @ 250 VAC, UL Listed, adjustable 0° to 95° (double insulated) |

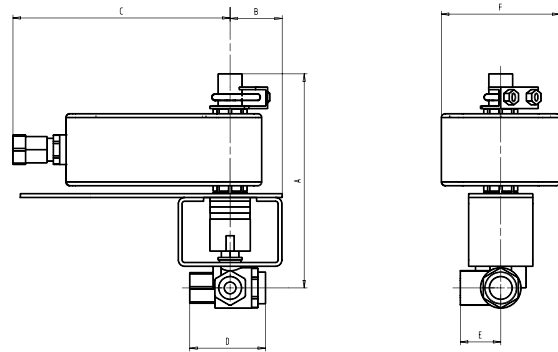
† Rated impulse voltage 800V (4kV for 120V model), Control pollution degree 3, Type of action 1.AA (1.AA.B for -S models)

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|-------------|------|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B2050VS-01 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 |
| B2050VS-02 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 |
| B2050VS-04 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 |
| B2050VS-15 | 50 | ½" | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 |
| B2050VSS-15 | 1000 | ½" | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B315VS | 75 | ½" | 15 | 6.50 | 2.00 | 8.00 | 2.30 | 1.25 | 3.86 |

PAGE11

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Wiring Diagrams

✂️ INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption must be observed.

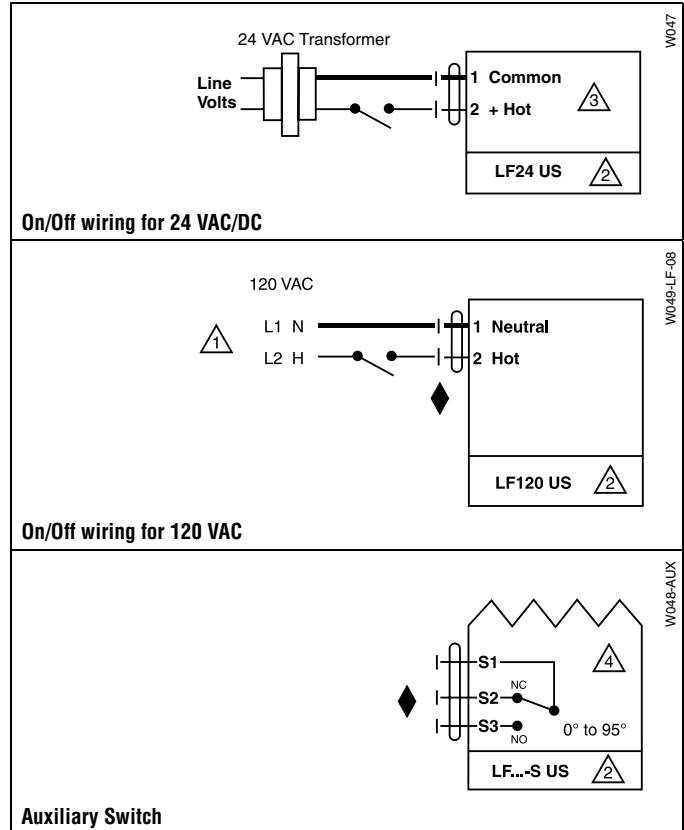
3 Actuator may also be powered by 24 VDC.

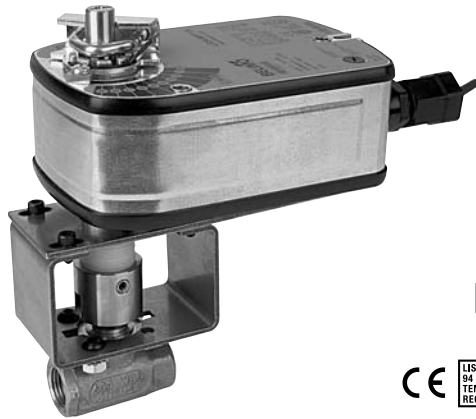
4 For end position indication, interlock control, fan startup, etc., LF24-S US and LF120-S US incorporates a built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @ 250 VAC, UL listed, adjustable 0° to 95°.

📄 APPLICATION NOTES

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

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





MFT

2
YEAR
WARRANTY



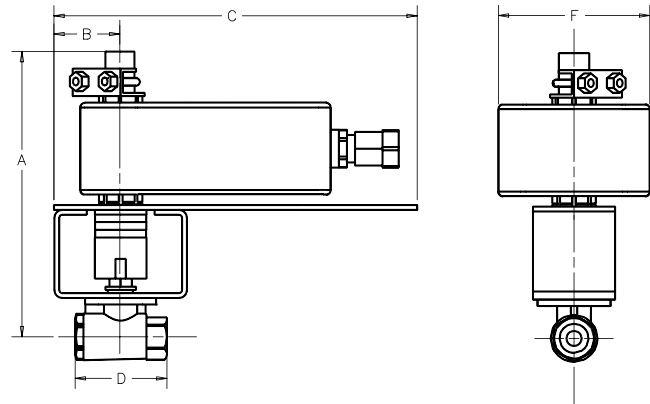
Models

LF24-MFT US
LF24-MFT-S US w/built-in Aux. Switch

| Technical Data | |
|---------------------------|--|
| Control | MFT |
| Control signal | 2 to 10 VDC (4-20mA with 500 Ω resistor) |
| Power consumption | running 2.5 W holding 1 W |
| Transformer sizing | 5 VA (class 2 power source) |
| Electrical connection | ½" conduit connector |
| (-S models have 2 cables) | 3 ft [1m], 18 GA appliance cable |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input impedance | 100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20mA 750 Ω for PWM 500 Ω for on/off and floating point |
| Feedback | 2 to 10 VDC, 0.5 mA max |
| Angle of rotation | 95° |
| Direction of rotation | spring reversible with CW/CCW mounting motor reversible with built-in switch |
| Position indication | visual indicator |
| Running time | <40 to 75 sec. (on-off) 150 sec. independent of load (proportional) |
| spring | <25 sec. @-4°F to 122°F [-20°C to 50°C] <60 sec. @-22°F [-30°C] |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 |
| Agency listings | UL 873, CSA C22.2 No. 24 certified, CE |
| Noise level | max. 62 dB(A) |
| Quality standard | ISO 9001 |

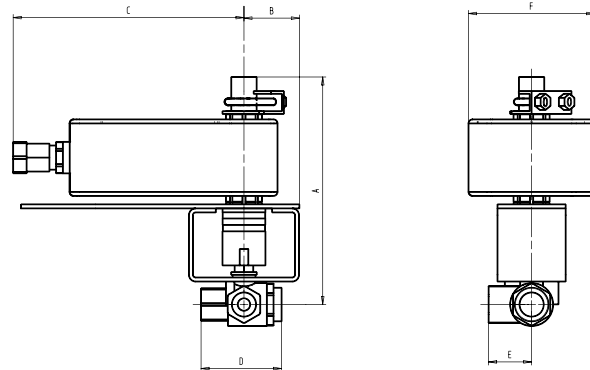
| LF24-MFT-S US | |
|------------------|---|
| Auxiliary switch | 1 x SPDT, 6A (1.5A) @ 250 VAC, UL Listed, adjustable 0° to 95° (double insulated) |

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|-------------|------|--------------------|---------|---------------------|------|------|------|------|--|
| | | Inches | DN [mm] | A | B | C | D | F | |
| B2050VS-01 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | |
| B2050VS-02 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | |
| B2050VS-04 | 50 | ½" | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | |
| B2050VS-15 | 50 | ½" | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 | |
| B2050VSS-15 | 1000 | ½" | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 | |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B315VS | 75 | ½" | 15 | 6.50 | 2.00 | 8.00 | 2.30 | 1.25 | 3.86 |

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Wiring Diagrams

INSTALLATION NOTES

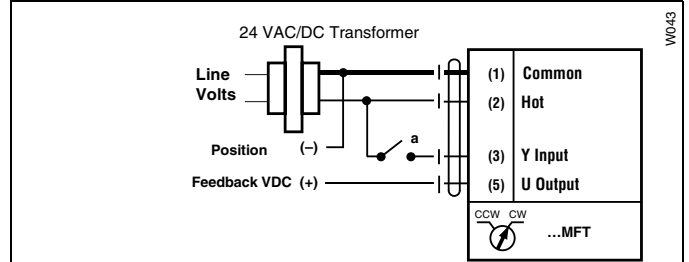
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac sink controller. The actuators internal common reference is not compatible.

APPLICATION NOTES

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

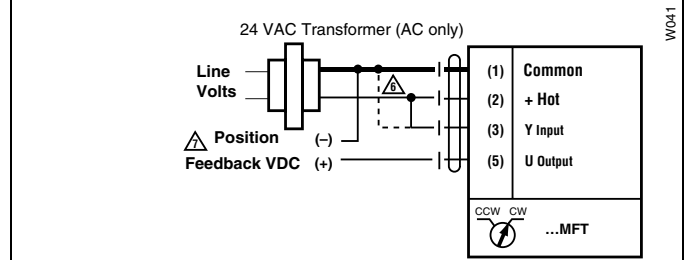
WARNING Live Electrical Components!
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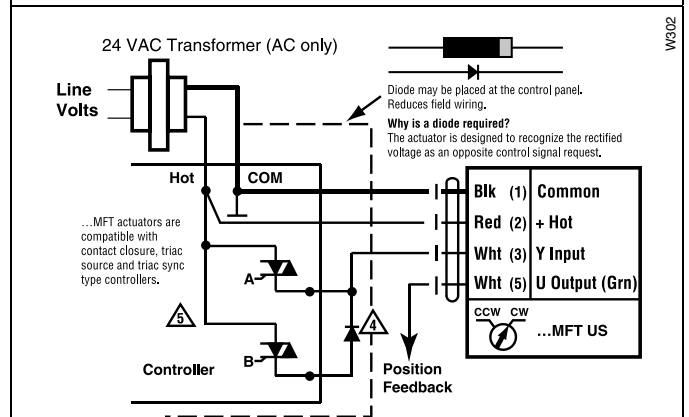
On/Off control

WD43



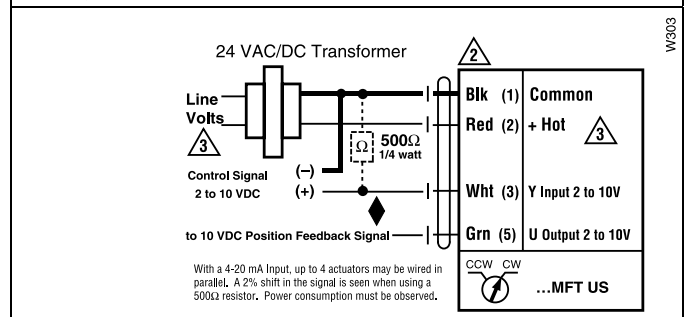
PWM, triac source and sink

WD1



Floating Point control

WS02



Proportional 2 to 10 or 4 to 20 mA control signal

WS03

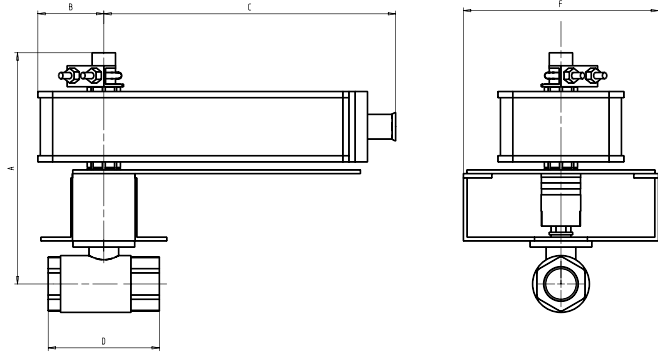


Models

- NFB24-X1
- NFBUP-X1
- NFBUP-S-X1 w/built-in Aux. Switch

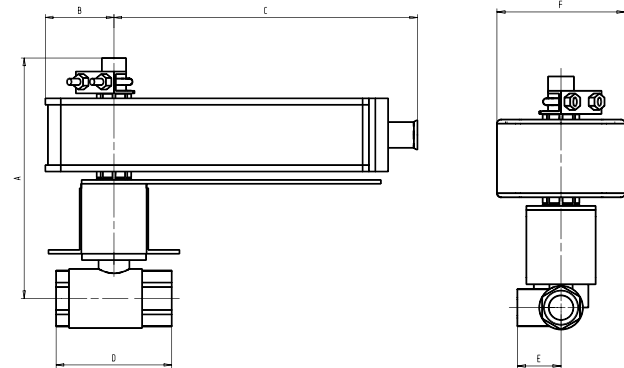
| Technical Data | |
|-------------------------|--|
| Control | On/Off |
| Power consumption | |
| NF24(-S) US | running 5 W |
| | holding 2.6 W |
| NF120(-S) US | running 6 W |
| | holding 3.5 W |
| Transformer sizing | |
| NFB24-X1 | 8.5 VA |
| NFBUP(-S)-X1 | 9.5 VA |
| Electrical connection | ½" conduit connector |
| (-S model has 2 cables) | 3 ft [1m], 18 GA appliance cables |
| Electrical protection | 120 V actuators double insulated |
| Overload protection | electronic throughout 0° to 95° rotation |
| Angle of rotation | 95° |
| Position indication | visual indicator |
| Running time | control <75 seconds |
| | spring <20 seconds |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 / IP54 |
| Agency listings | UL 873, CSA C22.2 No. 24 certified, CE |
| Noise level | max. 45 dB(A) |
| NFBUP-S-X1 | |
| Auxiliary switch | 2 x SPDT, 3A (0.5A inductive) @ 250 V |

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B219VS | 400 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B220VS | 200 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B320VS | 75 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |

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Wiring Diagrams

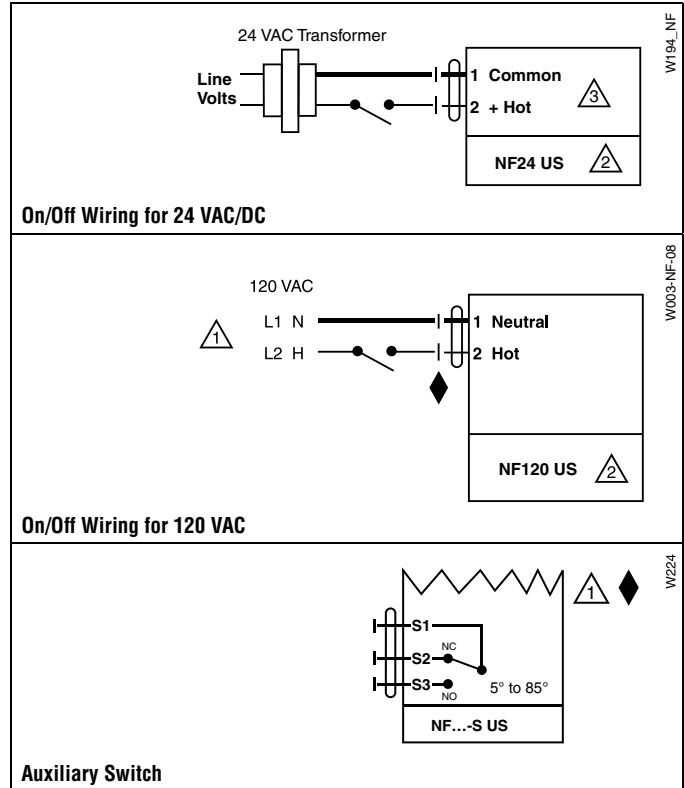
✂️ INSTALLATION NOTES

- ⚠️ 1 Provide overload protection and disconnect as required.
- ⚠️ 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption must be observed.
- ⚠️ 3 Actuators may also be powered by 24 VDC.
- ⚠️ 4 For end position indication, interlock control, fan startup, etc.,
NF24-S US incorporates a built-in auxiliary switch: 1 x SPDT, 7A (2.5A)
@ 250 VAC, UL listed, adjustable 5° to 85°.

📄 APPLICATION NOTES

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

- ⚠️ **WARNING Live Electrical Components!**
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MFT

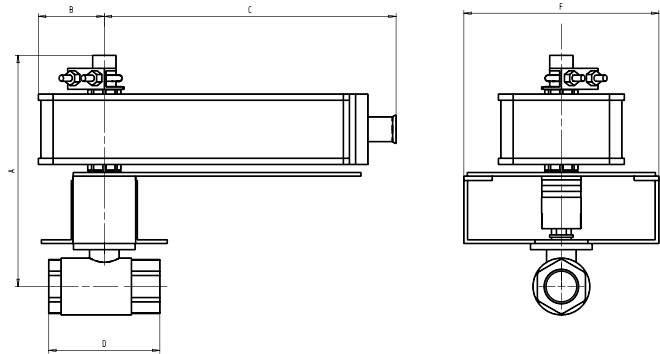


Models

NFX24-MFT-X1
NFX24-MFT-S-X1

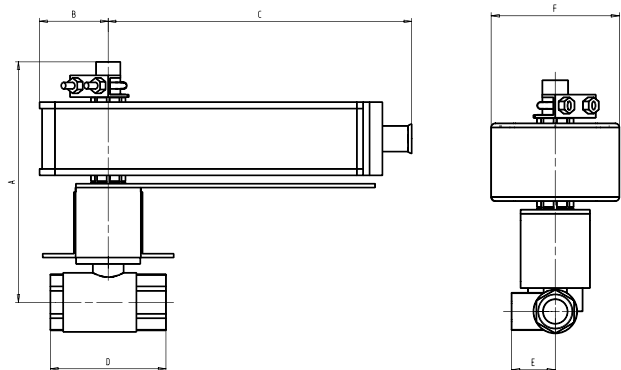
| Technical Data | |
|-----------------------|---|
| Control | MFT |
| Control signal | 2 to 10 VDC, (4 to 20 mA with 500 Ω resistor) |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 20% / -10% |
| Power consumption | running 6.5 W holding 3 W |
| Transformer sizing | 9 VA, (class 2 power source) |
| Electrical connection | ½" conduit connector 3 ft [1m], 18 GA appliance cable |
| Overload protection | electronic throughout 0 to 95° rotation |
| Input impedance | 100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for on/off and floating point |
| Feedback output | 2 to 10 VDC, 0.5 mA max |
| Angle of rotation | 95° |
| Direction of Rotation | spring reversible with CW/CCW mounting motor reversible with built-in switch |
| Position indication | visual indicator, 0° to 95° |
| Running time | motor 150 seconds (default), variable (40 to 220 seconds) spring <20 sec @ -4°F to 122°F [-20°C to 50°C]; <60 sec @ -22°F [-30°F] |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 / IP54, Enclosure Type 2 |
| Agency listings | cULus acc. to UL60730-1A/ -2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC |
| Noise level | <40 dB(A) motor @ 150 seconds, run time dependent <62 dB(A) spring return |
| NFX24-MFT-S-X1 | |
| Auxiliary switch | 2 x SPDT, 3A (0.5A) @ 250 VAC, UL Approved one set at +10°, one adjustable 10° to 90° |

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B219VS | 400 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B220VS | 200 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B320VS | 75 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |

Wiring Diagrams

INSTALLATION NOTES

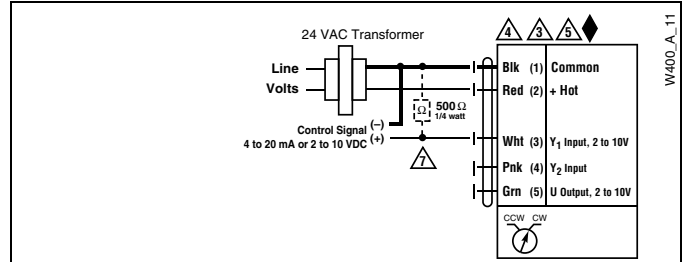
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac sink controller. The actuators internal common reference is not compatible.

APPLICATION NOTES

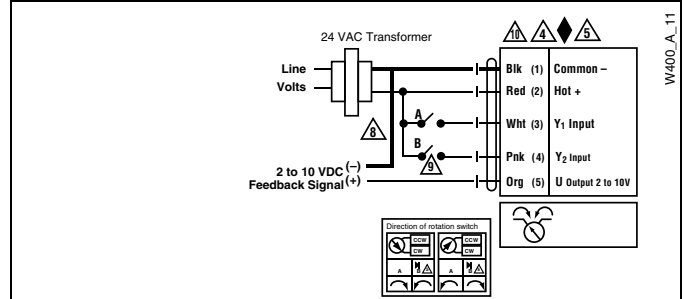
- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.
- ◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

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

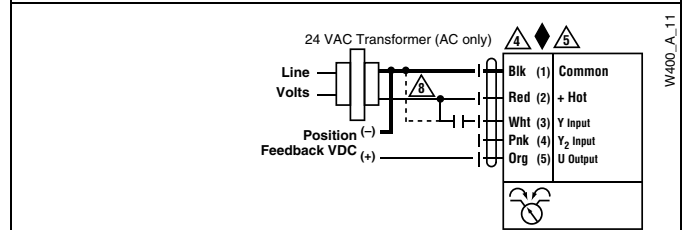
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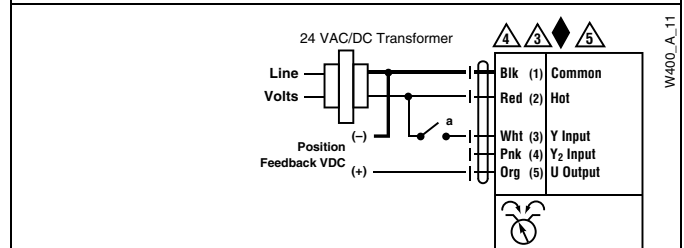
VDC/4-20 mA



