

# VBN Threaded Control Ball Valves and Actuators

## PRODUCT DATA

### APPLICATION

The VBN2 2-Way Control Ball Valves and VBN3 3-Way Control Ball Valves control hot and chilled water with glycol solutions up to 50% in heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions. These control ball valves can be ordered alone or with spring return or non-spring return actuators.

### VBN2, VBN3



### FEATURES

- Sizes from 1/2 to 3 in. with internal (female) NPT connections.
- Equal percentage flow characteristic.
- Reduced B port CV for constant loop flow.
- Choice of factory-installed actuation: floating, modulating (2-10 V), spring return or non-spring return 2-Position, Spring Return Modulating/Floating, Spring Return Sylk-enabled.
- Field configurable for normally open or normally closed fail-safe position.
- Removable manual operating handle to control valve during installation or in an event of power failure.
- Actuator can be mounted on the valve in any of four orientations.
- Field-serviceable stem assembly.
- Wide range of CV choices from 0.33 to 266.
- Nickel-chrome plated brass or 316 stainless steel ball and stem.
- Valve installs in a globe valve “T” pattern, no extra elbows or piping required.
- Mixing or Diverting control for 3-way valves.
- ANSI Class IV seat leakage specification (0.01% of CV) for 3-way A port and ANSI Class III seat leakage specification (0.1% of CV) for 3-way B port.

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## SPECIFICATIONS

**Valve Type:** Control Ball Valve

**Body Pattern:** 2-way, 3-way

**Connection Type:** Female NPT

**Controlled Fluid:** Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.

**Leakage Rating:** ANSI Class IV (0.01% of CV maximum) for 3-way A port and ANSI Class III seat leakage specification (0.1% of CV) for 3-way B port

**Maximum Safe Operating Rating:** 360 psi (2482 kPa)

**Fluid Temperature Range:** -22°F to +250°F (-30°C to +121°F)

**Materials:**

Body: Brass

Ball and Stem:

Two-way: Nickel-chrome plated brass or 316 Stainless Steel.

Three-way: Nickel-chrome plated brass.

Seat: Teflon® seals with EPDM O-rings

Flow Control Insert: Noryl®

**Body Style:**

2-way ball valve, straight-through flow, full or reduced port using patented flow control insert.

3-way ball valve, A-B-AB flow, full or reduced port using patented flow control insert.  
Internal NPT connections.

**Body Pressure Rating (maximum):**  
360 psi (2482 kPa) at 250°F (121°C).

**Medium Temperature Range:**  
-22 to +250°F (-30 to +121°C).

**Flow Characteristics:**

2-way: Equal Percentage with flow control insert.

3-way: Port A to AB: Equal Percentage.

Port B to AB: Linear.

**Compatible Actuators:**

Minimum Torque Required:

35 lb-in. (4 Nm) up to 3 in. (.DN80)

27 lb-in. (3 Nm) up to 1-1/4 in. (.DN32)

Fail Safe: MSXX05\*

Non-Fail Safe: MVN\* and MNXX05\*

\* These actuators are available as factory installed assemblies. See Table 1 for all available options.

**Approvals/Standards:**

Valves: ANSI Class IV close-off/leakage (maximum 0.01% of CV let by)

Actuators: See literature for the given actuator.

## ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number. If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Environmental and Combustion Controls Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care  
1985 Douglas Drive North  
Golden Valley, Minnesota 55422-4386
3. <http://customer.honeywell.com> or <http://customer.honeywell.ca>

International Sales and Service Offices in all principal cities of the world. Manufacturing in Belgium, Canada, China, Czech Republic, Germany, Hungary, Italy, Mexico, Netherlands, United Kingdom, and United States.

Table 1. VBN Model Selection Table.

| Model Selection: Ball Valve                    |          |                 |          |               |          |                  | Actuator       | Fail Position  | Accessories  |           |
|--|----------|-----------------|----------|---------------|----------|------------------|----------------|--|--|-----------|
| Valve  | Fitting  | Body/ Flow Type | Size     | CV            | Trim     | Actuator Adapter |                |  |  |           |
| VB - ball valve                                |          |                 |          |               |          |                  | MVN613A0000*** | (Leave blank) = Fail in place  | (Leave blank) = No Cable<br>C1 = 1 m cable<br>C3 = 3 m cable |           |
| N - Female NPT threaded                        |          |                 |          |               |          |                  | MVN613L0000*** |  |  |           |
| 2 - 2-way<br>3 - 3-way                         |          |                 |          |               |          |                  | MVN643A0000*** | FSO = Fail Safe Open (VBN2)<br>FSC = Fail Safe Closed (VBN2)<br>FSA = Fail A-AB Open (VBN3)<br>FSB = Fail B-AB Open (VBN3) | (Leave blank) = No enclosure<br>3R = NEMA 3R Enclosure       |           |
| A---1/2 (DN15)                                 |          |                 |          |               |          |                  | MVN643L0000*** |  |  |           |
| B---3/4 (DN20)                                 |          |                 |          |               |          |                  | MVN713A0000*** |  |  |           |
| C---1 (DN25)                                   |          |                 |          |               |          |                  | MVN713L0000*** |  |  |           |
| D---1-1/4 (DN32)                               |          |                 |          |               |          |                  | MN6105A1011    |  |  |           |
| E---1-1/2 (DN40)                               |          |                 |          |               |          |                  | MN6105A1201    |  |  |           |
| F---2 (DN50)                                   |          |                 |          |               |          |                  | MN7505A2001    |  |  |           |
| G---2-1/2 (DN65)                               |          |                 |          |               |          |                  | MN7505A2209    |  |  |           |
| H---3 (DN80) (VBN2)                            |          |                 |          |               |          |                  | MS7505A2030    |  |  |           |
| xxx.xx - CV Designator See Table 4 and 5.      |          |                 |          |               |          |                  | MS7505A2130    |  |  |           |
| P - Plated Brass<br>S - Stainless Steel (VBN2) |          |                 |          |               |          |                  | MS8105A1030    | FSO = Fail Safe Open (VBN2)<br>FSC = Fail Safe Closed (VBN2)<br>FSA = Fail A-AB Open (VBN3)<br>FSB = Fail B-AB Open (VBN3) | (Leave blank) = 3 ft cable standard                          |           |
| A* - Standard Base                             |          |                 |          |               |          |                  | MS8105A1130    |  |  |           |
| L** - Low Profile                              |          |                 |          |               |          |                  | MS4105A1030    |  |  |           |
| X - MN/MS DCA Actuator Bracket                 |          |                 |          |               |          |                  | MS4105A1130    |  |  |           |
|  |          |                 |          |               |          |                  | MS7103A2021*** |  |  |           |
|  |          |                 |          |               |          |                  | MS7103A2221*** |  |  |           |
|  |          |                 |          |               |          |                  | MS3103A1023*** |  |  |           |
|  |          |                 |          |               |          |                  | MS3103A1223*** |  |  |           |
|  |          |                 |          |               |          |                  | MS7503A2021*** |  |  |           |
|  |          |                 |          |               |          |                  | MS7503A2221*** |  |  |           |
| <b>VB</b>                                      | <b>N</b> | <b>2</b>        | <b>A</b> | <b>004.70</b> | <b>P</b> | <b>A</b>         | +              | <b>MVN613A0000</b>   | +  | <b>C1</b> |