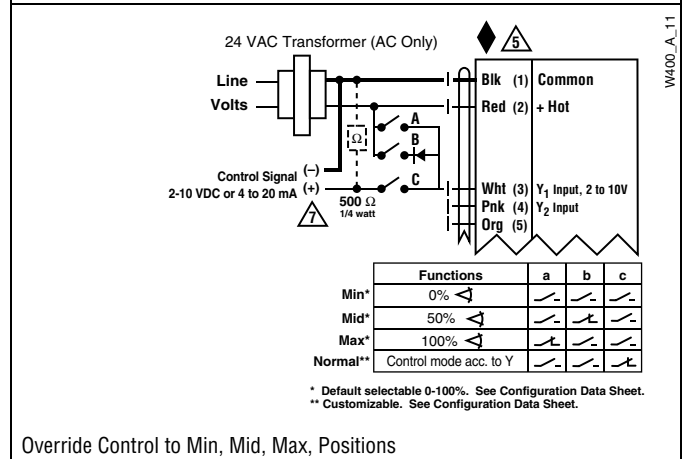
Floating Point



PWM



Two Position



Override Control to Min, Mid, Max, Positions



MFT

2
YEAR
WARRANTY

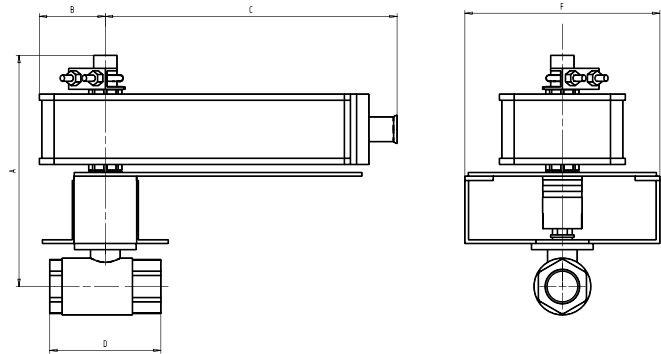


Models

NFX24-MFT95-X1

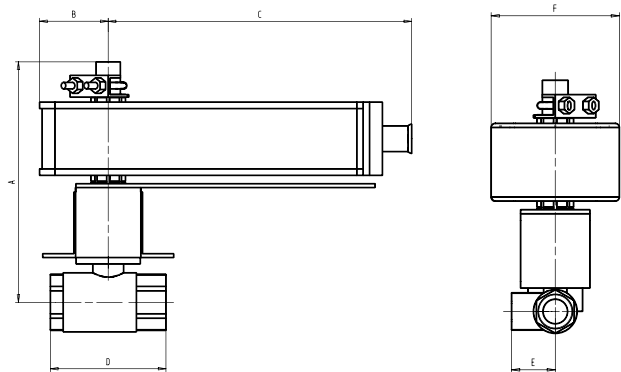
| Technical Data | |
|-----------------------|--|
| Control | MFT |
| Control signal | 0-135 Ω |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 20% / -10% |
| Power consumption | running 6.5 W holding 3 W |
| Transformer sizing | 9 VA (class 2 power source) |
| Electrical connection | ½" conduit connector 3 ft [1m], 18 GA appliance cable |
| Overload protection | electronic throughout 0 to 95° rotation |
| Input impedance | 100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for on/off and floating point |
| Feedback output | 2 to 10 VDC, 0.5 mA max |
| Angle of rotation | 95° (adjustable with mechanical end stop, 35° to 95°) |
| Direction of Rotation | spring reversible with CW/CCW mounting motor reversible with built-in switch |
| Position indication | visual indicator, 0° to 95° |
| Running time | control 150 seconds (default), variable (40 to 220 seconds) spring <20 sec @ -4°F to 122°F [-20°C to 50°C]; <60 sec @ -22°F [-30°F] |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 / IP54, Enclosure Type 2 |
| Agency listings | cULus acc. to UL60730-1A/ -2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC |
| Noise level | <40 dB(A) motor @ 150 seconds, run time dependent, <62 dB(A) spring return |

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B219VS | 400 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B220VS | 200 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B320VS | 75 | ¾ | 20 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |

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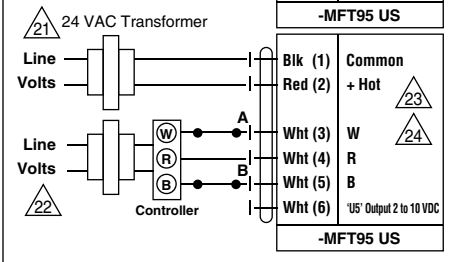
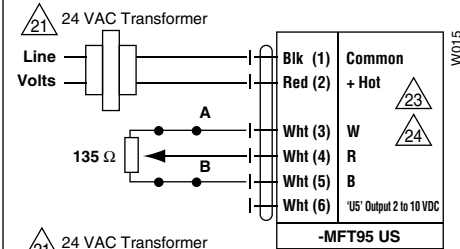
INSTALLATION NOTES

- 21 Provide overload protection and disconnect as required.
- 22 Actuators and controller must have separate transformers.
- 23 Consult controller instruction data for more detailed information.
- 24 Resistor value depends on the type of controller and the number of actuators. No resistor is used for one actuator. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

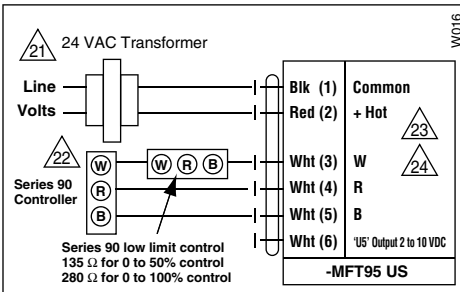
Override

| Switch A | Switch B | Damper Position |
|----------|----------|-----------------|
| | | Damper Open |
| | | Damper Closed |

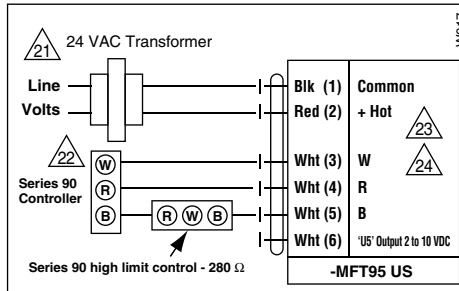
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



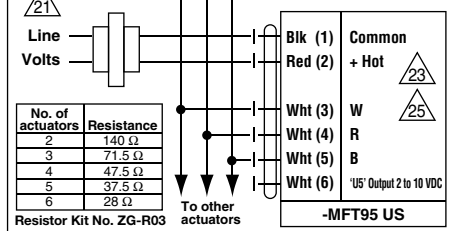
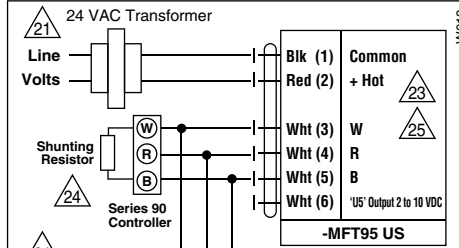
Low Limit Control



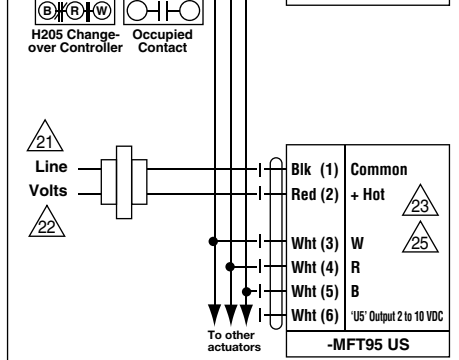
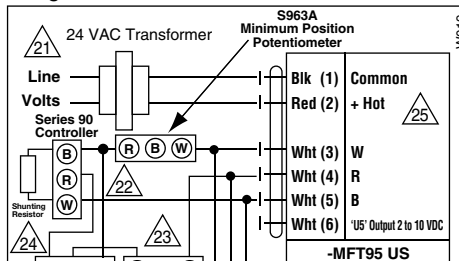
High Limit Control



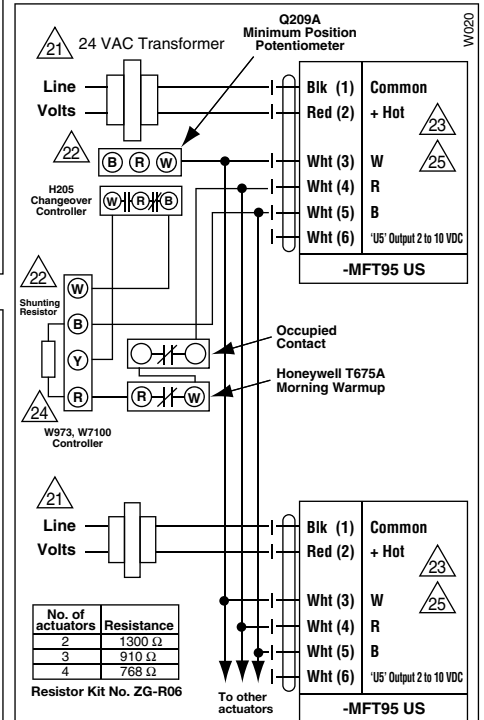
Wiring Multiple Actuators to a Series 90 Controller



Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



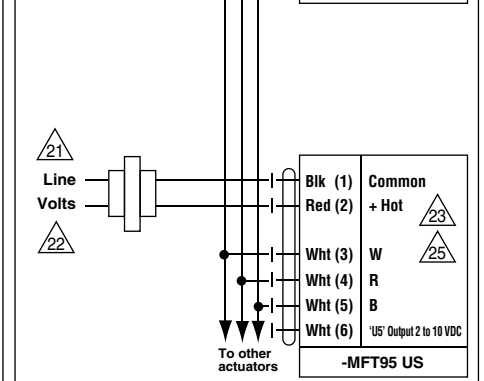
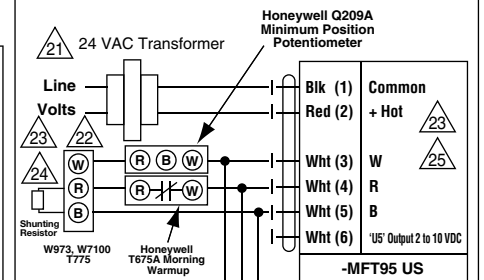
Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers

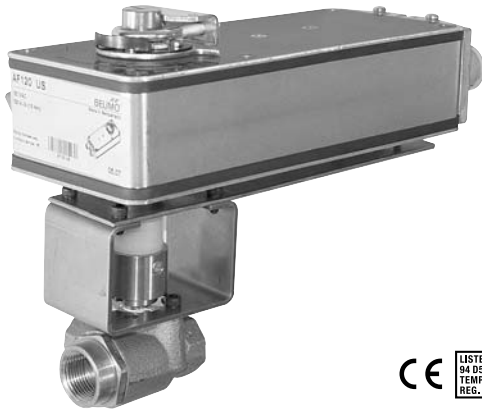


| No. of actuators | Resistance |
|------------------|------------|
| 2 | 1300 Ω |
| 3 | 910 Ω |
| 4 | 768 Ω |

Resistor Kit No. ZG-R06

Used with the W973 and W7100 controllers





Models

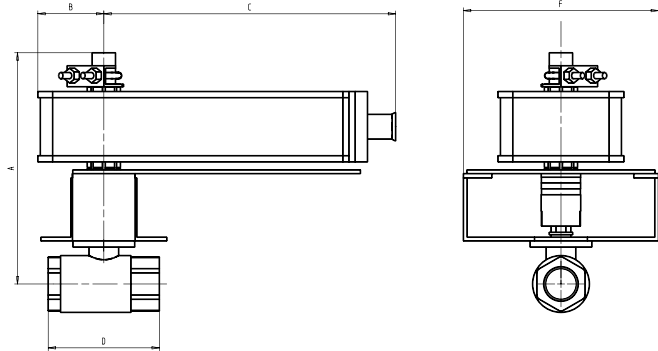
| | |
|------------|--------------------------|
| AF24 US | |
| AF24-S US | w/built-in Aux. Switches |
| AF120 US | |
| AF120-S US | w/built-in Aux. Switches |

| Technical Data | | |
|-------------------------|---------|--|
| Control | | On/Off |
| Power consumption | | |
| AF24(-S) US | running | 5 W |
| | holding | 1.5 W |
| AF120(-S) US | running | 6 W |
| | holding | 2.3 W |
| Transformer sizing | | 10 VA, class 2 power |
| Electrical connection | | ½" conduit connector |
| (-S model has 2 cables) | | 3 ft [1m], 18 GA appliance cables |
| Electrical protection | | 120 V actuators double insulated |
| Overload protection | | electronic throughout 0° to 95° rotation |
| Angle of rotation | | 95° |
| Position indication | | visual indicator |
| Manual override | | hex crank |
| Running time | control | 150 sec. independent of load |
| | spring | <20 sec. |
| Ambient temperature | | -22° F to 122° F [-30° C to 50° C] |
| Housing | | NEMA 2 / IP54 |
| Agency listings | | UL 873, CSA C22.2 No. 24 certified, CE |
| Noise level | | max. 45 dB(A) |

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

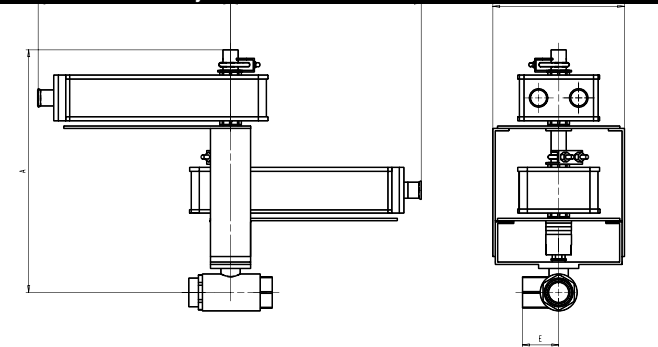
* Dual Mounted Actuators

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|------------|------|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B224VS | 400 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B225VS | 50 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.62 | 6.25 |
| B232VS | 200 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B239VS | 400 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.37 | 6.25 |
| *B240VS | 50 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.75 | 6.25 |
| *B249VS | 200 | 2 | 50 | 8.00 | 3.00 | 8.00 | 4.68 | 6.25 |
| B219VSS | 1000 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 |
| B224VSS | 1000 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B232VSS | 400 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B232VSS | 1000 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B239VSS | 1000 | 1½ | 40 | 6.70 | 3.00 | 8.00 | 4.37 | 6.25 |
| *B249VSS | 400 | 2 | 50 | 8.00 | 3.00 | 8.00 | 4.68 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B325VS | 75 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |
| B332VS | 75 | 1¼ | 32 | 7.00 | 2.00 | 8.00 | 4.13 | 2.07 | 6.25 |
| B325VSS | 200 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |
| B332VSS | 200 | 1¼ | 32 | 7.00 | 2.00 | 8.00 | 4.13 | 2.07 | 6.25 |
| *B340VS | 75 | 1½ | 40 | 7.00 | 3.00 | 8.00 | 4.44 | 2.25 | 6.25 |
| *B350VS | 75 | 2 | 50 | 7.00 | 3.00 | 8.00 | 5.38 | 2.75 | 6.25 |

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Wiring Diagrams

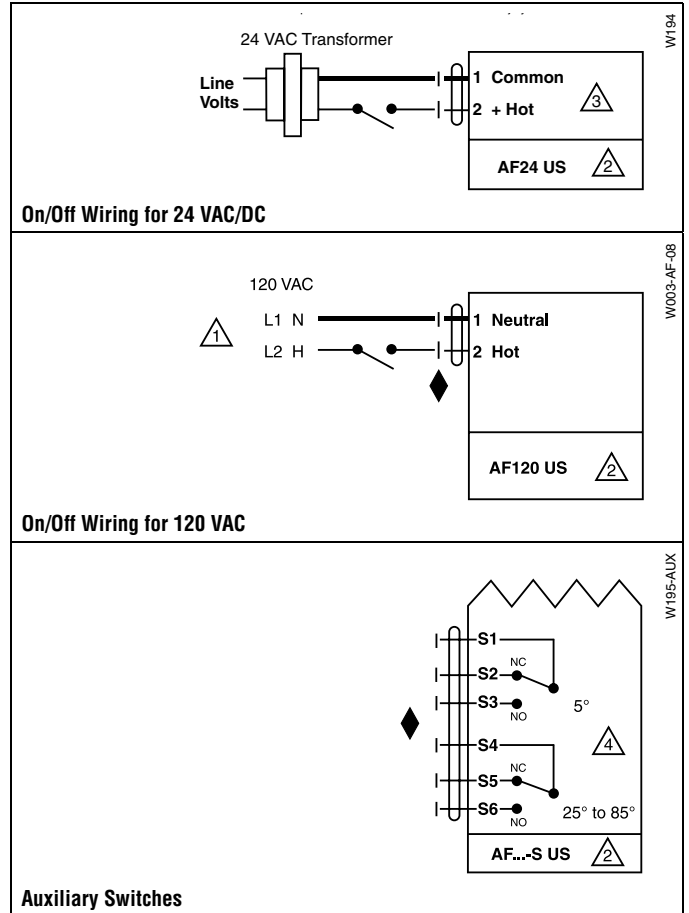
✂️ INSTALLATION NOTES

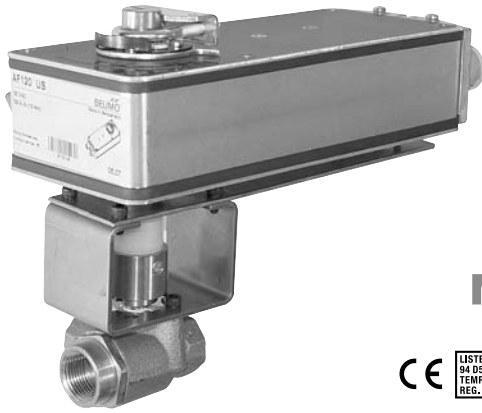
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc., AF24-S US incorporates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

📄 APPLICATION NOTES

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

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





MFT

2
YEAR
WARRANTY



Models

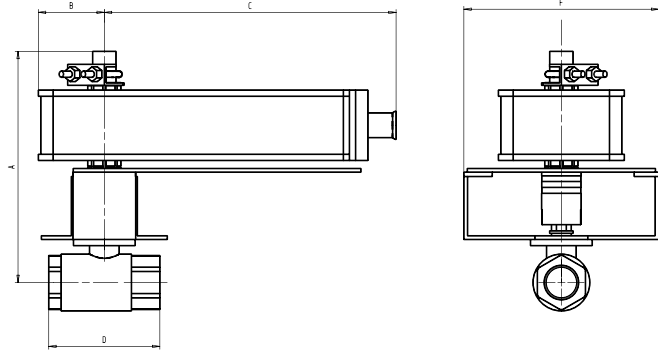
AF24-MFT US
AF24-MFT-S US w/built-in Aux. Switches
AF24-MFT95 US

| Technical Data | |
|--|--|
| Control | MFT |
| Control signal | 2 to 10 VDC, (4 to 20 mA with 500 Ω resistor) 0-135 Ω (MFT95) |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running 6 W holding 2.5 W |
| Transformer sizing | 10 VA, class 2 power |
| Electrical connection (-S model has 2 cables) | ½" conduit connector 3 ft [1m], 18 GA appliance cable |
| Overload protection | electronic throughout rotation |
| Input impedance | 100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point |
| Feedback output | 2 to 10 VDC, 0.5 mA max |
| Angle of rotation | 95° |
| Direction of Rotation | spring reversible with CW/CCW mounting motor reversible with built-in ↻/↻ switch |
| Position indication | visual indicator |
| Manual override | hex crank |
| Running time | control 150 sec. independent of load spring <20 sec. |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Housing | NEMA 2 / IP54 |
| Agency listings | UL 873, CSA C22.2 No. 24 certified, CE |
| Noise level | max. 45 dB(A) |

| AF24-MFT-S US | |
|--------------------|---|
| Auxiliary switches | 2 x SPDT, 7A (2.5A) @ 250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85° (double insulated) |

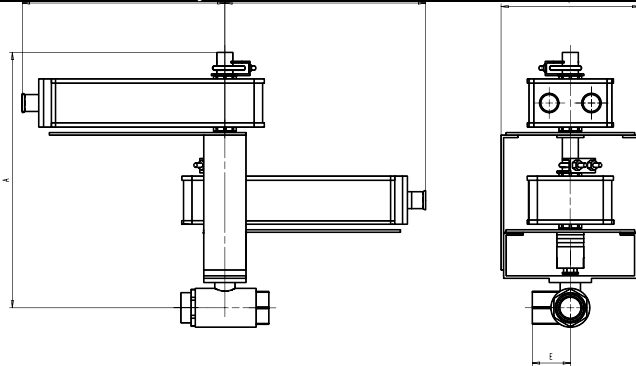
* Dual Mounted Actuators

Dimensions with 2-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | |
|------------|------|--------------------|---------|---------------------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F |
| B224VS | 400 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B225VS | 50 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.62 | 6.25 |
| B232VS | 200 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B239VS | 400 | 1½ | 40 | 7.50 | 2.00 | 8.00 | 4.37 | 6.25 |
| *B240VS | 50 | 1½ | 40 | 7.50 | 2.00 | 8.00 | 4.75 | 6.25 |
| *B249VS | 200 | 2 | 50 | 8.00 | 2.00 | 8.00 | 4.68 | 6.25 |
| B219VSS | 1000 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 |
| B224VSS | 1000 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 |
| B232VSS | 1000 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B232VSS | 1000 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 |
| *B239VSS | 1000 | 1½ | 40 | 6.70 | 2.00 | 8.00 | 4.37 | 6.25 |
| *B249VSS | 400 | 2 | 50 | 8.00 | 2.00 | 8.00 | 4.68 | 6.25 |

Dimensions with 3-Way Valve



| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F |
| B325VS | 75 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |
| B332VS | 75 | 1¼ | 32 | 7.00 | 2.00 | 8.00 | 4.13 | 2.07 | 6.25 |
| *B325VS | 200 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.56 | 1.88 | 3.86 |
| *B332VS | 200 | 1¼ | 32 | 7.00 | 2.00 | 8.00 | 4.13 | 2.07 | 6.25 |
| *B340VS | 75 | 1½ | 40 | 7.00 | 2.00 | 8.00 | 4.44 | 2.25 | 6.25 |
| *B350VS | 75 | 2 | 50 | 7.00 | 2.00 | 8.00 | 5.38 | 2.75 | 6.25 |

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Wiring Diagrams

INSTALLATION NOTES

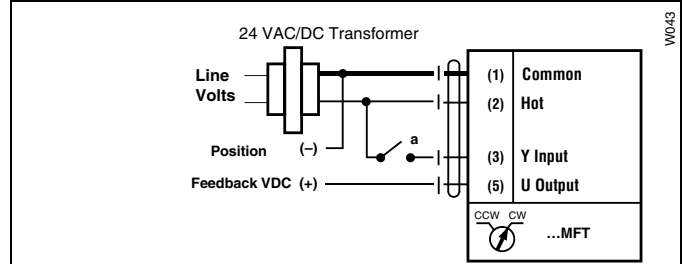
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac sink controller. The actuators internal common reference is not compatible.

APPLICATION NOTES

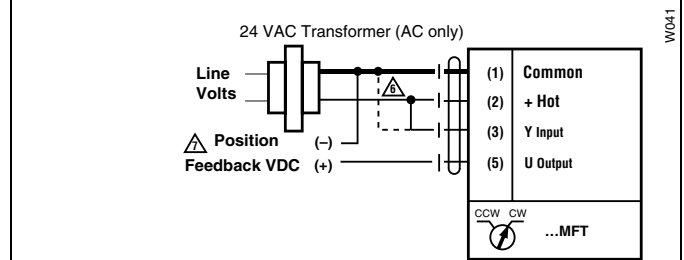
- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.
- ◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

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

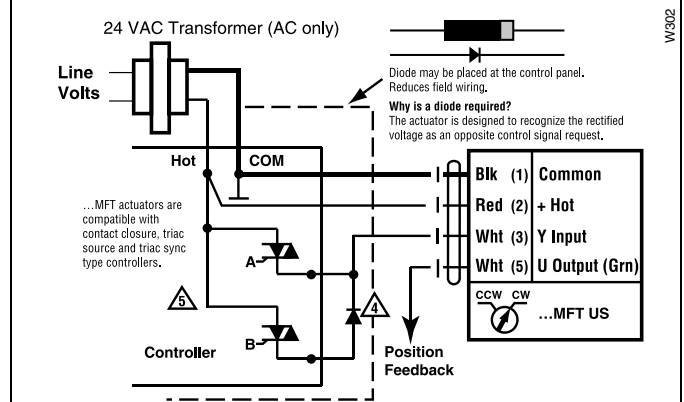
IN40099 - 09/11 - Subject to change. © Belimo Aircontrols (USA), Inc.



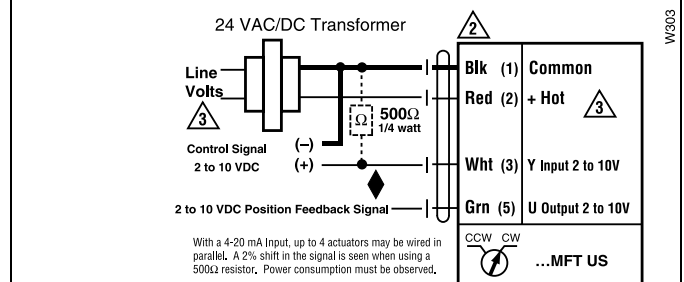
On/Off control



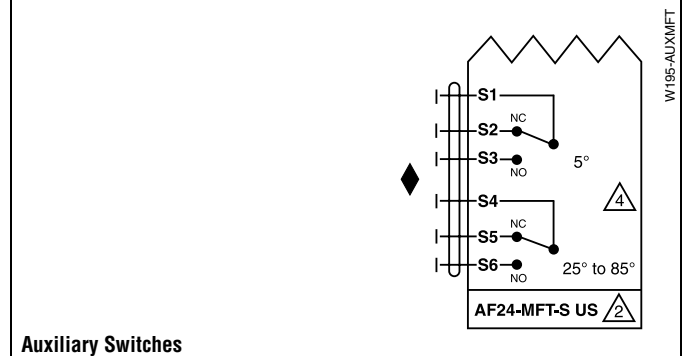
PWM, triac source and sink



Floating Point control



Proportional 2 to 10 or 4 to 20 mA control signal



Auxiliary Switches

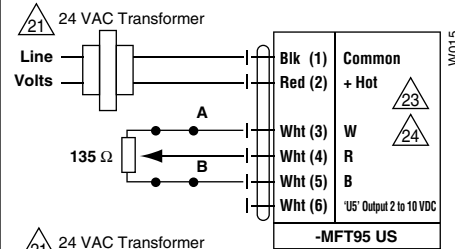
INSTALLATION NOTES

- 21 Provide overload protection and disconnect as required.
- 22 Actuators and controller must have separate transformers.
- 23 Consult controller instruction data for more detailed information.
- 24 Resistor value depends on the type of controller and the number of actuators. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

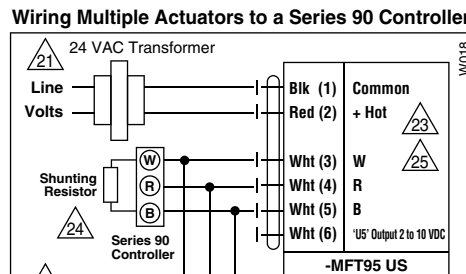
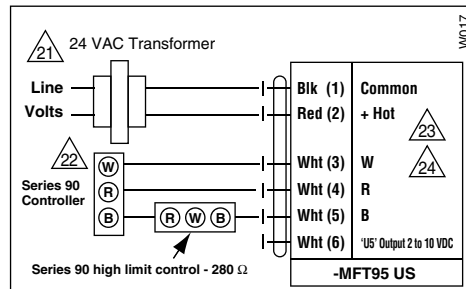
Override

| Switch A | Switch B | Damper Position |
|----------|----------|-----------------|
| | | Damper Open |
| | | Damper Closed |

The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



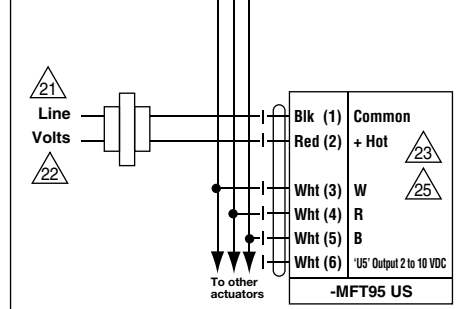
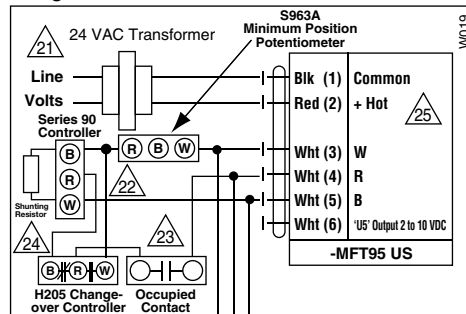
High Limit Control



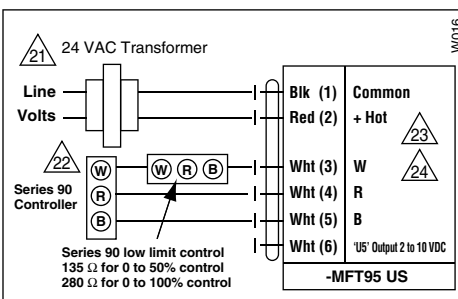
| No. of actuators | Resistance |
|------------------|------------|
| 2 | 140 Ω |
| 3 | 71.5 Ω |
| 4 | 47.5 Ω |
| 5 | 37.5 Ω |
| 6 | 28 Ω |

Resistor Kit No. ZG-R03

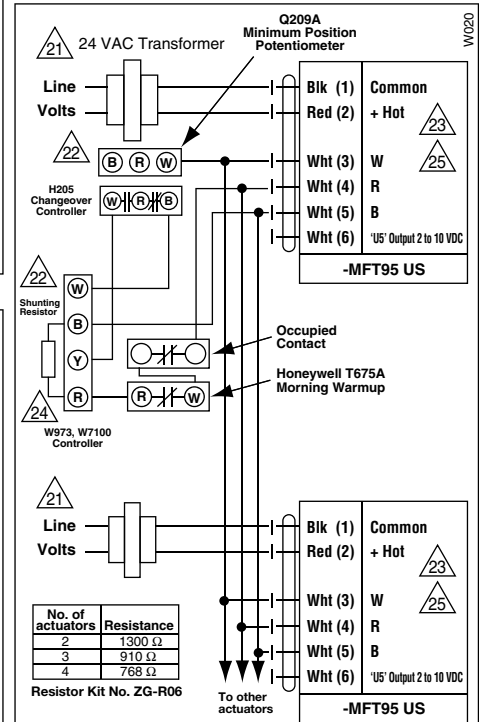
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



Low Limit Control



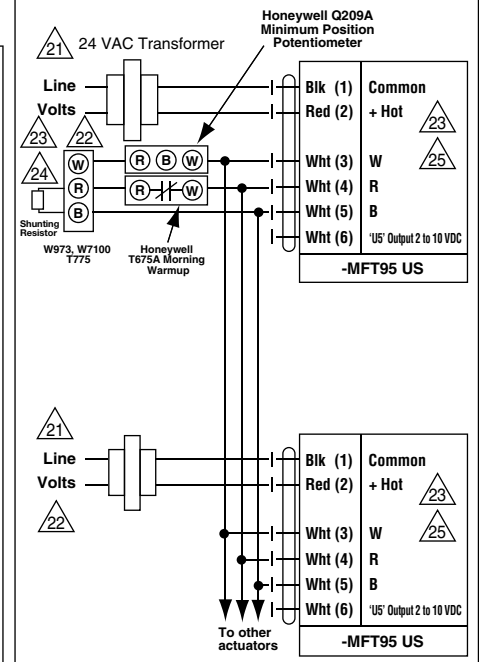
Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers

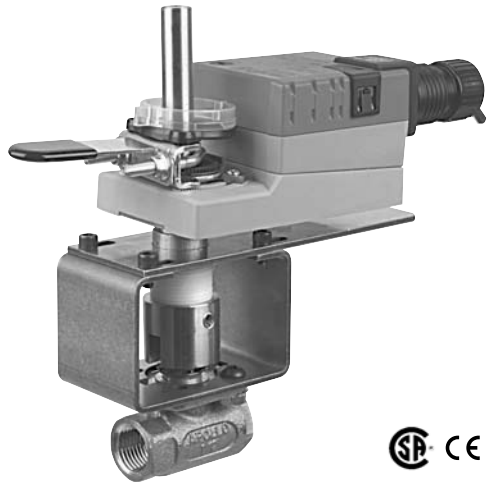


| No. of actuators | Resistance |
|------------------|------------|
| 2 | 1300 Ω |
| 3 | 910 Ω |
| 4 | 768 Ω |

Resistor Kit No. ZG-R06

Used with the W973 and W7100 controllers



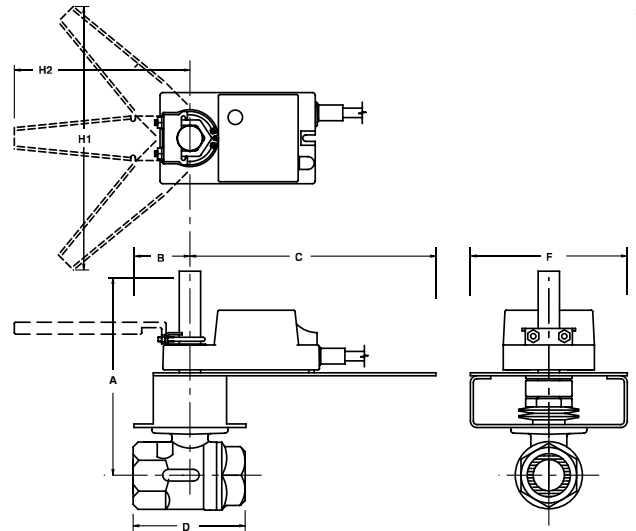


Models

LMB24-3-X1
LMX24-3-X1

| Technical Data | | |
|-----------------------|---------|--|
| Control | | On/Off, Floating Point |
| Power supply | | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running | 1.5 W |
| | holding | 0.2 W |
| Transformer sizing | | 3 VA (class 2 power source) |
| Electrical connection | | ½" conduit connector LMB24-3-X1 3 ft, 18 GA plenum rated cables |
| Overload protection | | electronic throughout 0° to 95° rotation |
| Input Impedance | | 600 Ω |
| Angle of rotation | | 95° |
| Torque | | 45 in-lb [5 Nm] |
| Direction of rotation | | reversible with switch |
| Position indication | | reflective visual indicator (snap-on) |
| Manual override | | external push button |
| Running time | | 95 seconds, constant independent of load |
| Humidity | | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | | -40° F to 176° F [-40° C to 80° C] |
| Housing | | NEMA type 2/IP54 |
| Housing material | | UL94-5VA |
| Agency listings | | cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC |
| Noise level | | <35 db(A) |
| Servicing | | maintenance free |
| Quality standard | | ISO 9001 |

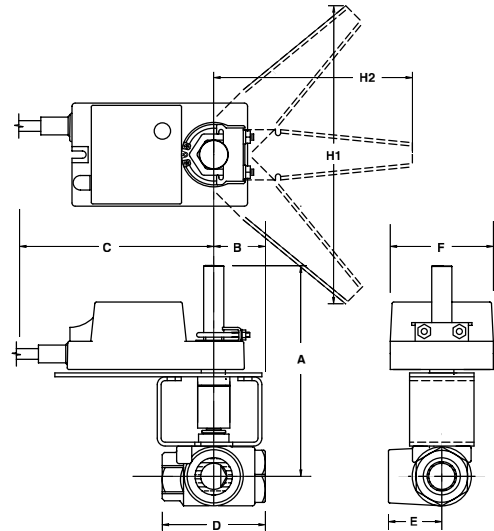
Dimensions with 2-Way Valve



PAGE7

| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
| B2050VS-01 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-02 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-04 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-15 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



PAGE11

| Valve Body | COP | Valve Nominal Size | | Dimensions (Inches) | | | | | | | |
|------------|-----|--------------------|---------|---------------------|------|------|------|------|------|------|------|
| | | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
| B315VS | 75 | ½ | 15 | 6.50 | 1.50 | 4.70 | 2.30 | 1.25 | 3.19 | 9.75 | 8.50 |

Wiring Diagrams

INSTALLATION NOTES

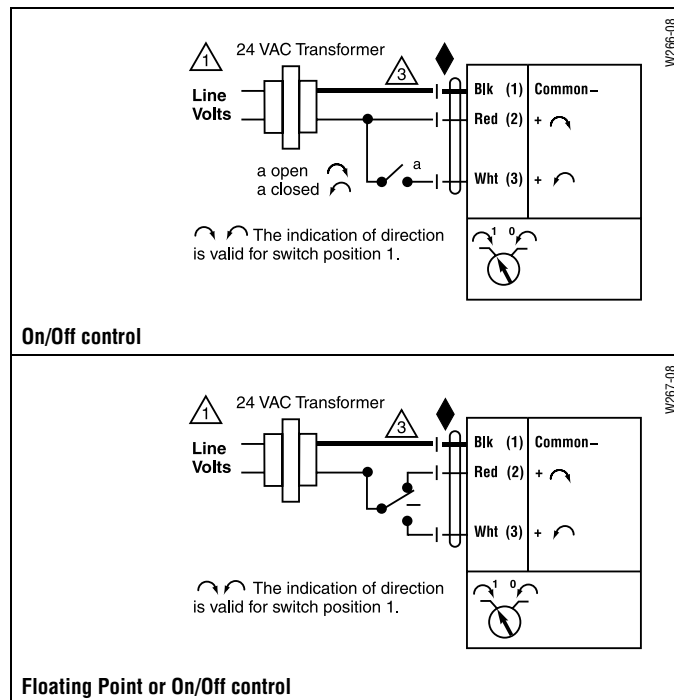
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.

APPLICATION NOTES

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

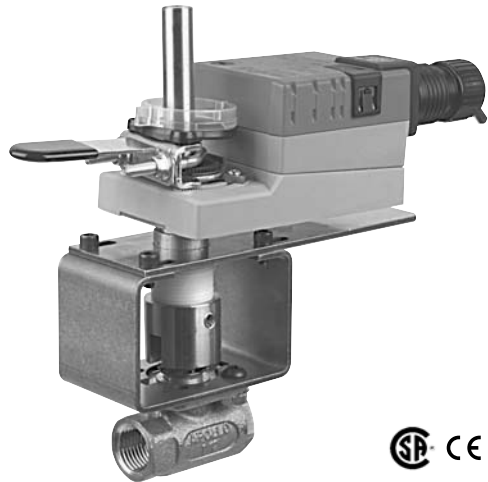
WARNING Live Electrical Components!

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Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.

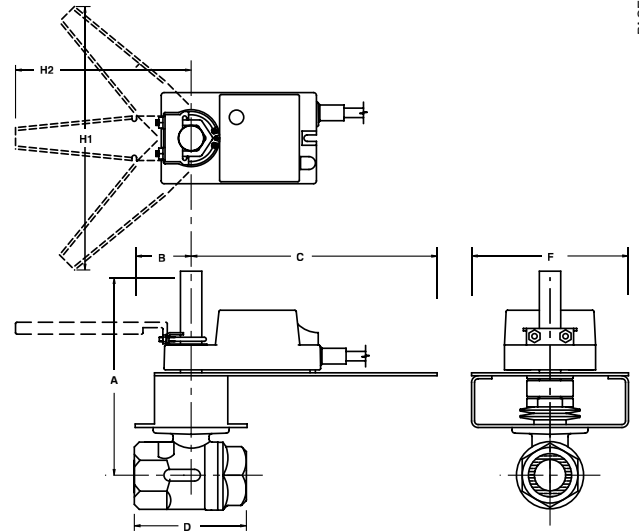


Models

LMX24-MFT-X1

| Technical Data | |
|-----------------------|--|
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | 2 W |
| Transformer sizing | 3.5 VA (class 2 power source) |
| Electrical connection | □ 3 ft [1m] □ 10 ft [3m] □ 16 ft [5m] 18 GA plenum rated cable ½" conduit connector |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input Impedance | 100k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for On/Off and Floating Point |
| Feedback | 2 to 10 VDC, 0.5 mA max VDC variable |
| Angle of rotation | 95° |
| Torque | 45 in-lb [5 Nm] |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Manual override | external push button |
| Running time | 150 seconds (default) Variable (35 to 150 secs) |
| Humidity | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | -40° F to 176° F [-40° C to 80° C] |
| Housing | NEMA type 2/IP54 |
| Housing material | UL94-5VA |
| Agency listings | cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC |
| Noise level | <35 db(A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve

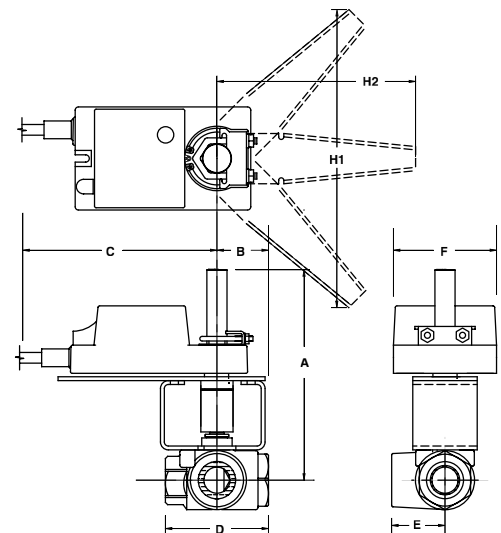


PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|
| B2050VS-01 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-02 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-04 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |
| B2050VS-15 | 50 | ½ | 15 | 6.75 | 2.00 | 6.75 | 2.25 | 4.00 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



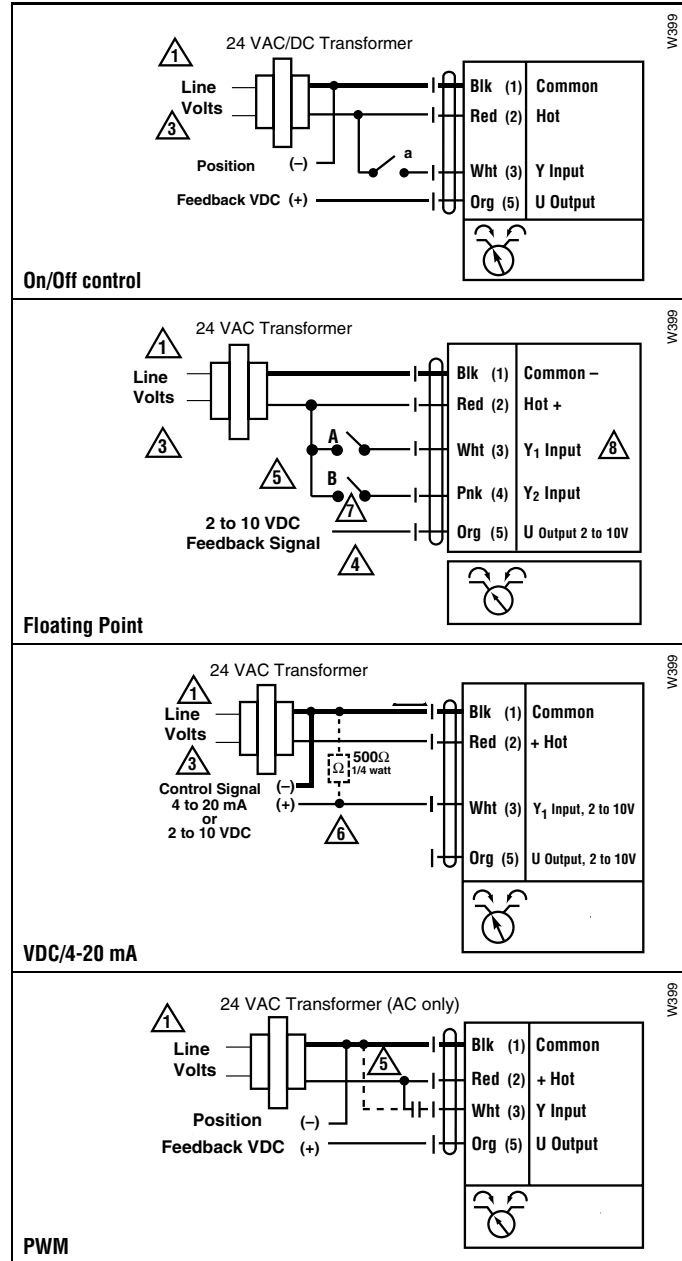
PAGE11

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|------|
| B315VS | 75 | ½ | 15 | 6.50 | 1.50 | 4.70 | 2.30 | 1.25 | 3.19 | 9.75 | 8.50 |

Wiring Diagrams

- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 6 ZG-R01 may be used.
- 7 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



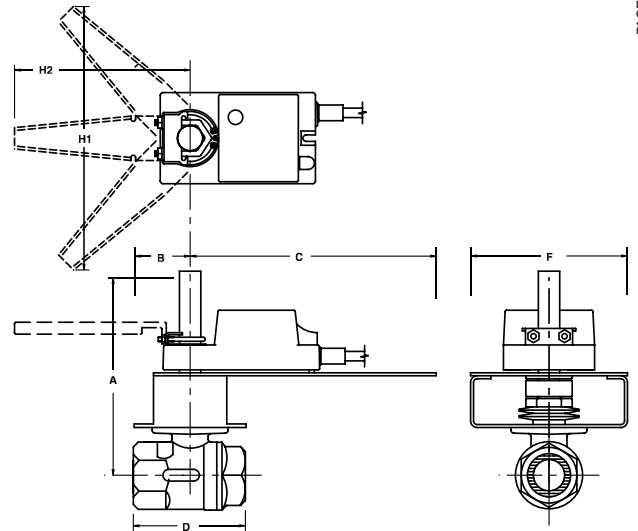


Models

NMB24-3-X1
NMX24-3-X1

| Technical Data | |
|-----------------------|--|
| Control | On/Off, Floating Point |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running 2.0 W |
| | holding 0.2 W |
| Transformer sizing | 4 VA (class 2 power source) |
| Electrical connection | 3 ft, 18 GA plenum rated cable |
| NMB24-3-X1 | ½" conduit connector |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input Impedance | 600 Ω |
| Angle of rotation | max 95°, adjustable with mechanical stop |
| Torque | 90 in-lb [10 Nm] |
| Direction of rotation | reversible with switch =CCW with decreasing control signal (10-2V) =CW with decreasing control signal (10-2V) |
| Position indication | reflective visual indicator (snap-on) |
| Manual override | external push button |
| Running time | 95 seconds, constant independent of load |
| Humidity | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | -40° F to 176° F [-40° C to 80° C] |
| Housing | NEMA type 2/IP54 |
| Housing material | UL94-5VA |
| Agency listings | cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC |
| Noise level | <45 db(A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve



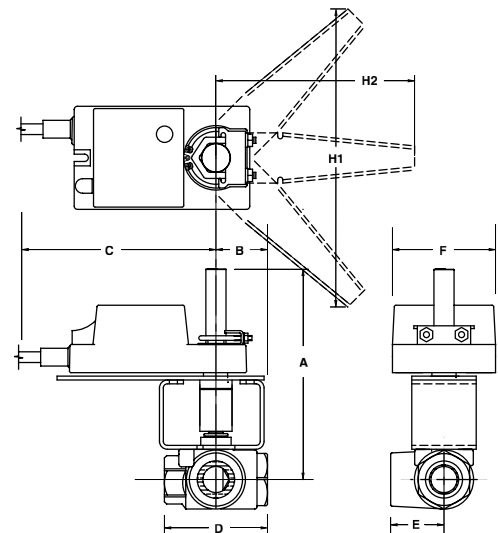
PAGE 7

Valve Nominal Size

Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|-------------|------|--------|---------|------|------|------|------|------|------|------|
| B219VS | 400 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.00 | 6.25 | 9.75 | 8.50 |
| B220VS | 400 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.12 | 6.25 | 9.75 | 8.50 |
| B2050VSS-15 | 1000 | ½ | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 | 9.75 | 8.50 |
| B219VSS | 1000 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.00 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



PAGE 11

Valve Nominal Size

Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|------|
| B320VS | 75 | ¾ | 20 | 6.70 | 1.50 | 6.88 | 2.82 | 1.62 | 3.15 | 9.75 | 8.50 |
| B325VS | 75 | 1 | 25 | 7.00 | 1.50 | 6.88 | 3.56 | 1.88 | 3.15 | 9.75 | 8.50 |

Wiring Diagrams

INSTALLATION NOTES

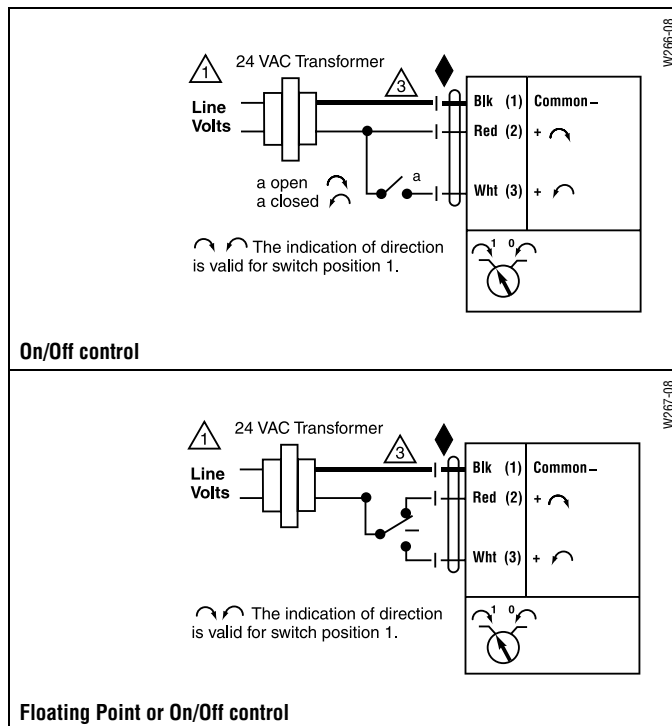
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.

APPLICATION NOTES

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

WARNING Live Electrical Components!

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



Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.

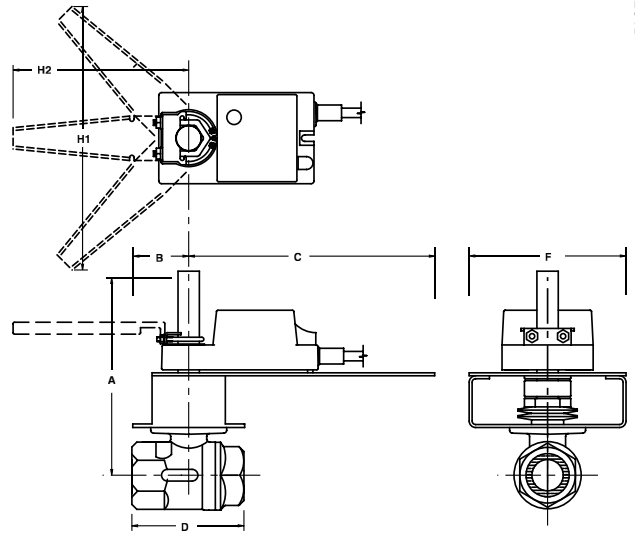


Models

NMX24-MFT-X1

| Technical Data | |
|-----------------------|--|
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | 3.5 W (1.25 W) |
| Transformer sizing | 5.5 VA (class 2 power source) |
| Electrical connection | □ 3 ft [1m] □ 10 ft [3m] □ 16 ft [5m] 18 GA plenum rated cable ½" conduit connector |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input Impedance | 100k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for On/Off and Floating Point |
| Feedback | 2 to 10 VDC, 0.5 mA max VDC variable |
| Angle of rotation | max 95°, adjust. with mechanical stop electronically variable |
| Torque | 90 in-lb [10 Nm] |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Manual override | external push button |
| Running time | 150 seconds (default) Variable (45 to 170 secs) |
| Humidity | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | -40° F to 176° F [-40° C to 80° C] |
| Housing | NEMA type 2/IP54 |
| Housing material | UL94-5VA |
| Agency listings | cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC |
| Noise level | <45 db(A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve

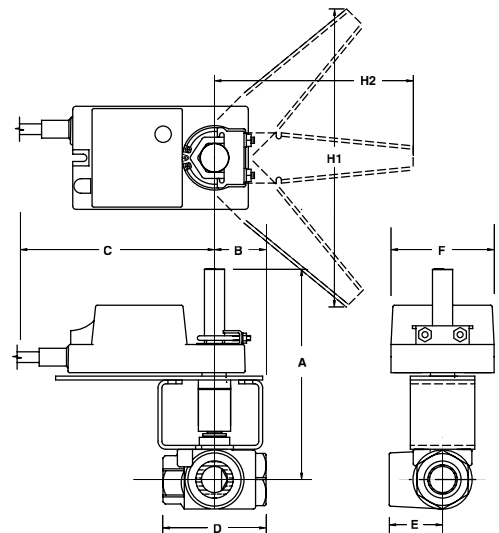


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Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|-------------|------|--------|---------|------|------|------|------|------|------|------|
| B219VS | 400 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.00 | 6.25 | 9.75 | 8.50 |
| B220VS | 400 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.12 | 6.25 | 9.75 | 8.50 |
| B2050VSS-15 | 1000 | ½ | 15 | 6.70 | 2.00 | 8.00 | 2.25 | 6.25 | 9.75 | 8.50 |
| B219VSS | 1000 | ¾ | 20 | 6.70 | 2.00 | 8.00 | 3.00 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



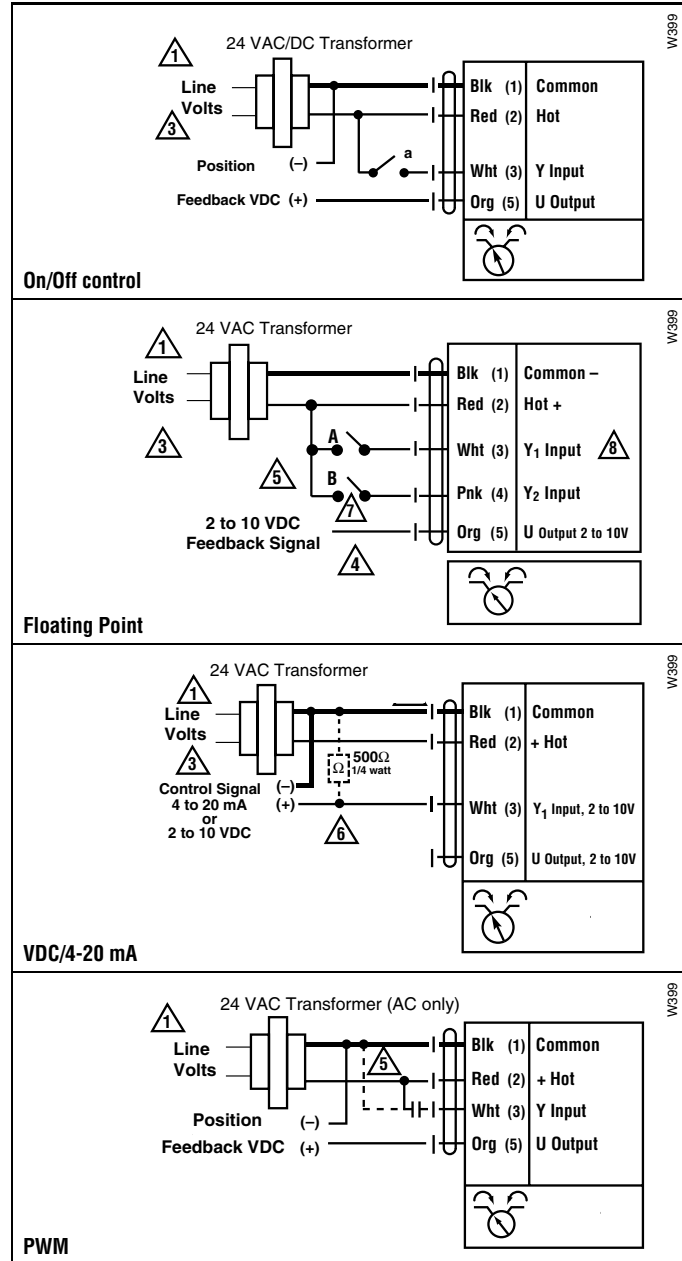
PAGE11

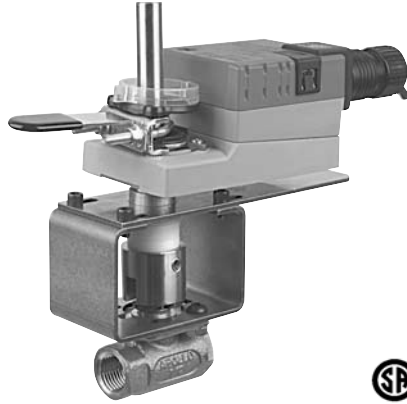
Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|------|
| B320VS | 75 | ¾ | 20 | 6.70 | 1.50 | 6.88 | 2.82 | 1.62 | 3.15 | 9.75 | 8.50 |
| B325VS | 75 | 1 | 25 | 7.00 | 1.50 | 6.88 | 3.56 | 1.88 | 3.15 | 9.75 | 8.50 |

Wiring Diagrams

- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 6 ZG-R01 may be used.
- 7 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



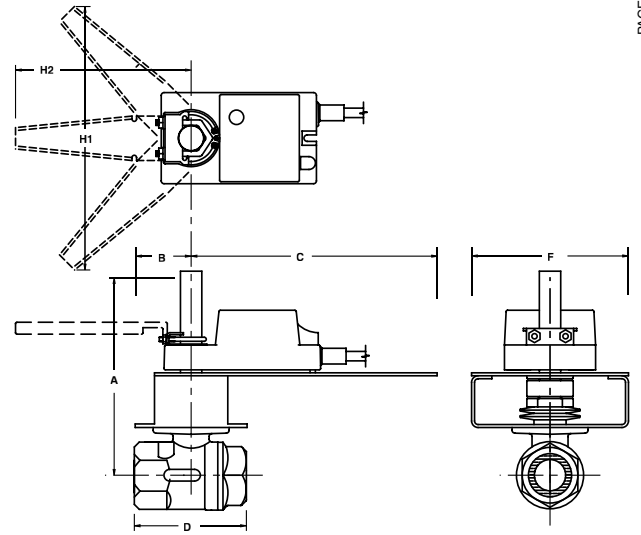


Models

AMB24-3-X1
AMX24-3-X1

| Technical Data | |
|-----------------------|--|
| Control | On/Off, Floating Point |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running 2.5 W |
| | holding 0.2 W |
| Transformer sizing | 5.5 VA (class 2 power source) |
| Electrical connection | ½" conduit connector |
| AMB24-3-X1 | 3 ft, 18 GA plenum rated cable |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input Impedance | 600 Ω |
| Angle of rotation | max 95°, adjustable with mechanical stop |
| Torque | 180 in-lb [20 Nm] |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Manual override | external push button |
| Running time | 95 seconds, constant independent of load |
| Humidity | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | -40° F to 176° F [-40° C to 80° C] |
| Housing | NEMA type 2/IP54 |
| Housing material | UL94-5VA |
| Agency listings | cULus acc. to UL 60730-1/-2-14, CAN/CSA C22.2 No. 24 certified, CE acc. to 73/23/EEC |
| Noise level | <45 db(A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve

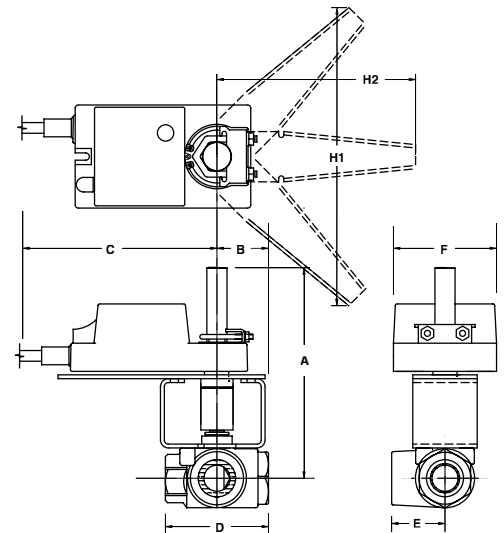


PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|------------|------|--------|---------|------|------|------|------|------|------|------|
| B224VS | 400 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 | 9.75 | 8.50 |
| B225VS | 200 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.62 | 6.25 | 9.75 | 8.50 |
| B232VS | 400 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 | 9.75 | 8.50 |
| B224VSS | 1000 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 | 9.75 | 8.50 |
| B232VSS | 1000 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



PAGE11

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|------|
| B320VS | 75 | ¾ | 20 | 6.70 | 1.50 | 6.88 | 2.82 | 1.62 | 3.15 | 9.75 | 8.50 |
| B325VS | 75 | 1 | 25 | 7.00 | 1.50 | 6.88 | 3.56 | 1.88 | 3.15 | 9.75 | 8.50 |
| B332VS | 75 | 1¼ | 32 | 7.00 | 2.00 | 7.48 | 4.13 | 2.07 | 3.46 | 9.75 | 8.50 |

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Wiring Diagrams

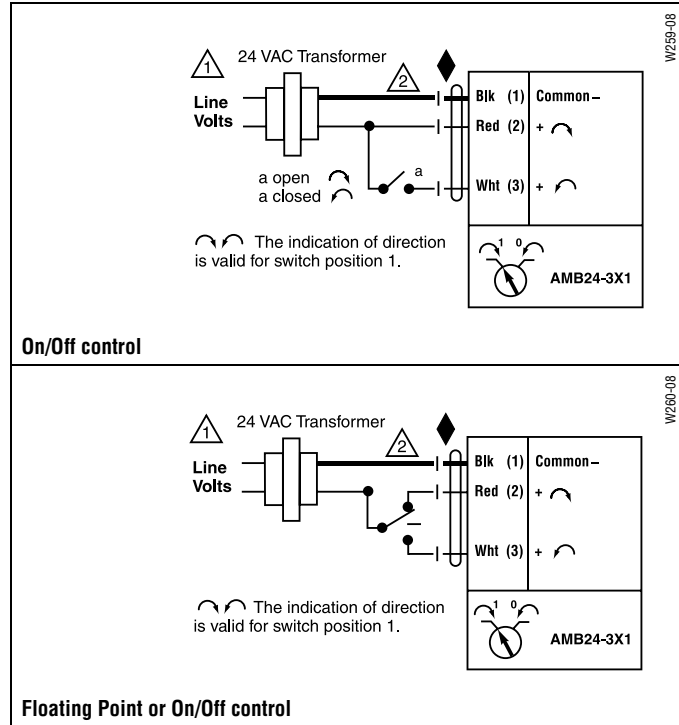
INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 5 Only connect common to neg. (-) leg of control circuits.

APPLICATION NOTES

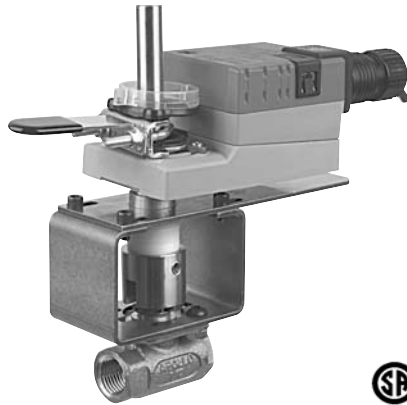
- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

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



Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.

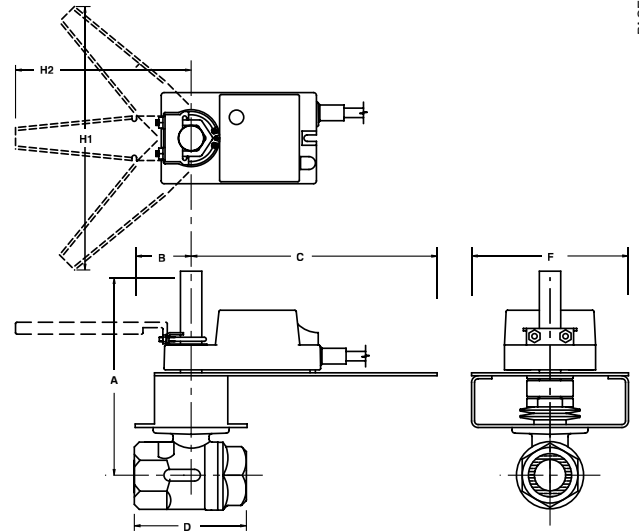


Models

AMX24-MFT-X1
AMX24-MFT95-X1

| Technical Data | |
|-----------------------|--|
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | 4 W (1.25 W) |
| Transformer sizing | 6 VA (class 2 power source) |
| Electrical connection | □ 3 ft [1m] □ 10 ft [3m] □ 16 ft [5m] 18 GA plenum rated cable ½" conduit connector |
| Overload protection | electronic throughout 0° to 95° rotation |
| Input Impedance | 100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for On/Off and Floating Point |
| Feedback | 2 to 10 VDC, 0.5 mA max VDC variable |
| Angle of rotation | max 95°, adjust. with mechanical stop electronically variable |
| Torque | 180 in-lb [20 Nm] |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Manual override | external push button |
| Running time | 150 seconds (default) Variable (90 to 350 secs) |
| Humidity | 5 to 95% RH non-condensing (EN 60730-1) |
| Ambient temperature | -22° F to 122° F [-30° C to 50° C] |
| Storage temperature | -40° F to 176° F [-40° C to 80° C] |
| Housing | NEMA type 2/IP54 |
| Housing material | UL94-5VA |
| Agency listings | cULus acc. to UL 60730-1/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC |
| Noise level | <45 db(A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve



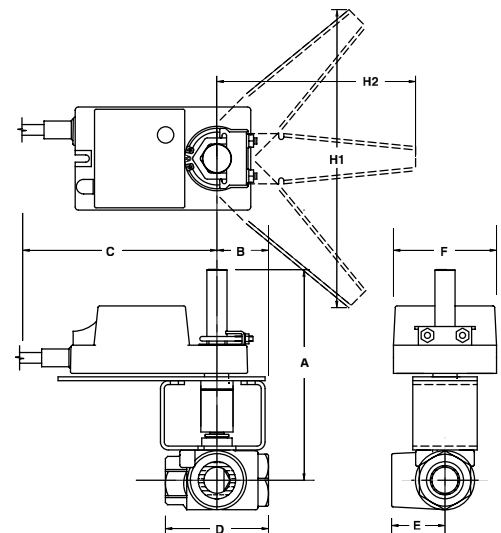
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Valve Nominal Size

Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|------------|------|--------|---------|------|------|------|------|------|------|------|
| B224VS | 400 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 | 9.75 | 8.50 |
| B225VS | 200 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.62 | 6.25 | 9.75 | 8.50 |
| B232VS | 400 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 | 9.75 | 8.50 |
| B224VSS | 1000 | 1 | 25 | 7.00 | 2.00 | 8.00 | 3.37 | 6.25 | 9.75 | 8.50 |
| B232VSS | 1000 | 1¼ | 32 | 7.25 | 2.00 | 8.00 | 3.97 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



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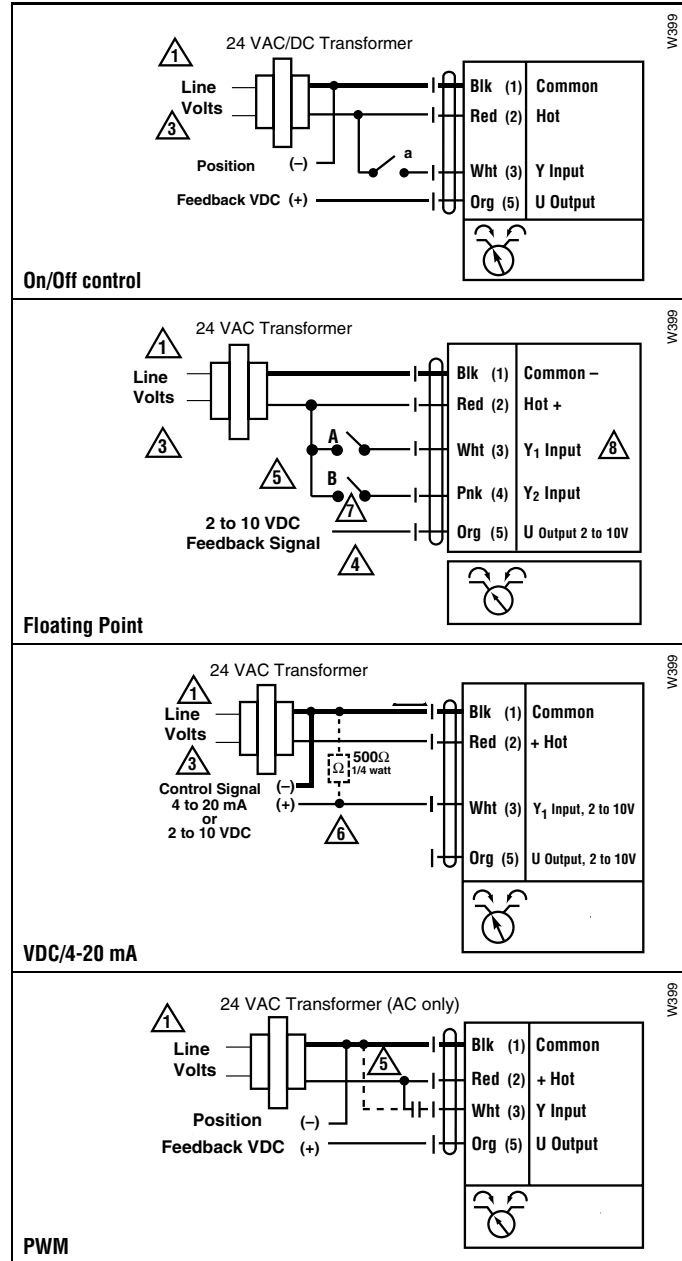
Valve Nominal Size

Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|------|------|------|------|------|------|------|------|
| B320VS | 75 | ¾ | 20 | 6.70 | 1.50 | 6.88 | 2.82 | 1.62 | 3.15 | 9.75 | 8.50 |
| B325VS | 75 | 1 | 25 | 7.00 | 1.50 | 6.88 | 3.56 | 1.88 | 3.15 | 9.75 | 8.50 |
| B332VS | 75 | 1¼ | 32 | 7.00 | 2.00 | 7.48 | 4.13 | 2.07 | 3.46 | 9.75 | 8.50 |

Wiring Diagrams

- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 6 ZG-R01 may be used.
- 7 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



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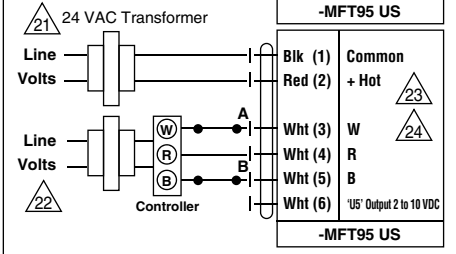
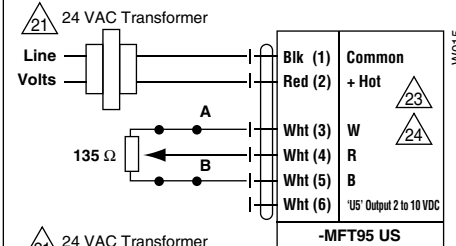
INSTALLATION NOTES

- 21 Provide overload protection and disconnect as required.
- 22 Actuators and controller must have separate transformers.
- 23 Consult controller instruction data for more detailed information.
- 24 Resistor value depends on the type of controller and the number of actuators. No resistor is used for one actuator. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

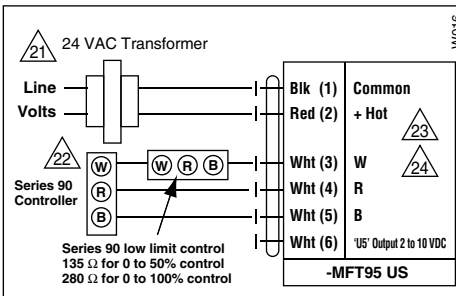
Override

| Switch A | Switch B | Damper Position |
|----------|----------|-----------------|
| | | Damper Open |
| | | Damper Closed |

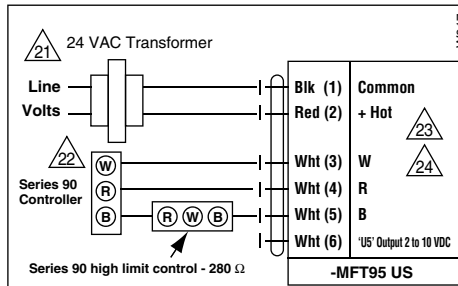
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



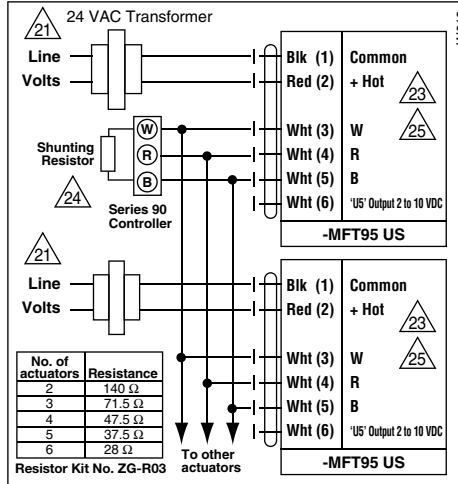
Low Limit Control



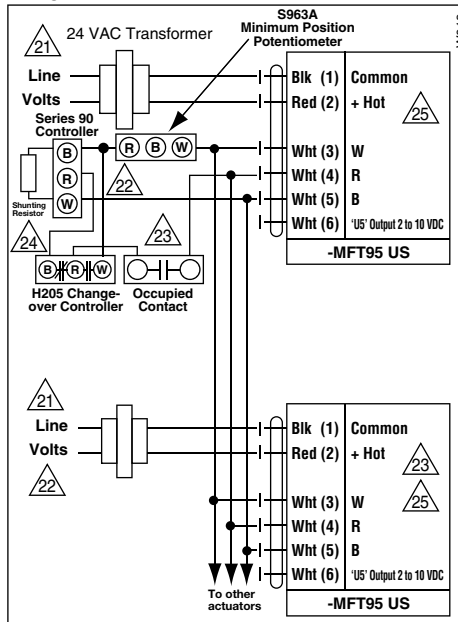
High Limit Control



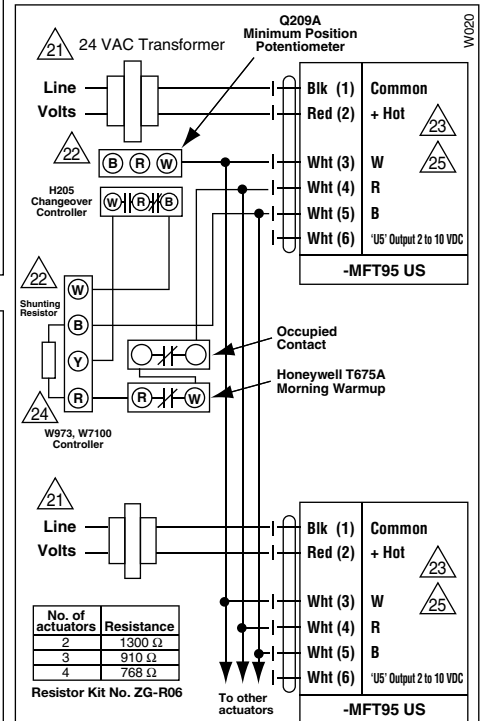
Wiring Multiple Actuators to a Series 90 Controller



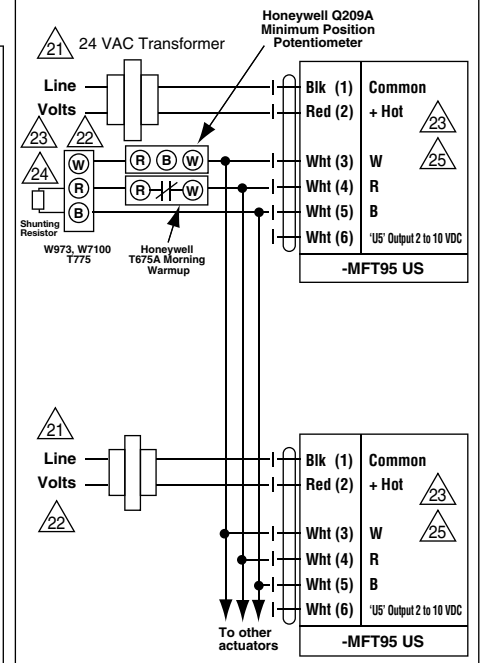
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer

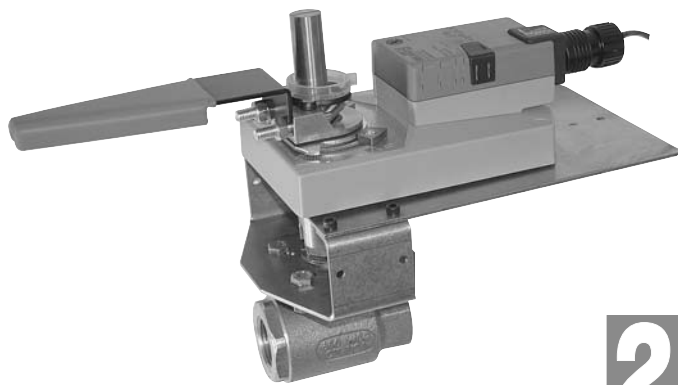


Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers



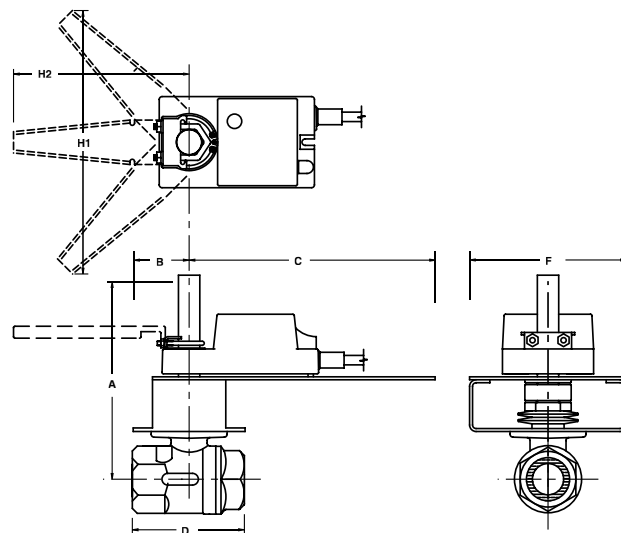


Models

GMB24-3-X1
2xGMB24-3-X1

| Technical Data | |
|-----------------------|---|
| Control | On/Off, Floating Point |
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running 4 W holding 2 W |
| Transformer sizing | 6 VA (Class 2 power source) |
| Electrical connection | □ 3 ft [1m] 18 GA plenum rated cable ½" conduit connector |
| Overload protection | electronic throughout stroke |
| Angle of rotation | 95° |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Running time | 150 seconds, constant independent of load |
| Humidity | 5 to 95% RH non-condensing |
| Ambient temperature | -22°F to 122°F [-30°C to 50°C] |
| Housing | NEMA 2/IP54 with cable entry down |
| Housing material | UL94-5V (flammability rating) |
| Agency listings | cULus acc. to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC |
| Noise level | <45 dB(A) |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve

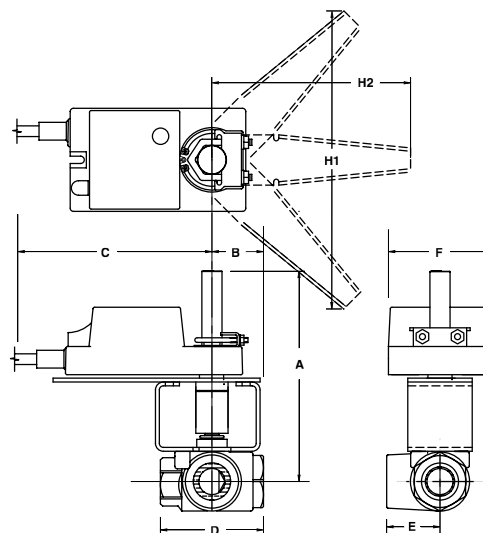


PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|------------|------|--------|---------|------|------|------|------|------|------|------|
| B239VS | 400 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.37 | 6.25 | 9.75 | 8.50 |
| B249VS | 200 | 2 | 50 | 7.50 | 3.00 | 8.00 | 4.68 | 6.25 | 9.75 | 8.50 |
| B239VSS | 1000 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.37 | 6.25 | 9.75 | 8.50 |
| B249VSS | 400 | 2 | 50 | 7.50 | 3.00 | 8.00 | 4.68 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



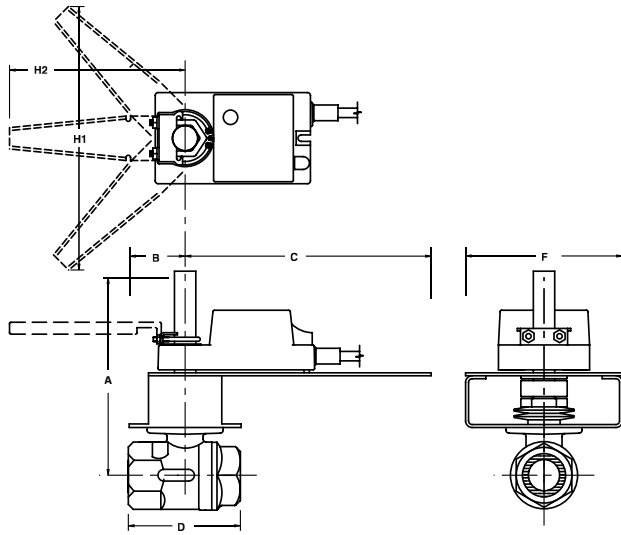
PAGE11

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|-------|------|------|------|------|------|------|------|
| B340VS | 75 | 1½ | 40 | 7.00 | 2.00 | 8.00 | 4.44 | 2.25 | 6.25 | 9.75 | 8.50 |
| B350VS | 75 | 2 | 50 | 15.00 | 8.00 | 8.00 | 5.38 | 2.75 | 6.25 | 9.25 | 8.50 |

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Dimensions with 2xGM... and 2-Way Valve



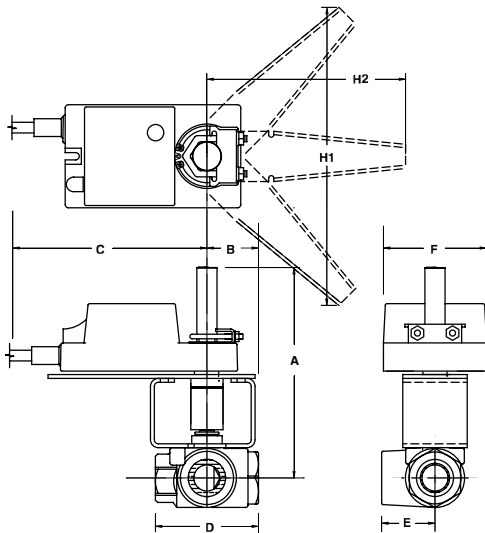
PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1* | H2* |
|------------|------|--------|---------|-------|------|------|------|------|------|------|
| B240VS | 400 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.75 | 6.25 | 9.75 | 8.50 |
| B250VS | 200 | 2 | 50 | 15.00 | 3.00 | 8.00 | 5.37 | 6.25 | 9.75 | 8.50 |
| B265VS | 100 | 2½ | 65 | 15.00 | 3.00 | 8.00 | 6.25 | 6.25 | 9.75 | 8.50 |
| B280VS | 50 | 3 | 80 | 15.00 | 3.00 | 8.00 | 6.75 | 6.25 | 9.75 | 8.50 |
| B249VSS | 1000 | 2 | 50 | 7.50 | 3.00 | 8.00 | 4.68 | 6.25 | 9.75 | 8.50 |
| B265VSS | 200 | 2½ | 65 | 15.00 | 3.00 | 8.00 | 6.25 | 6.25 | 9.75 | 8.50 |

*Handles not available on spring return series or dual mounted actuators

Dimensions with 2xGM... and 3-Way Valve



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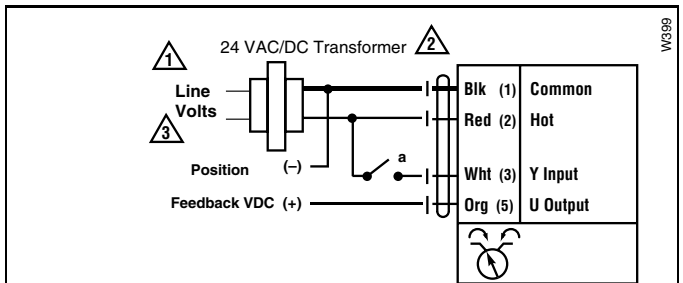
Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1* | H2* |
|------------|-----|--------|---------|-------|------|------|------|------|------|------|------|
| B350VS | 200 | 2 | 50 | 15.00 | 8.00 | 8.00 | 5.38 | 2.75 | 6.25 | 9.75 | 8.50 |

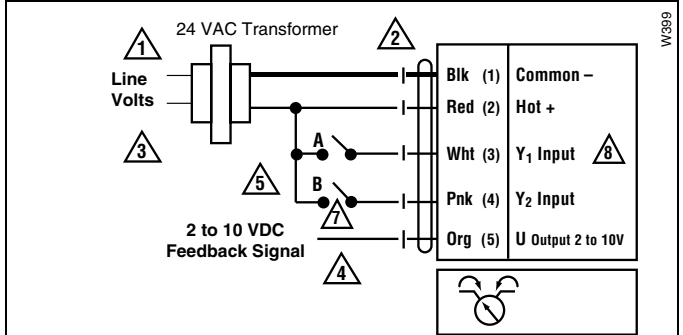
*Handles not available on spring return series or dual mounted actuators

Wiring Diagrams

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 7 Contact closures A & B also can be triacs.
- 8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



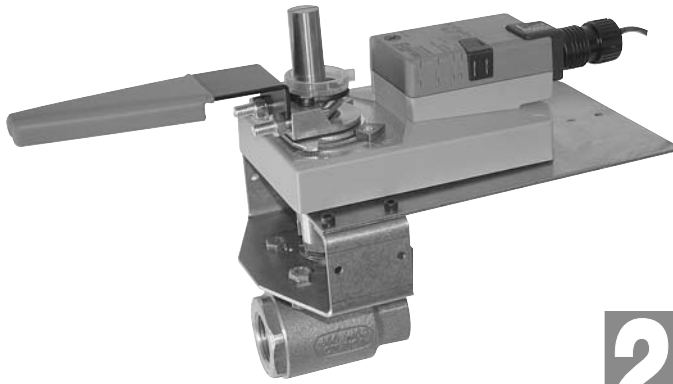
On/Off control



Floating Point

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.

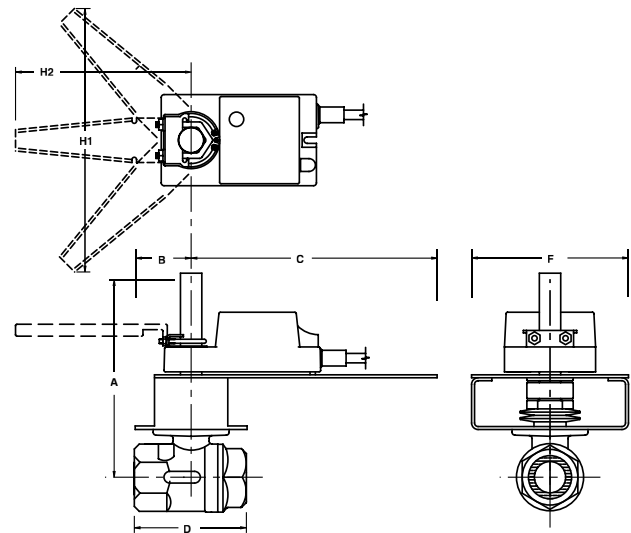


Models

GMX24-MFT-X1
 *2xGMX24-MFT-X1
 GMX24-MFT95-X1

| Technical Data | |
|-----------------------|--|
| Control | On/Off, Floating Point, 2 to 10 VDC |
| Power supply | 24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10% |
| Power consumption | running 4.5 W holding 3 W |
| Transformer sizing | 7 VA (Class 2 power source) |
| Electrical connection | □ 3 ft [1m] 18 GA plenum rated cable ½" conduit connector |
| Overload protection | electronic throughout stroke |
| Input impedance | 100k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for On/Off and Floating Point |
| Feedback | 2 to 10 VDC, 0.5 mA max VDC variable |
| Angle of rotation | 95° |
| Direction of rotation | reversible with switch |
| Position indication | reflective visual indicator (snap-on) |
| Running time | 150 seconds, constant independent of load |
| Humidity | 5 to 95% RH non-condensing |
| Ambient temperature | -22°F to 122°F [-30°C to 50°C] |
| Housing | NEMA 2/IP54 with cable entry down |
| Housing material | UL94-5V (flammability rating) |
| Agency listings | cULus acc. to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC |
| Noise level | <45 dB(A) |
| Quality standard | ISO 9001 |

Dimensions with 2-Way Valve

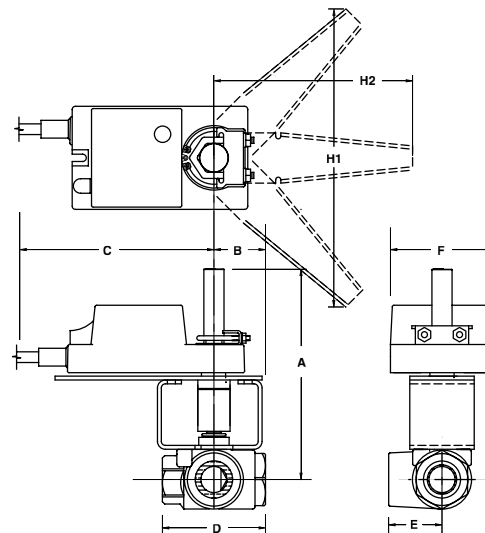


PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1 | H2 |
|------------|------|--------|---------|------|------|------|------|------|------|------|
| B239VS | 400 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.37 | 6.25 | 9.75 | 8.50 |
| B249VS | 200 | 2 | 50 | 7.50 | 3.00 | 8.00 | 4.68 | 6.25 | 9.75 | 8.50 |
| B239VSS | 1000 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.37 | 6.25 | 9.75 | 8.50 |
| B249VSS | 400 | 2 | 50 | 7.50 | 3.00 | 8.00 | 4.68 | 6.25 | 9.75 | 8.50 |

Dimensions with 3-Way Valve



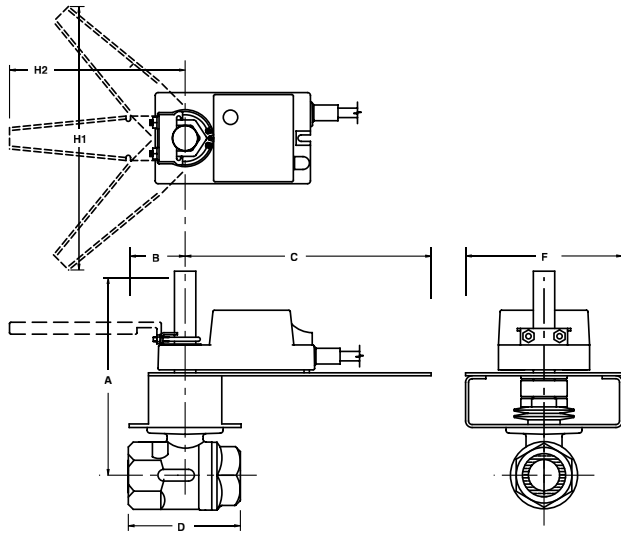
PAGE11

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1 | H2 |
|------------|-----|--------|---------|-------|------|------|------|------|------|------|------|
| B340VS | 75 | 1½ | 40 | 7.00 | 2.00 | 8.00 | 4.44 | 2.25 | 6.25 | 9.75 | 8.50 |
| B350VS | 75 | 2 | 50 | 15.00 | 8.00 | 8.00 | 5.38 | 2.75 | 6.25 | 9.25 | 8.50 |

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Dimensions with 2xGM... and 2-Way Valve



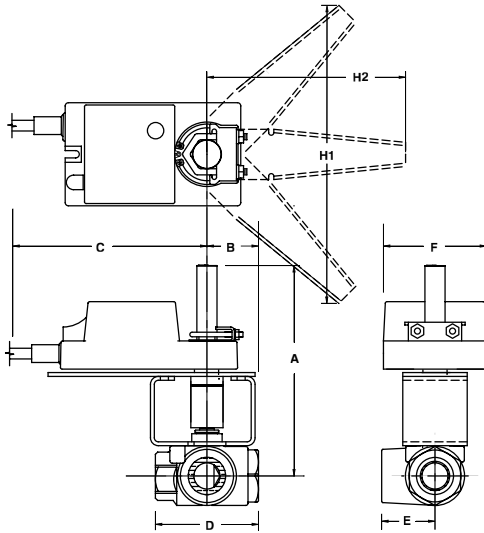
PAGE7

Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | F | H1* | H2* |
|------------|-----|--------|---------|-------|------|------|------|------|------|------|
| B240VS | 400 | 1½ | 40 | 7.50 | 3.00 | 8.00 | 4.75 | 6.25 | 9.75 | 8.50 |
| B250VS | 200 | 2 | 50 | 15.00 | 3.00 | 8.00 | 5.37 | 6.25 | 9.75 | 8.50 |
| B265VS | 100 | 2½ | 65 | 15.00 | 3.00 | 8.00 | 6.25 | 6.25 | 9.75 | 8.50 |
| B280VS | 50 | 3 | 80 | 15.00 | 3.00 | 8.00 | 6.75 | 6.25 | 9.75 | 8.50 |
| B265VSS | 200 | 2½ | 65 | 15.00 | 3.00 | 8.00 | 6.25 | 6.25 | 9.75 | 8.50 |
| B280VSS | 100 | 3 | 80 | 15.00 | 3.00 | 8.00 | 6.75 | 6.25 | 9.75 | 8.50 |

*Handles not available on spring return series or dual mounted actuators

Dimensions with 2xGM... and 3-Way Valve



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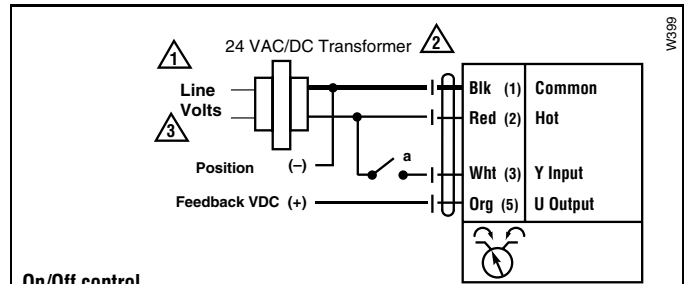
Valve Nominal Size Dimensions (Inches)

| Valve Body | COP | Inches | DN [mm] | A | B | C | D | E | F | H1* | H2* |
|------------|-----|--------|---------|-------|------|------|------|------|------|------|------|
| B350VS | 200 | 2 | 50 | 15.00 | 8.00 | 8.00 | 5.38 | 2.75 | 6.25 | 9.75 | 8.50 |

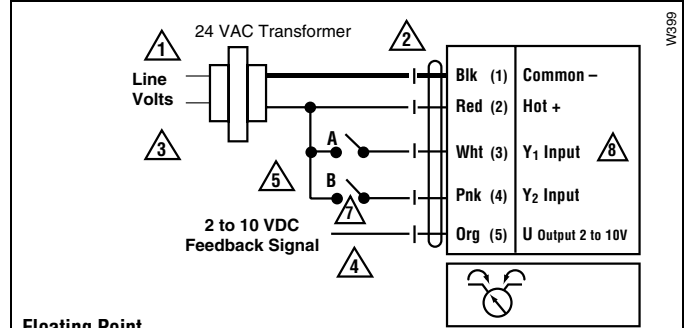
*Handles not available on spring return series or dual mounted actuators

Wiring Diagrams

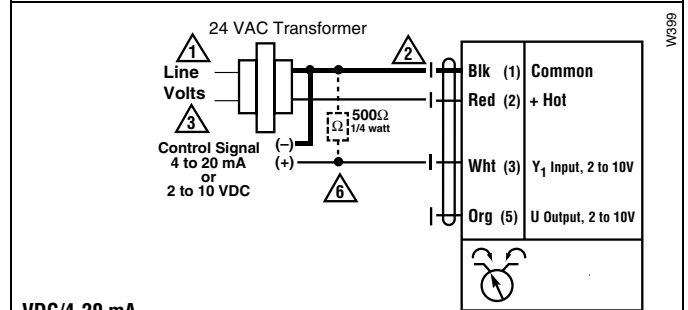
- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible. Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 5 ZG-R01 may be used.
- 6 Contact closures A & B also can be triacs.
- 7 A & B should both be closed for triac source and open for triac sink.
- 8 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



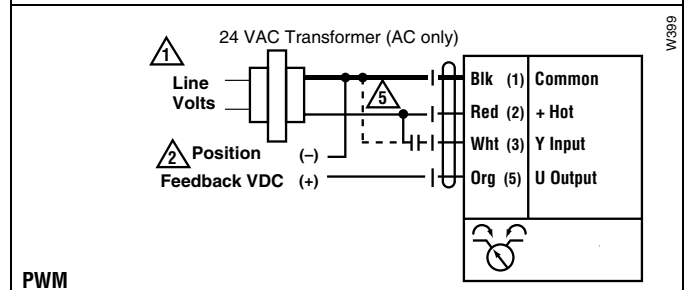
On/Off control



Floating Point



VDC/4-20 mA



PWM

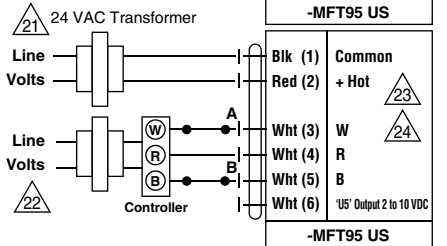
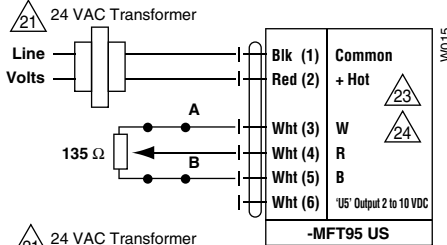
INSTALLATION NOTES

- 21 Provide overload protection and disconnect as required.
- 22 Actuators and controller must have separate transformers.
- 23 Consult controller instruction data for more detailed information.
- 24 Resistor value depends on the type of controller and the number of actuators. Honeywell® resistor kits may also be used.
- 25 To reverse control rotation, use the reversing switch.

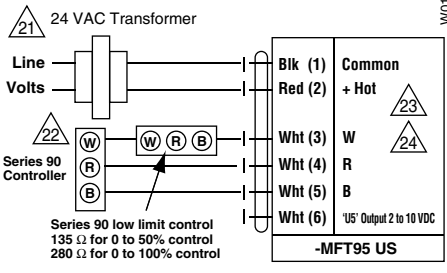
Override

| Switch A | Switch B | Damper Position |
|----------|----------|-----------------|
| | | Damper Open |
| | | Damper Closed |

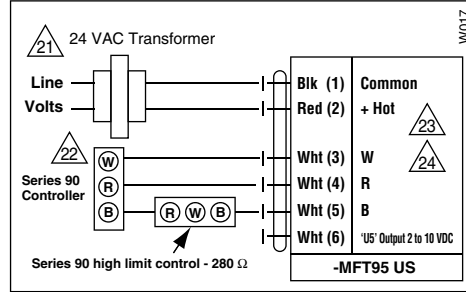
The direction of rotation switch is set so that the fail safe position and the position of the damper is closed with no signal at wire R.



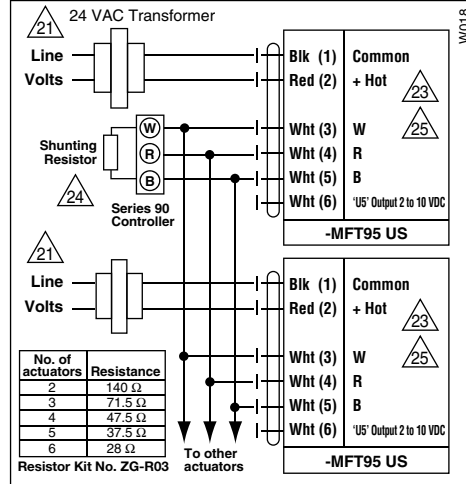
Low Limit Control



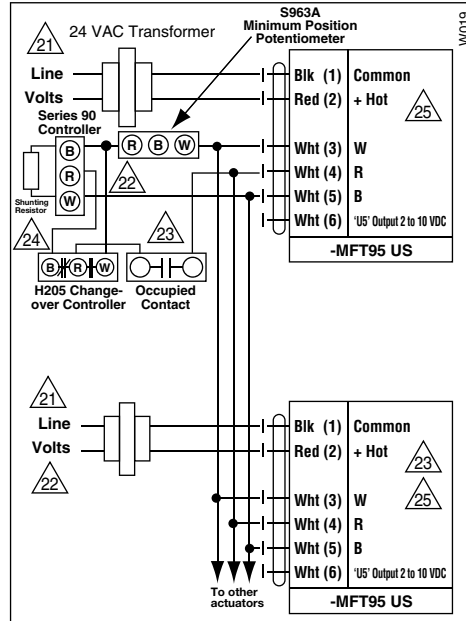
High Limit Control



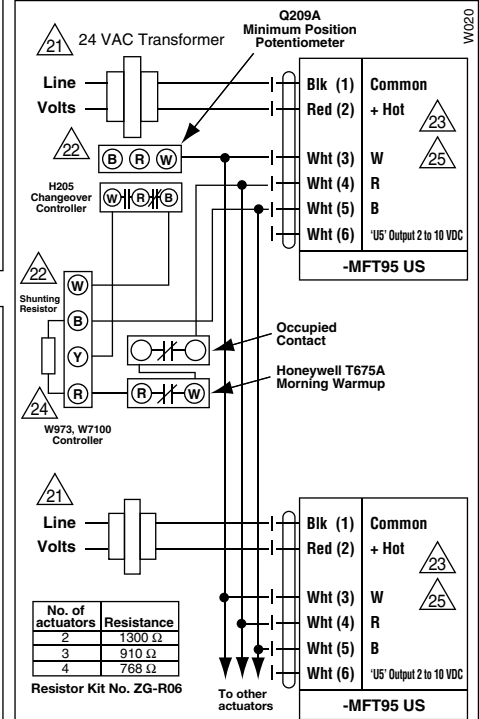
Wiring Multiple Actuators to a Series 90 Controller



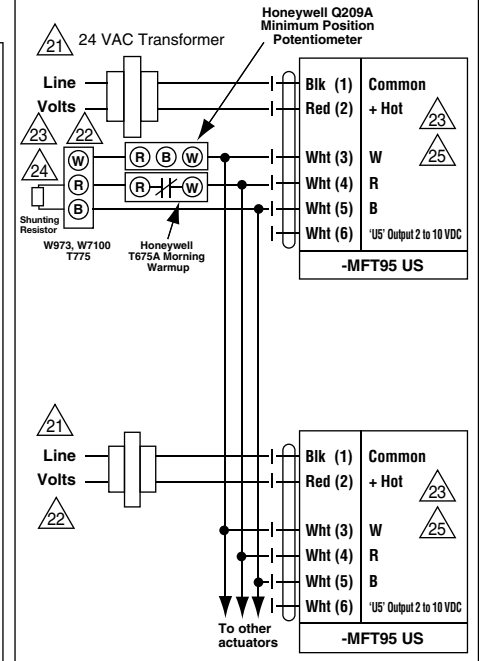
Wiring Multiple Actuators to a Series 90 Controller using a Minimum Position Potentiometer



Typical wiring diagrams for multiple actuators used with the W973, W7100 and T775 controllers



Used with the W973 and W7100 controllers





Models

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

| Technical Data | |
|---------------------------|--|
| Power supply | 24 VAC 50/60Hz, single phase |
| Electrical Connection | ½" Conduit Connector, screw terminals |
| Overload Protection | Thermally Protected 135°C cut-out |
| Motor Protection | SY1 H Class Insulation SY2... - SY5... F Class Insulation |
| Geartrain | High Alloy Steel gear sets, self locking |
| Operating Range | SY...-24 On/Off SY...-24MFT 2-10vdc, 4-20mA, 1-5vdc |
| Sensitivity | SY...-24MFT 0.2mA / 100mV |
| Feedback | SY...-24MFT 2-10vdc, 4-20mA |
| Angle of Rotation | Mechanically limited to 95° |
| Direction of Rotation | Reversible |
| Position Indication | Top mounted domed indicator |
| Internal Humidity Control | Resistive Heating Element |
| Auxiliary Switches | (2) SPDT, 10A 250VAC Factory Set for 3° and 87° change of state |
| Ambient Temperature | -22°F to 150°F [-30°C to 65°C] |
| Humidity Range | up to 95% |
| Housing Type | IP67, NEMA 4X |
| Housing Material | Die Cast Aluminum Alloy |
| Agency Listings | ISO, CE, cCSAus |

Attention

SY Series actuators are fractional horsepower devices, and utilize **full-wave power supplies**. Observe wire sizing and transformer sizing requirements. Proportional models CANNOT be connected to Belimo direct coupled (AF, AM, GM...etc) actuator power supplies or any type of half-wave device. You **MUST** use a separate, dedicated transformer or power supply to power the SY actuator. Please do not connect other automation equipment to the dedicated SY supply source. You **MUST** use four wires (plus a ground) to control a proportional control SY actuator (**See SY Wiring Section**).

Technical Data - continued

| Power Consumption | |
|-------------------|---------------------|
| SY1-24(P) | 1.8A |
| SY2-24MFT | 3.0A |
| SY3-24MFT | 3.0A |
| SY4-24MFT | 6.0A |
| SY5-24MFT | 6.5A |
| Torque | |
| SY1-24(P) | 35 Nm / 310 in-lb |
| SY2-24MFT | 90 Nm / 801 in-lb |
| SY3-24MFT | 150 Nm / 1335 in-lb |
| SY4-24MFT | 400 Nm / 3560 in-lb |
| SY5-24MFT | 500 Nm / 4450 in-lb |
| Manual Override | |
| SY1-24(P) | 8mm Wrench |
| SY2-24 - SY5-24 | Hand Wheel |
| Running Time | |
| SY1-24(P) | 15 seconds |
| SY2-24MFT | 15 seconds |
| SY3-24MFT | 22 seconds |
| SY4-24MFT | 16 seconds |
| SY5-24MFT | 22 seconds |

Wiring Diagrams

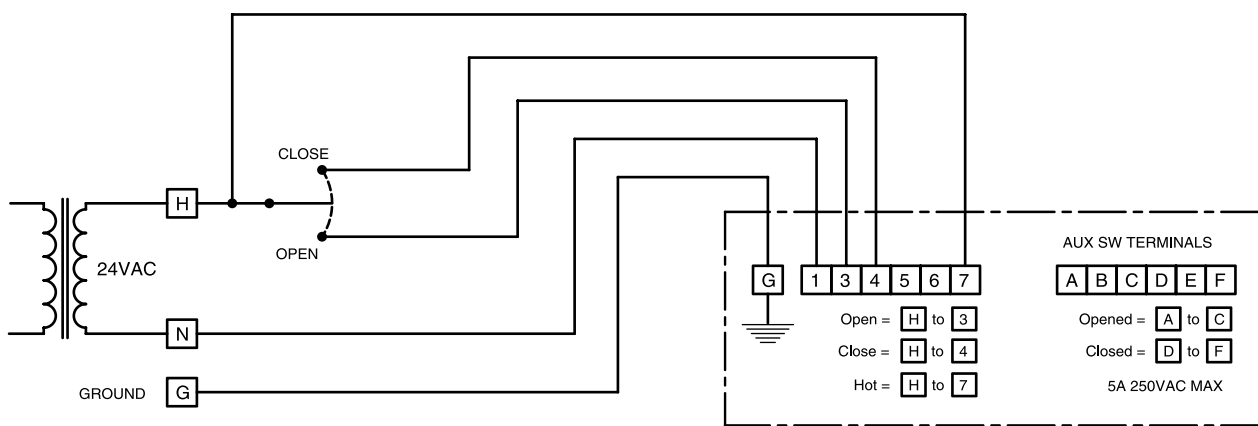
✂️ INSTALLATION NOTES

- T** Transformer sizing = SY actuator draw X 1.25 (safety margin)
EXAMPLE: SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer.
- 1** There can be no connection (internal to automation controller, external wiring, or otherwise) between actuator supply neutral & control signal reference. These actuators are full wave devices. Any connection to half wave equipment will result in equipment damage.
- 2** Do not change sensitivity or dip switch settings with power applied.

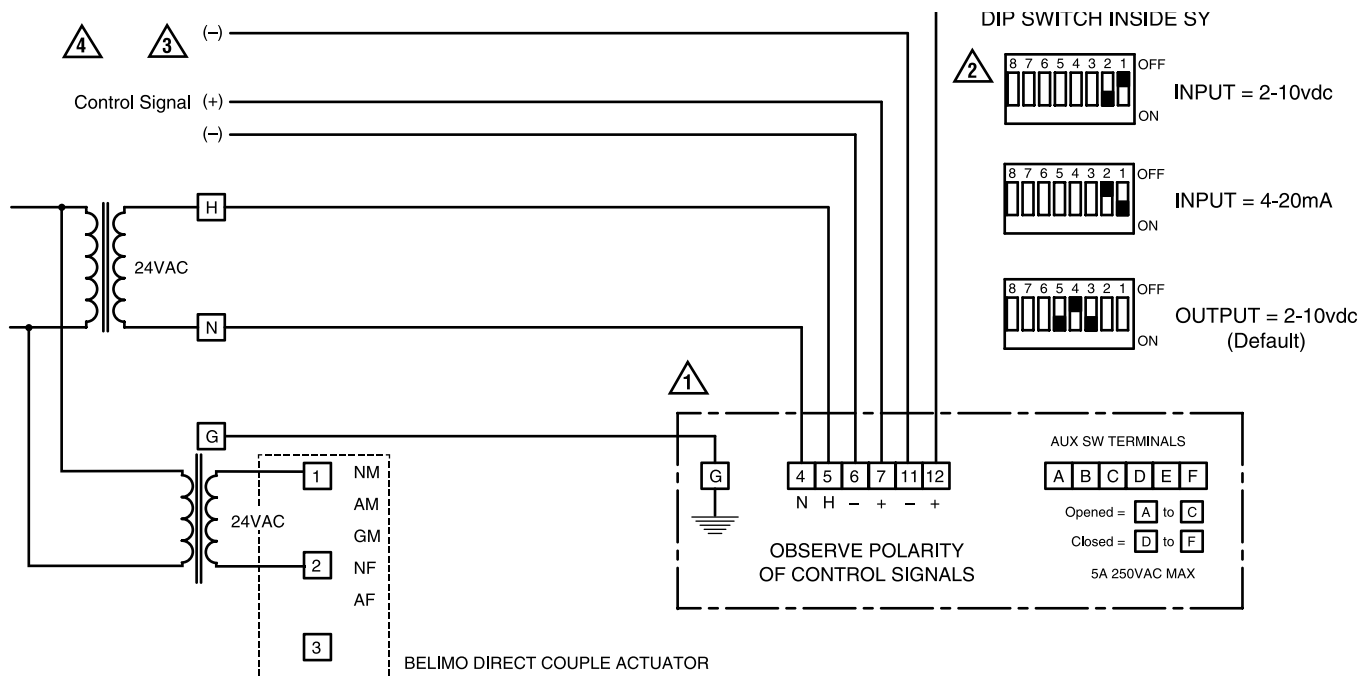
- 3** Terminals 6 & 11 can be common when control and feedback signals are both set for 2-10VDC operation.
- 4** Use of feedback is optional.

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

OBSERVE WIRE SIZING GUIDELINES FOR 24VAC OPERATION OVER DISTANCES.



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



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

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Models

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

| Technical Data | | |
|---------------------------|-----------------|---|
| Power supply | | 120 VAC 50/60Hz, single phase |
| Electrical Connection | | 1/2" Conduit Connector, screw terminals |
| Overload Protection | | Thermally Protected 135°C cut-out |
| Motor Protection | SY1 | H Class Insulation |
| | SY2... - SY8... | F Class Insulation |
| Geartrain | | High Alloy Steel gear sets, self locking |
| Operating Range | SY...-110 | On/Off, Floating Point |
| | SY...-120MFT | 2-10VDC 4-20mA, 1-5vdc |
| Sensitivity | SY...-120MFT | 0.2mA / 100mV |
| Feedback | SY...120MFT | 2-10VDC, 4-20mA |
| Angle of Rotation | | Mechanically limited to 95° |
| Direction of Rotation | | Reversible |
| Position Indication | | Top mounted domed indicator |
| Internal Humidity Control | | Resistive Heating Element |
| Auxiliary Switches | | (2) SPDT, 5A 250VAC Factory Set for 5° and 85° change of state |
| Ambient Temperature | | -22°F to 150°F [-30°C to 65°C] |
| Humidity Range | | up to 95% |
| Housing Type | | IP67, NEMA 4X |
| Housing Material | | Die Cast Aluminum Alloy |
| Agency Listings | | ISO, CE, cCSAus |

Application:

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

| Technical Data - <i>continued</i> | | |
|-----------------------------------|-------------|-----------------------|
| Power Consumption | | |
| SY1-110(P) | | 0.5A |
| SY2-120MFT | | 1.0A |
| SY3-120MFT | | 1.0A |
| SY4-120MFT | | 1.3A |
| SY5-120MFT | | 1.5A |
| SY6-120MFT | | 1.8A |
| SY7-120MFT | | 3.2A |
| SY8-120MFT | | 4.0A |
| Torque | | |
| SY1-110(P) | | 35 Nm / 310 in-lb |
| SY2-120MFT | | 90 Nm / 801 in-lb |
| SY3-120MFT | | 150 Nm / 1335 in-lb |
| SY4-120MFT | | 400 Nm / 3560 in-lb |
| SY5-120MFT | | 500 Nm / 4450 in-lb |
| SY6-120MFT | | 650 Nm / 5785 in-lb |
| SY7-120MFT | | 1000 Nm / 8900 in-lb |
| SY8-120MFT | | 1500 Nm / 13350 in-lb |
| Manual Override | | |
| SY1-110(P) | | 8mm Wrench |
| SY2-120MFT – SY8-120MFT | | Hand Wheel |
| Running Time | | |
| | 50hz | 60hz |
| SY1-110(P) | 13 seconds | 12 seconds |
| SY2-120MFT | 17 seconds | 15 seconds |
| SY3-120MFT | 26 seconds | 22 seconds |
| SY4-120MFT | 18 seconds | 16 seconds |
| SY5-120MFT | 25 seconds | 22 seconds |
| SY6-120MFT | 31 seconds | 28 seconds |
| SY7-120MFT | 55 seconds | 46 seconds |
| SY8-120MFT | 55 seconds | 46 seconds |

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Wiring Diagrams

Hazard Identification

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

CAUTION

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

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

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



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



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



Use of feedback is optional.



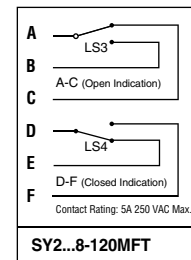
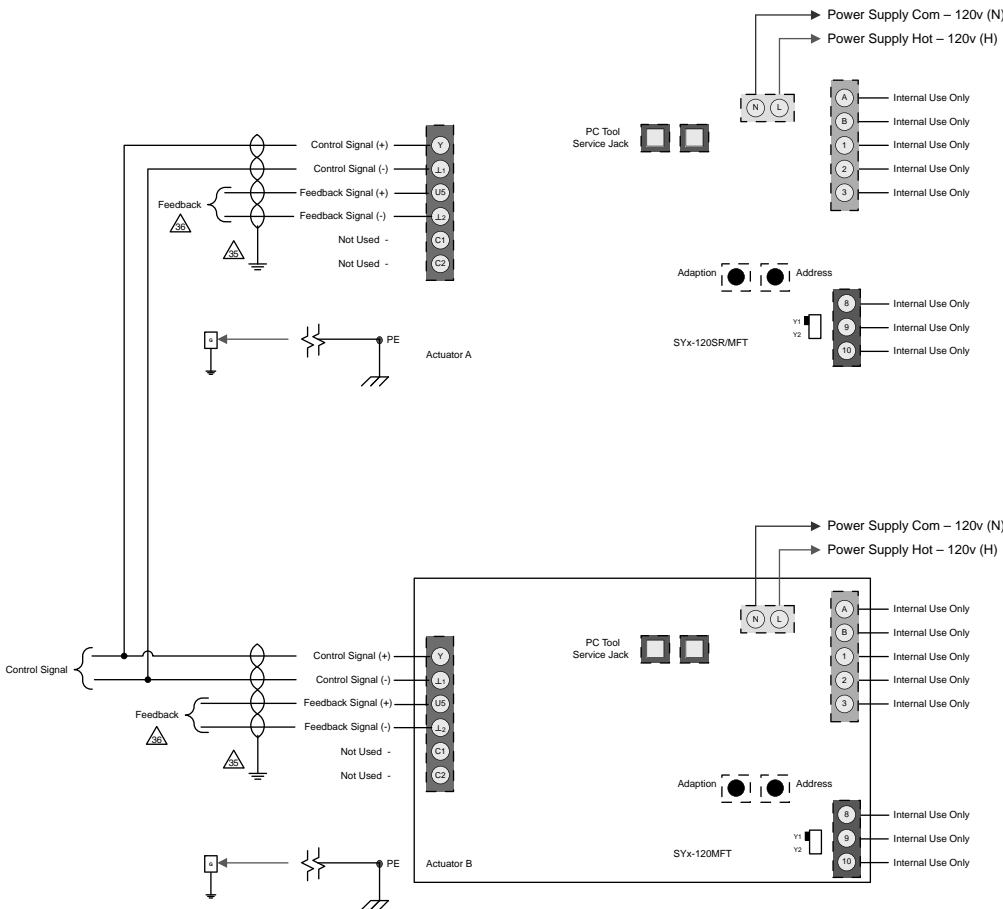
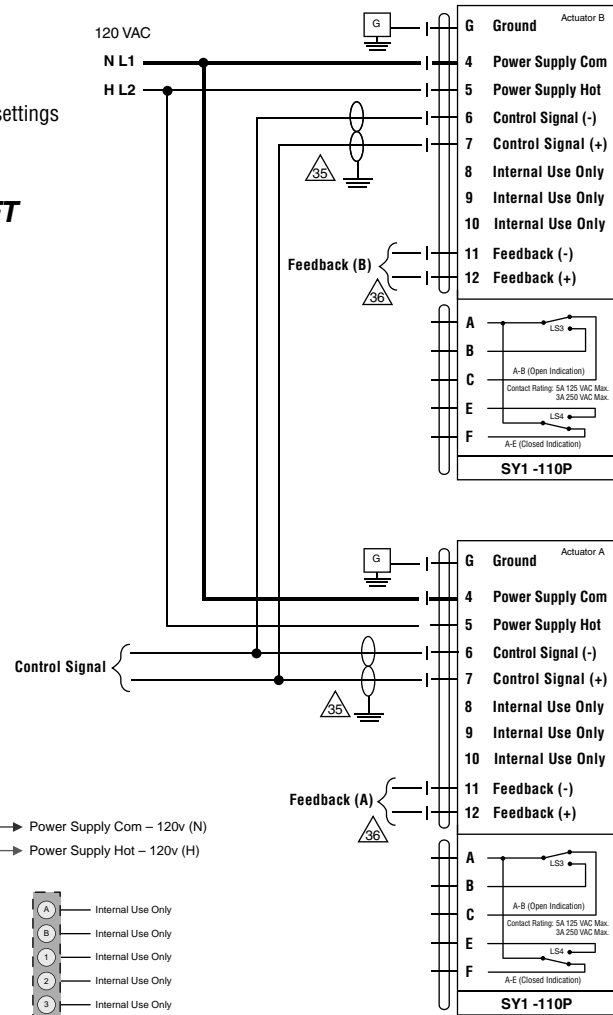
NOTES SY1-110P

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



NOTES SY2...8-120MFT

- **Caution:** Power supply voltage.





Models

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

| Technical Data | |
|---------------------------|--|
| Power supply | 230 VAC 50/60Hz, single phase |
| Electrical Connection | 1/2" Conduit Connector, screw terminals |
| Overload Protection | Thermally Protected 135°C cut-out |
| Motor Protection | SY1 H Class Insulation SY2... - SY6... F Class Insulation |
| Geartrain | High Alloy Steel gear sets, self locking |
| Operating Range | SY...-220 On/Off, Floating Point SY...-230MFT 2-10vdc, 4-20mA, 1-5vdc |
| Sensitivity | SY...-230MFT 0.2mA / 200mV |
| Feedback | SY...-230MFT 2-10vdc, 4-20mA |
| Angle of Rotation | Mechanically limited to 95° |
| Direction of Rotation | Reversible |
| Position Indication | Top mounted domed indicator |
| Internal Humidity Control | Resistive Heating Element |
| Auxiliary Switches | (2) SPDT, 5A 250VAC Factory Set for 5° and 85° change of state |
| Ambient Temperature | -22°F to 150°F [-30°C to 65°C] |
| Humidity Range | up to 95% |
| Housing Type | IP67, NEMA 4X |
| Housing Material | Die Cast Aluminum Alloy |
| Agency Listings | ISO, CE, cCSAus |

Attention

SY Series actuators are fractional horsepower devices, and utilize **full-wave power supplies**. Observe wire sizing and transformer sizing requirements. Proportional models CANNOT be connected to Belimo direct coupled (AF, AM, GM...etc) actuator power supplies or any type of half-wave device. You **MUST** use a separate, dedicated transformer or power supply to power the SY actuator. Please do not connect other automation equipment to the dedicated SY supply source. You **MUST** use four wires (plus a ground) to control a proportional control SY actuator (**See SY Wiring Section**).

| Technical Data - Continued | | |
|----------------------------|---------------------|-------------|
| Power consumption | | |
| SY1-220(P) | 0.3A | |
| SY2-230MFT | 0.5A | |
| SY3-230MFT | 0.5A | |
| SY4-230MFT | 0.6A | |
| SY5-230MFT | 0.7A | |
| SY6-230MFT | 0.8A | |
| Torque | | |
| SY1-220(P) | 35 Nm / 310 in-lb | |
| SY2-230MFT | 90 Nm / 801 in-lb | |
| SY3-230MFT | 150 Nm / 1335 in-lb | |
| SY4-230MFT | 400 Nm / 3560 in-lb | |
| SY5-230MFT | 500 Nm / 4450 in-lb | |
| SY6-230MFT | 650 Nm / 5785 in-lb | |
| Manual Override | | |
| SY1-220(P) | 8mm Wrench | |
| SY2-230MFT – SY6-230MFT | Hand Wheel | |
| Running Time | 50hz | 60hz |
| SY1-220(P) | 13 seconds | 12 seconds |
| SY2-230MFT | 17 seconds | 15 seconds |
| SY3-230MFT | 26 seconds | 22 seconds |
| SY4-230MFT | 18 seconds | 16 seconds |
| SY5-230MFT | 25 seconds | 22 seconds |
| SY6-230MFT | 31 seconds | 28 seconds |

Wiring Diagrams

Hazard Identification

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

CAUTION

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

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

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



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



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



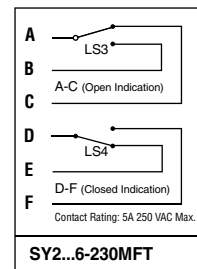
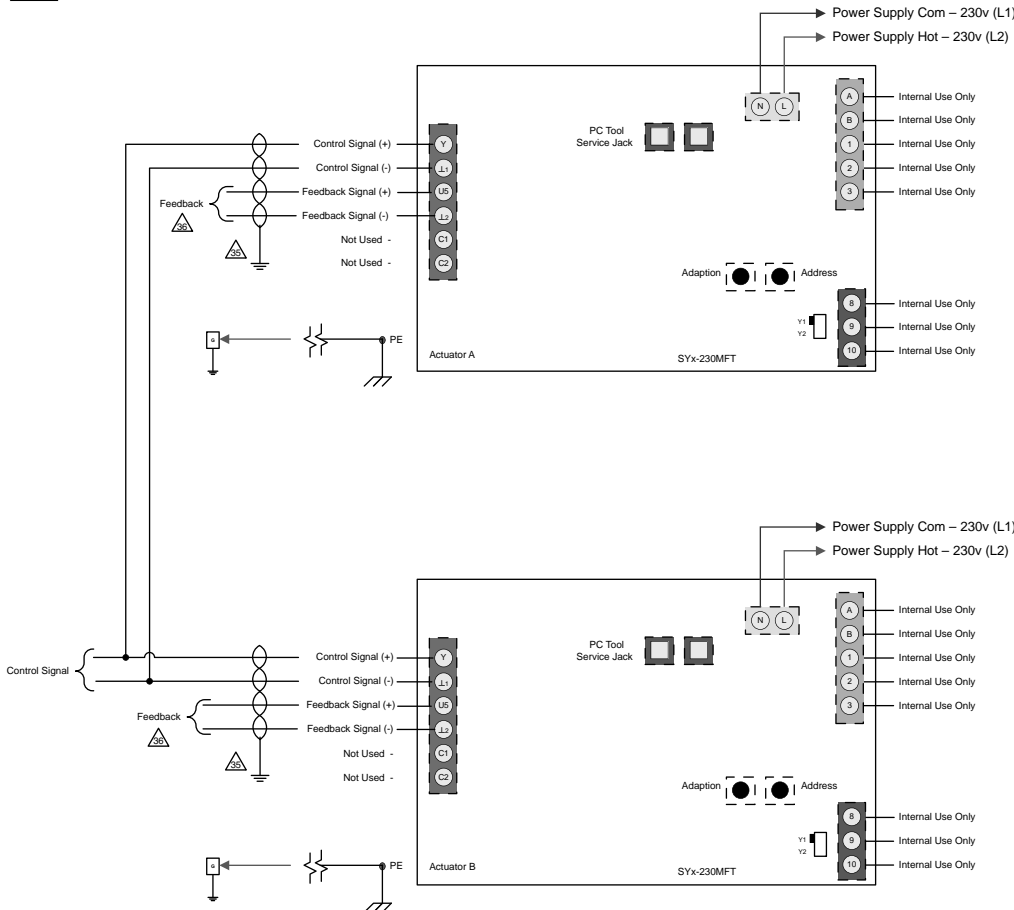
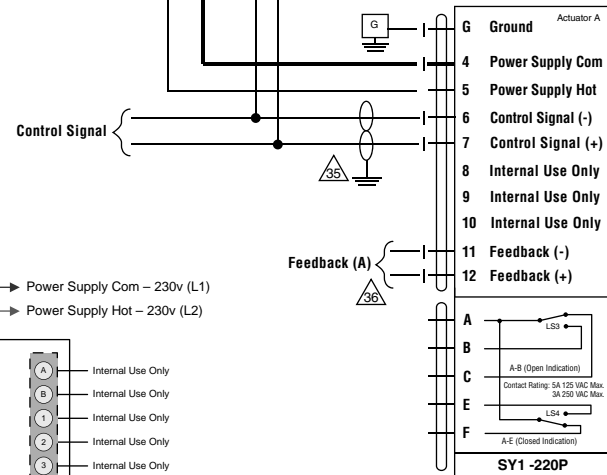
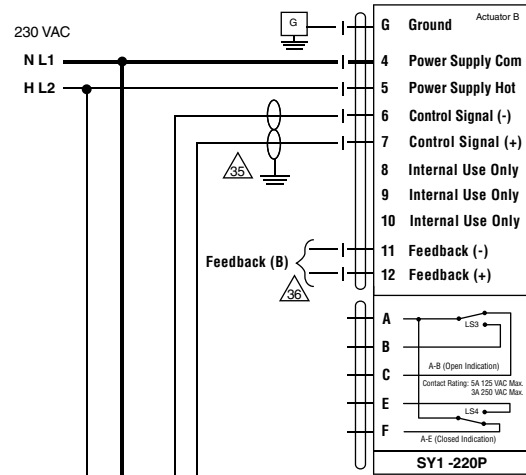
Use of feedback is optional.

NOTES SY1-220P

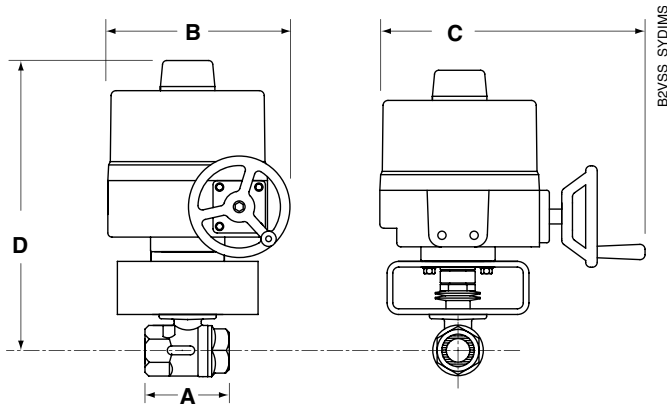
- **Caution:** Power supply voltage.
- Do not change sensitivity or dip switch settings with power applied.

NOTES SY2...6-230MFT

- **Caution:** Power supply voltage.



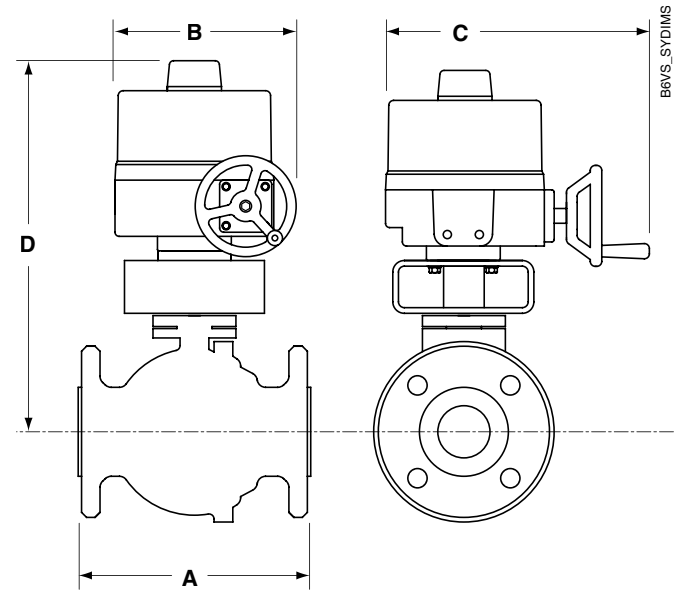
Dimensions with 2-Way Valves



Valve Nominal Size Dimensions (Inches)

| | Valve Body | COP | Inches | DN [mm] | A | B | C | D |
|--------|-------------|------|--------|---------|------|-------|-------|-------|
| SY1 | B2050VS-01 | 600 | ½" | 15 | 2.25 | 4.00 | 6.25 | 8.00 |
| | B2050VS-02 | 600 | ½" | 15 | 2.25 | 4.00 | 6.25 | 8.00 |
| | B2050VS-04 | 600 | ½" | 15 | 2.25 | 4.00 | 6.25 | 8.00 |
| | B2050VS-15 | 600 | ½" | 15 | 2.25 | 4.00 | 6.25 | 8.00 |
| | B219VS | 600 | ¾" | 20 | 3.00 | 4.00 | 6.25 | 8.00 |
| | B2050VSS-15 | 1000 | ½" | 15 | 2.25 | 8.00 | 13.00 | 16.00 |
| | B220VS | 600 | ¾" | 20 | 3.12 | 4.00 | 6.25 | 3.12 |
| | B224VS | 600 | 1" | 25 | 3.37 | 4.00 | 6.25 | 16.00 |
| | B225VS | 600 | 1" | 25 | 3.62 | 4.00 | 6.25 | 9.00 |
| | B232VS | 600 | 1¼" | 32 | 3.97 | 4.00 | 6.25 | 9.50 |
| | B239VS | 600 | 1½" | 40 | 4.37 | 4.00 | 6.25 | 17.50 |
| | B220VS | 600 | ¾" | 20 | 3.12 | 8.00 | 13.00 | 8.00 |
| | B225VS | 600 | 1" | 25 | 3.62 | 8.00 | 13.00 | 17.00 |
| | B240VS | 600 | 1½" | 40 | 4.75 | 8.00 | 13.00 | 19.00 |
| | B249VS | 600 | 2" | 50 | 4.68 | 8.00 | 13.00 | 19.50 |
| B250VS | 600 | 2" | 50 | 5.37 | 8.00 | 13.00 | 20.00 | |
| B265VS | 600 | 2½" | 65 | 6.25 | 8.00 | 13.00 | 20.00 | |
| SY3 | B280VS | 600 | 3" | 80 | 6.75 | 8.00 | 13.00 | 21.00 |
| | B219VSS | 1000 | ¾" | 20 | 3.00 | 8.00 | 13.00 | 18.00 |
| SY1 | B224VSS | 1000 | 1" | 25 | 3.37 | 8.00 | 13.00 | 17.00 |
| | B232VSS | 1000 | 1¼" | 32 | 3.97 | 8.00 | 13.00 | 3.97 |
| | B239VSS | 1000 | 1½" | 40 | 4.37 | 8.00 | 13.00 | 18.50 |
| | B249VSS | 1000 | 2" | 50 | 4.68 | 8.00 | 13.00 | 19.50 |
| | B265VSS | 1000 | 2½" | 65 | 6.25 | 8.00 | 13.00 | 20.00 |
| SY3 | B280VSS | 600 | 3" | 80 | 6.75 | 8.00 | 13.00 | 21.00 |

Dimensions with Flanged Valves



Valve Nominal Size Dimensions (Inches)

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

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

*P-10001 is the default configuration.

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

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

Note: Most popular configurations available at no additional cost.

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

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

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

PRODUCTS

| MODEL | Base Actuator Codes | Torque | Control Input | Feedback | Running Time | Angle of Rotation/Stroke | Power Supply | VA Rating | Weight (lb) | List Price (add to valve assembly) |
|--------------|---------------------|-------------------|------------------------|----------|---------------|--------------------------|--------------|-----------|-------------|------------------------------------|
| LMX24-3-X1 | LX000 | 45 in-lb [5 Nm] | On/Off, Floating Point | — | 95 (Default) | 95 deg | 24 VAC/DC | 2 | 1.10 | ● |
| LMX24-MFT-X1 | LX100 | 45 in-lb [5 Nm] | 2-10 VDC (Default) | 2-10 VDC | 150 (Default) | 95 deg | 24 VAC/DC | 5 | 1.50 | ● |
| NMX24-3-X1 | NX000 | 90 in-lb [10 Nm] | On/Off, Floating Point | — | 95 (Default) | 95 deg | 24 VAC/DC | 4 | 1.70 | ● |
| NMX24-MFT-X1 | NX100 | 90 in-lb [10 Nm] | 2-10 VDC (Default) | 2-10 VDC | 150 (Default) | 95 deg | 24 VAC/DC | 6 | 2.10 | ● |
| AMX24-3-X1 | AX000 | 180 in-lb [20 Nm] | On/Off, Floating Point | — | 95 (Default) | 95 deg | 24 VAC/DC | 5.5 | 2.20 | ● |
| AMX24-MFT-X1 | AX100 | 180 in-lb [20 Nm] | 2-10 VDC (Default) | 2-10 VDC | 150 (Default) | 95 deg | 24 VAC/DC | 6 | 2.60 | ● |
| GMX24-3-X1 | GX000 | 360 in-lb [40 Nm] | On/Off, Floating Point | — | 95 (Default) | 95 deg | 24 VAC/DC | 6 | 3.40 | ● |
| GMX24-MFT-X1 | GX100 | 360 in-lb [40 Nm] | 2-10 VDC (Default) | 2-10 VDC | 150 (Default) | 95 deg | 24 VAC/DC | 7 | 3.40 | ● |

| | Configuration (Substitute 'V' for 'P' for NV(F) actuators) | Code | Control | | Running Time† | Motion | | List Price |
|----------------|--|-----------------|--------------------|-------------------|---------------|----------|------------|------------|
| | | | Input Range | Position Feedback | | Torque % | Adaptation | |
| Voltage | P-10001 | A01 | 2.0 to 10.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ●* |
| | P-10002 | A02 | 0.0 to 10.0 VDC | 0.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10003 | A03 | 2.0 to 10.0 VDC | 0.0 to 5.0 VDC | 150 | 100 | Manual | ● |
| | P-10004 | A04 | 4.0 to 7.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10005 | A05 | 6.0 to 9.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10006 | A06 | 10.5 to 13.5 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10007 | A07 | 0.0 to 5.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10009 | A09 | 5.0 to 10.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10010 | A10 | 5.0 to 10.0 VDC | 0.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10013 | A13 | 0.0 to 10.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10015 | A15 | 2.0 to 5.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10016 | A16 | 2.0 to 6.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10017 | A17 | 6.0 to 10.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10018 | A18 | 14.0 to 17.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10020 | A20 | 9.0 to 12.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-10028 | A28 | 0.0 to 10.0 VDC | 0.0 to 10.0 VDC | 100 | 100 | Manual | ● |
| P-10031 | A31 | 0.0 to 4.0 VDC | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● | |
| P-10063 | A63 | 0.5 to 4.5 VDC | 0.5 to 4.5 VDC | 150 | 100 | Manual | ● | |
| P-10064 | A64 | 5.5 to 10.0 VDC | 5.5 to 10.0 VDC | 150 | 100 | Manual | ● | |
| PWM | P-20001 | W01 | 0.59 to 2.93 sec. | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-20002 | W02 | 0.02 to 5.00 sec. | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-20003 | W03 | 0.10 to 25.50 sec. | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-20004 | W04 | 0.10 to 25.60 sec. | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-20005 | W05 | 0.10 to 5.20 sec. | 0.0 to 5.0 VDC | 150 | 100 | Manual | ● |
| Floating Point | P-30001 | F01 | Floating point | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-30002 | F02 | Floating point | 0.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-30003 | F03 | Floating point | 2.0 to 10.0 VDC | 100 | 100 | Manual | ● |
| | P-30004 | F04 | Floating point | 0.0 to 5.0 VDC | 100 | 100 | Manual | ● |
| | P-30005 | F05 | Floating point | 0.0 to 10.0 VDC | 100 | 100 | Manual | ● |
| | P-30006 | F06 | Floating point | 0.0 to 5.0 VDC | 150 | 100 | Manual | ● |
| On/Off | P-40001 | J01 | On/Off | None | 75 | 100 | Manual | ● |
| | P-40002 | J02 | On/Off | 2.0 to 10.0 VDC | 150 | 100 | Manual | ● |
| | P-40003 | J03 | On/Off | None | 75 | 100 | Manual | ● |
| | P-40004 | J04 | On/Off | 0.0 to 5.0 VDC | 100 | 100 | Manual | ● |
| | P-40005 | J05 | On/Off | 0.0 to 10.0 VDC | 100 | 100 | Manual | ● |

*P-10001 is the default configuration.

N40099 - 09/11 - Subject to change. © Belimo Aircontrols (USA), Inc.

Custom MFT Configuration Order Form

FAX: USA Toll Free 1-800-228-8283



#1 Select an Actuator

(use one sheet for each unique actuator/configuration)

| | Quantity | | Quantity |
|--|----------|---------------------------------------|----------|
| <input type="checkbox"/> AF24-MFT US | _____ | <input type="checkbox"/> AMX24-MFT | _____ |
| <input type="checkbox"/> AF24-MFT-S US | _____ | <input type="checkbox"/> AMX24-MFT-X1 | _____ |
| <input type="checkbox"/> NF24-MFT US | _____ | <input type="checkbox"/> NMX24-MFT | _____ |
| <input type="checkbox"/> LF24-MFT US | _____ | <input type="checkbox"/> NMX24-MFT-X1 | _____ |
| <input type="checkbox"/> LF24-MFT-S US | _____ | <input type="checkbox"/> LMX24-MFT | _____ |
| <input type="checkbox"/> AF24-MFT95 US | _____ | <input type="checkbox"/> LMX24-MFT-X1 | _____ |
| <input type="checkbox"/> NV24-MFT US | _____ | <input type="checkbox"/> LRX24-MFT | _____ |
| <input type="checkbox"/> NVF24-MFT US | _____ | <input type="checkbox"/> GMX24-MFT95 | _____ |
| <input type="checkbox"/> NVF24-MFT-E US | _____ | <input type="checkbox"/> AMX24-MFT95 | _____ |
| <input type="checkbox"/> NVFD24-MFT US | _____ | <input type="checkbox"/> NMX24-MFT95 | _____ |
| <input type="checkbox"/> NVFD24-MFT-E US | _____ | <input type="checkbox"/> LMX24-MFT95 | _____ |
| <input type="checkbox"/> GMX24-MFT | _____ | <input type="checkbox"/> LHX24-MFT | _____ |
| <input type="checkbox"/> GMX24-MFT-X1 | _____ | <input type="checkbox"/> LUX24-MFT | _____ |

(-S=Auxiliary Switch)

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

Email _____

FIELD LABELING: LBL-MFT

Custom configuration labels required
 1-3/8" X 1-1/4" orange labels preprinted to your specifications 12 label sets per sheet.
 Includes configuration code and wiring labels.

#2 Create a Custom Configuration

Deactivated (Default) The following settings ② - ⑤ refer to the full angle of rotation of 95°.

Activated The following settings ② - ⑤ are automatically adapted to the effective mechanical angle of rotation.

① Angle of rotation setting

Manual triggering by pressing the push button twice.

Automatic triggering each time the unit is powered up or by pressing the push button twice.

② Control Types

| VDC | PWM | Floating Point | On/Off |
|--|--|--------------------------|--------------------------|
| <input type="checkbox"/> 2 - 10 | <input type="checkbox"/> 0.2 to 5.0 seconds | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> 0 - 10 | <input type="checkbox"/> 0.1 to 25.5 seconds | | |
| <input type="checkbox"/> Variable | <input type="checkbox"/> 0.59 to 2.93 seconds | | |
| Start <input type="checkbox"/> <input type="checkbox"/> · <input type="checkbox"/> | <input type="checkbox"/> Variable | | |
| Stop <input type="checkbox"/> <input type="checkbox"/> · <input type="checkbox"/> | Start <input type="checkbox"/> <input type="checkbox"/> · <input type="checkbox"/> | | |
| | Stop <input type="checkbox"/> <input type="checkbox"/> · <input type="checkbox"/> | | |

③ Feedback Signals U_s

Position Feedback U DC 2...10 V (Default)

Position Feedback U DC 0...10 V

Position Feedback U Start DC · V (0...8 V) The finish must be at least 2 V above the start!
 Finish DC · V (2...10 V)

④ Running Time

150 seconds (Default)

Running time seconds (75...300 seconds) (in 5 second increments)

Note: The sound power level [dB(A)] increases when the running time is below 150 seconds.

| | |
|--------|------------------|
| LM | 35...150 seconds |
| NM | 45...170 seconds |
| AM | 90...300 seconds |
| GM | 90...300 seconds |
| Others | 75...300 seconds |

⑤ Override control and electronic angle of rotation limiting

Min. (min. position) = % (0...100%) < (beginning of working range) default 0

ZS (intermediate position) = % (0...100%) (0% = Min.; 100% = Max.) default 50

Max. (max. position) = % (0...100%) < (end of working range) default 100

Section 230900 – INSTRUMENTATION AND CONTROL FOR HVAC

2.15 ACTUATORS

- A. Electronic Damper Actuators:
1. Manufactured, brand labeled or distributed by BELIMO.
 2. Size for torque required for damper seal at load conditions.
 3. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle.
 4. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.
 5. Overload Protection: Electronic overload or digital rotation-sensing circuitry without the use of end switches to prevent any damage to the actuator during a stall condition.
 6. Fail-Safe Operation: Mechanical, spring-return mechanism. Internal chemical storage systems, capacitors, or other internal non-mechanical forms of fail-safe operation are not acceptable.
 7. Power Requirements (Two-Position Spring Return): 24 [120] [230] VAC.
 8. Power Requirements (Proportional): Maximum 10 VA at 24 VAC or 8 W at 24 VDC.
 9. Proportional Actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable by use of external computer software Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload and mechanical travel. Programming shall be through an EEPROM without the use of actuator mounted switches.
 10. Temperature Rating: -22 to +122°F -30 to +50°C [-58 to +122°F -50 to +50°C]
 11. Housing: Minimum requirement NEMA type 2 / IP54 mounted in any orientation.
 12. Agency Listing: ISO 9001, cULus, and CSA C22.2 No. 24-93.
 13. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.
- B. Electronic Valve Actuators:
1. Manufactured, brand labeled or distributed by BELIMO.
 2. Size for torque required for valve close off at 150% of total system (head) pressure for 2-way valves; and 100% of pressure differential across the valve or 100% of total system (pump) head differential pressure for 3-way valves.
 3. Coupling: Directly couple end mount to stem, shaft, or ISO-style direct-coupled mounting pad.
 4. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.
 5. Overload Protection: Electronic overload or digital rotation-sensing circuitry without the use of end switches to deactivate the actuator at the end of rotation.
 6. Fail-Safe Operation: Mechanical, spring-return mechanism. Internal chemical storage systems, capacitors, or other internal non-mechanical forms of fail-safe operation are not acceptable.
 7. Power Requirements: Maximum 10 VA at 24 VAC or 8 W at 24 VDC. Maximum 1 VA at 24 VAC or 1 W at 24 VDC.
 8. Temperature Rating: -22 to +122°F. -30 to +50°C [-58 to +122°F -50 to +50°C]
 10. Housing: Minimum requirement NEMA type 2 / IP54 mounted in any orientation.
 11. Agency Listing: ISO 9001, cULus, and CSA C22.2 No. 24-93.
 12. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.
- C. Terminal Unit Actuators:
1. Manufactured, brand labeled or distributed by BELIMO.
 2. Close-off (Differential) Pressure Rating: 200 psi.
 3. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle or an ISO-style direct-coupled mounting pad.
 4. Power Requirements: Maximum 1 VA at 24 VAC or 1 W at 24 VDC.
 5. Temperature Rating: -22 to +122°F. -30 to +50°C.

6. Housing Rating: Minimum UL94-5V(B) flammability.
7. Agency Listing: CE, UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE according to 89/336/EEC.
8. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

- D. Industrial Actuators
(ONLY TO BE USED WITH BUTTERFLY VALVE SECTION)
1. Manufactured, brand labeled or distributed by BELIMO.
 2. The combination of valve and actuator shall meet the close-off requirements as specified in Section 2.16.F – Butterfly Valves.
 3. Coupling: ISO 5211 mounting standards.
 4. Overload Protection: A self resetting thermal switch embedded in the motor.
 5. Manual Override: Actuator shall be equipped with a hand wheel or shaft for manual override to permit operation of the actuator in the event of an electrical power failure
 6. Auxiliary Switches: 2 SPDT rated 3A at 250 VAC.
 7. Temperature Rating: -4 to +150°F. -20 to +65°C.
 8. Housing: Minimum requirement NEMA type 4X/ IP67. Actuator shall have an internal heater. A visual indication beacon shall indicate position status of the device.
 9. Agency Listing: ISO, CE, CSA
 10. The manufacturer shall warrant for 2 years from the date of production.

2.16 CONTROL VALVES

- A. Manufacturer:
1. Manufactured, brand labeled or distributed by BELIMO.
- B. Control Valves: Factory fabricated of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
- C. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional (except as noted).
- D. Pressure Independent Control Valves
1. NPS 2 and Smaller: Forged brass body rated at no less than 400 psi, chrome plated brass ball and stem, female NPT union ends, dual EPDM lubricated O-rings and TEFZEL® characterizing disc.
 2. Accuracy: The control valves shall accurately control the flow from 0 to 100% full rated flow. The flow shall not vary more than ±5% due to system pressure fluctuations across the valve with a minimum of 5 psid across the valve.
 3. Flow Characteristics: Equal percentage characteristics.
 4. Close-off Pressure Rating: 200 psi.
 5. All actuators shall be electronically programmed by use of external computer software. Programming using actuator mounted switches or multi-turn actuators are NOT acceptable. **[Actuators for 3-wire floating (tri-state) on ½” to 1” pressure independent control valves shall fail in place and have a mechanical device inserted between the valve and the actuator for the adjustment of flow.] [Actuators for two-position ½” to 1” pressure independent control valves shall fail in place and have a mechanical device inserted between the valve and the actuator for the adjustment of flow.] [Actuators shall be provided with an auxiliary switch to prove valve position.]**
 6. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory with a single screw on a four-way DIN mounting-base.
 7. The control valve shall require no maintenance and shall not include replaceable cartridges.
 8. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.
 9. The use of pressure independent valves piped in parallel to achieve the rated coil flow shall be permitted. Actuators shall be electronically programmed to permit sequencing the flow with a single control output point. The use of external devices to permit sequencing is NOT acceptable.

SPECIFYING PRESSURE INDEPENDENT CONTROL VALVES REQUIRE THE FOLLOWING ADDITIONS TO SECTIONS 232113 AND 230593.

To be inserted into Section 232113 – HYDRONIC PIPING

2.6 CONTROL VALVES

- K. Calibrated Balancing Valves and Automatic Flow-Control Valves shall not be required on devices where pressure independent control valves are installed.

To be inserted into Section 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

3.11 PROCEDURE FOR HYDRONIC SYSTEMS

- H. Systems installed with pressure independent control valves shall not require hydronic system balancing. **[Flow shall be verified for [10%] [20%] [25%] <Insert Percentage> of the total installed product. Exact locations of tested product to be coordinated with the design engineer.]**

E. Characterized Control Valves:

1. NPS 3 and Smaller: Nickel-plated forged brass body rated at no less than 400 psi, stainless steel ball and blowout proof stem, NPT female end fittings, with a dual EPDM O-ring packing design, fiberglass reinforced Teflon® seats, and a TEFZEL® flow characterizing disc. **[NPS ¾” and Smaller for Terminal Units: Nickel plated forged brass body rated at no less than 600 psi, chrome plated brass ball and blowout proof stem, NPT female end fittings, with a dual EPDM O-Ring packing design, fiberglass reinforced Teflon® seats, and a TEFZEL® flow characterizing disc.]**
2. Sizing:
 - a. Two-Position: Line size or size using a pressure differential of 1 psi.
 - b. 2-way Modulating: [3 psig] 5 psig or twice the load pressure drop, whichever is greater.
 - c. 3-way Modulating: Twice the load pressure drop, but not more than [3 psig] 5 psig.
3. Close-off Pressure Rating: 100 psi. [NPS ¾” and Smaller for Terminal Units: 200 psi.]
4. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory with a single screw on a four-way DIN mounting-base.

F. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: ANSI Class 250 bronze body, stainless steel stem, brass plug, bronze seat, and a TFE packing.
2. NPS 2-½ and Larger: ANSI Class 125 [250] cast iron body, stainless steel stem, bronze plug, bronze seat, and a TFE V-ring packing.
3. Sizing:
 - a. Two-Position: Line size or size using a pressure differential of 1 psi.
 - b. 2-way Modulating: [3 psig] 5 psig or twice the load pressure drop, whichever is greater.
 - c. 3-way Modulating: Twice the load pressure drop, but not more than [3 psig] 5 psig.
4. Flow Characteristics: 2-way valves shall have equal percentage characteristics; 3-way valves shall have linear characteristics.
5. Close-off Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150% of total system head pressure for 2-way valves and 150% of the design pressure differential across the 3-way valves.
6. 2- and 3-way globe valves shall be used only if characterized control valves do not fit the sizing criteria or application.

G. Steam system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: ANSI Class 250 bronze body; stainless steel seat, stem and plug; and a TFE packing.
2. NPS 2-½ and Larger: ANSI Class 125 [250] cast iron body; stainless steel seat, stem and plug; and a TFE V-ring packing.
3. Sizing:
 - a. Two-Position: Line size or sized using 10% of inlet gauge pressure.
 - b. Modulating: 15 psig or less inlet steam pressure, the pressure drop shall be 80% of inlet gauge pressure. Higher than 15 psig inlet steam pressure the pressure drop shall be 42% of the inlet absolute pressure.
4. Flow Characteristics: Linear or equal percentage characteristics.
5. Close-off Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150% of operating (inlet) pressure.

H. Butterfly Valves – Resilient Seat:

1. NPS 2 to 12: Valve body shall be full lugged cast iron 200 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize an internal spline. External mechanical methods to achieve this mechanical connection, such as pins or screws, are not acceptable. The shaft shall be supported at four locations by RPTFE bushings.
2. NPS 14 and Larger: Valve body shall be full lugged cast iron 150 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize a dual-pin method to prevent the disc from settling onto the liner. The shaft shall be supported at four locations by RPTFE bushings.
3. Sizing:
 - a. Two-Position: Line size or size using a pressure differential of 1 psi.
 - b. Modulating: 3 psig [5 psig] or twice the load pressure drop, whichever is greater. Size for the design flow with the disc in a 60° open-position with the design velocity less than 12 feet per second.
4. Close-off Pressure Rating: NPS 2” to 12” 200 psi bubble tight shut-off. NPS 14” and larger, 150 psi bubble tight shut-off.

I. Zone Valves (On/Off, Two-Position Applications):

1. NPS 1 and Smaller: Forged brass body rated at no less than 300 psi, stainless steel stem, female NPT union or sweat with a stainless steel stem and EPDM seals.
2. Sizing:
 - a. Two-Position: Line size or size using a pressure differential of 1 psi.
3. Close-off Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150% of total system head pressure for 2-way valves and 125% of the design pressure differential across the 3-way valves.
4. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory.
5. The manufacturer shall warrant all components for a period of 2 years from the date of production.

To be inserted into Section 233300 – AIR DUCT ACCESSORIES

2.8 SMOKE DAMPERS

Replace with the following:

I. Damper Motors:

1. Manufactured, brand labeled or distributed by BELIMO.
2. Size for torque required for damper seal at load conditions.
3. Coupling: V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or set screws are not acceptable.
4. Overload Protection: Microprocessor or an electronic based motor controller providing burnout protection if stalled before full rotation is reached. The actuator shall be electronically cut off at full open to eliminate noise generation with the holding noise level to be inaudible.
5. Power Requirements (Two-Position Spring Return): 24 [120] [230] VAC.
6. Power Requirements (Proportional): Maximum (running) 12 VA at 24 VAC or 8 W at 24 VDC. Maximum (holding) 5VA at 24 VAC or 3 W at 24 VDC holding.
7. Proportional Actuators (24 VAC/VDC): Control signal shall be 2-10 VDC or 4-20 mA, with a 2-10 VDC position feedback signal.
8. Actuator timing shall meet 15 seconds [75 seconds] [local codes].
9. Temperature Rating: Actuator shall have a UL555S listing by the damper manufacturer for 350°F [250°F].

The following replaces item 2.8.K.1

10. Auxiliary switches for **[signaling] [fan control] [or] [position indication]**.

2.9 COMBINATION FIRE AND SMOKE DAMPERS

Replace with the following:

O. Damper Motors:

11. Manufactured, brand labeled or distributed by BELIMO.
12. Size for torque required for damper seal at load conditions.
13. Coupling: V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or set screws are not acceptable.

14. Overload Protection: Microprocessor or an electronic based motor controller providing burnout protection if stalled before full rotation is reached. The actuator shall be electronically cut off at full open to eliminate noise generation with the holding noise level to be inaudible.
15. Power Requirements (Two-Position Spring Return): 24 [120] [230] VAC.
16. Power Requirements (Proportional): Maximum (running) 12 VA at 24 VAC or 8 W at 24 VDC. Maximum (holding) 5VA at 24 VAC or 3 W at 24 VDC holding.
17. Proportional Actuators (24 VAC/VDC): Control signal shall be 2-10 VDC or 4-20 mA, with a 2-10 VDC position feedback signal.
18. Actuator timing shall meet 15 seconds [75 seconds] [local codes].
19. Temperature Rating: Actuator shall have a UL555S listing by the damper manufacturer for 350°F [250°F].

The following replaces item 2.9.Q.1

20. Auxiliary switches for **[signaling] [fan control] [or] [position indication]**.

NOTE TO SPECIFIER

Any (or all) of the following manufacturers are listed per UL555S with Belimo actuators: Air Balance, Arlan, E.H. Price, Greenheck, Leader, Lloyd Industries, Nailor, Pottorff, Prefco, Ruskin and Safe-Air.

21. Housing: Steel housing, aluminum is unacceptable.
22. Agency Listing: ISO 9001, UL873, or UL60730.
23. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

I. General

- 1.1. The following Terms and Conditions of Sale ("Terms") apply to the sale of products described in this Product Guide ("Products"). As used herein, "Seller" or "Belimo" refers to Belimo Aircontrols (USA) Inc. or Belimo Aircontrols (CAN) Inc., as applicable, and "Client" refers to the individual or business entity that purchases the Products from Seller. These Terms shall apply unless the parties mutually agree to different terms and memorialize such agreement in a writing signed by both Client and Seller.

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.
- 2.1. 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 with a net value of less than US\$300 (CAN\$450) will be subject to a US\$20 (CAN\$35) 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\$450) or for Products ordered through Seller's internet ordering system at: www.belimo.com.
- 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 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 are due no later than 30 days from the date of invoice, without any deductions.
- 3.2. If Client fails to pay the entire invoice balance within 60 days from the date of the invoice, Client will be subject to an interest charge of 2% per month (or the maximum rate permitted by law, whichever is less) on the outstanding unpaid balance due to Seller.
- 3.3. Clients who maintain outstanding balances for 45 days or more after the date of invoice may be subject to restricted shipments of Products or may be required to pay for all future deliveries of Products on a cash-on-delivery basis.

IV. Title and Risk

- 4.1. Title to all Products shall remain with Seller and shall not pass to Client until Seller has received full payment for the Products.

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 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, customer 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. Seller is not liable for consequential damage to Client's property or a third-party's property resulting from the installation of damaged Products.

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. Return of Goods

- 7.1. Products received by Client cannot be returned unless: (i) Client alerts Seller that it intends to return such Products, (ii) Seller agrees to accept the return of such Products, (iii) Client obtains a Return Material Authorization ("RMA") number from Seller for the 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 Products. Only Products returned to proper the location as instructed by Seller and identified with an RMA number will be considered for credit.
- 7.2. Only Products that are returned in original packaging may be accepted for return. Such returned Products must be received in good condition, adequate for resale as new Products to qualify for credit. Client will be responsible for payment of a restocking charge for all returned Products in an amount no less than 20% of the invoice value of the Products ("Restocking Charges"). All return Products must be shipped to Seller at Client's cost.
- 7.3. Returns that result from Seller errors will be credited in full and will not be subject to Restocking Charges.

VIII. Warranty

VIII.A 5-year Warranty

- 8.1. Products that are listed in this Product Guide as carrying a 5-year warranty and shipped after May 1, 2000 to a location in the United States or Canada shall carry a 5-year warranty. The 5-year warranty is unconditional for the first two years from the date of production of the Products. After the first two years from the date of Production, the warranty shall be conditional and the warranty coverage shall not apply to damage to Products caused by ordinary wear and tear, negligence or improper use by Client, or other causes beyond the control of the Seller. 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.

VIII.B 2-year Conditional Warranty

- 8.2. Products that are listed in this Product Guide as carrying a 2-year warranty and shipped after May 1, 2005 to a location in the United States or Canada shall carry a 2-year warranty. The 2-year warranty is conditional and the warranty coverage shall not apply to damage to Products caused by ordinary wear and tear, negligence or improper use by Client, or other causes beyond the control of the Seller. 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.

VIII.C General Warranty Terms

- 8.3. Seller's warranty may 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.
- 8.4. Client must promptly notify Seller of Products' alleged defect and provide Seller with other evidence and documentation reasonably requested by Seller. Before removing Products from service, Client should contact a Seller-authorized support technician by calling Belimo customer service. 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.com. Belimo customer service will work with field technicians to troubleshoot problems. Many problems can be resolved over the phone.
- 8.5. If a problem cannot be resolved over the phone, 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.
- 8.6. All returned Products should be packaged appropriately to prevent further damage. Seller reserves the right to refuse any returned material if improperly packaged or labeled (without an RMA number). Products returned without proper RMA documentation will void Seller's warranty.
- 8.7. Products found to be defective for which a warranty is applicable will either be replaced or repaired at the Seller's discretion. Seller is not responsible for charges that Client may incur as a result of the removal or replacement of Products.

- 8.8. Repaired or replacement Products are shipped from Seller via ground shipment. Other shipping methods are available at the sole expense of the Client.
- 8.9. 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").
- 8.10. Advanced replacement Products for Products covered under warranty may be obtained from Seller after the Belimo customer service troubleshooting process has been completed. For industrial products (such as butterfly valves), a purchase order is required. The purchase order will be credited upon the receipt and verification by Seller of the returned defective Products. For non-industrial products, an invoice will be issued and shall be due and payable is the returned Products are not received by Seller within 60 days from the date of that the replacement Products are shipped. Additional charges may apply if the nature of the problem has been misrepresented by Client.
- 8.11. Both the conditional and unconditional warranties cover the Products only, and do NOT cover labor associated with the troubleshooting, removal or replacement of such Products.
- 8.12. 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.
- 8.13. Advanced replacement Products for butterfly valve actuators may not be new, but have been verified by the Seller for electrical and mechanical operation. Such Products carry the full warranty for the entire Replacement Warranty Period.

IX. No Warranty for Non-HVAC Application

- 9.1. All Seller warranties shall extend only to HVAC use of the Products. If Products are used in non-HVAC application (e.g., aircraft, industrial processes, etc.), Seller's warranties shall 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.

X. Liability Disclaimer

- 10.1. 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. Seller shall not be responsible for and Client does not have any right to make any claim for, damage that occurs to any property other than Products. Seller shall in no way be responsible for any costs incurred by Client in the determination of the causes of damage to any of Client's property, for expert opinions, or for any punitive or special, incidental or consequential damages of any kind whatsoever.
- 10.2. Seller shall not be liable for any damage resulting from or contributed by Client or third parties acting within the scope of responsibility of Client or such third party when:
 1. Products are used for non-HVAC applications, such as in aircrafts, industrial processes, etc.;
 2. Client uses the Products without complying with applicable law or institutional regulations or Belimo data and installation sheets or Client uses the Products without following good industry practice;
 3. Products are used by personnel who have not received suitable instruction; or
 4. Products are modified or repaired without the written approval of Seller. When requested to do so, Client shall immediately release 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 product 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.

XIII. Proper Law and Jurisdiction

- 11.1. All sales of Products under these Terms and the warranties described herein shall be governed by the laws of the State of Connecticut, and the parties 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 parties hereby waive all rights to a jury trial in connection with any claims relating to the subject matter hereof.