Example part number: **VBN2A004.70PA+MVN613A0000+C1**

\* Standard base provides clearance between valve and actuator for insulation.

\*\* Low profile enables installation of valve and actuator in tight spaces.

\*\*\* Only compatible with valves 1-1/4" or smaller.

**Table 2. Actuator Control Description.**

| <b>Actuator</b> | <b>Control</b>  |
|-----------------|---|
| MVN613A0000     | Floating, Two-position (SPDT) (90 sec. timing), 24 V, Fail in Place                                 |
| MVN613L0000     |   |
| MVN643A0000     | Floating, Two-position (SPDT or SPST) Fast Acting (30 sec. timing), 24 V, Fail in Place             |
| MVN643L0000     |   |
| MVN713A0000     | 0(2)-10 Vdc Modulating, 24 V, Fail in Place   |
| MVN713L0000     |   |
| MN6105A1011     | Floating, Two-position (SPDT), 24 V, Fail in Place  |
| MN6105A1201     | Floating, Two-Position (SPDT), 24 V, Fail in Place with end switches                                |
| MN7505A2001     | 0(2)-10 Vdc Modulating, 24 V, Fail in Place   |
| MN7505A2209     | 0(2)-10 Vdc Modulating, 24 V, Fail in Place with end switches                                       |
| MS7505A2030     | Universal, 0(2)-10 Vdc Modulating, Floating, Two-position (SPDT), 24 V, Fail Safe                   |
| MS7505A2130     | Universal, 0(2)-10 Vdc Modulating, Floating, Two-Position (SPDT), 24 V, Fail Safe with end switches |
| MS8105A1030     | Two-Position (SPST), 24 V, Fail Safe  |
| MS8105A1130     | Two-Position (SPST), 24 V, Fail Safe with end switches  |
| MS4105A1030     | Two-Position (SPST), 120 V, Fail Safe   |
| MS4105A1130     | Two-Position (SPST), 120 V, Fail Safe with end switches   |
| MS7103A2021     | 2-10 Vdc Modulating, 24 V, Fail Safe  |
| MS7103A2221     | 2-10 Vdc Modulating, 24 V, Fail Safe with end switches  |
| MS3103A1023     | Sylk-enabled, 24 V, Fail Safe   |
| MS3103A1223     | Sylk-enabled, 24 V, Fail Safe with end switches   |
| MS7503A2021     | Universal, 0(2)-10 Vdc Modulating, Floating, Two-Position, 24 V, Fail Safe                          |
| MS7503A2221     | Universal, 0(2)-10 Vdc Modulating, Floating, Two-Position, 24 V, Fail Safe with end switches        |

Table 3. Control Ball Valve Short Order Codes 1/2” – 3”.

| Model Selection: Ball Valve   |                |            |          |          |                  |          | Actuator   | Fail Position  | Accessories  |
|---|----------------|------------|----------|----------|------------------|----------|--|--|--|
| Valve   | Body Flow Type | Valve Size | CV       | Trim     | Actuator Adapter |          |  |  |  |
| <b>VBN - Control Ball Valve</b>   |                |            |          |          |                  |          | <b>0</b> - No Actuator (valve only)  | <b>0</b> - No Actuator or Fail in Place (FIP)  | <b>00</b> - None   |
| 2 - 2-way<br>3 - 3-way  |                |            |          |          |                  |          | <b>1</b> - 24 Vac, Floating, 90 sec. (MVN613, Fail in place)***<br><b>2</b> - 24 Vac, Floating/2-Pos., 30 sec. (MVN643, Fail in place)***<br><b>3</b> - 24 Vac, Modulating 0(2)-10 Vdc (MVN713, Fail in place)***<br><b>4</b> - 24 Vac, Floating/2-Position (MN6105, Fail in place)<br><b>5</b> - 24 Vac, Mod. 0(2)-10 Vdc (MN7505, Fail in place)<br><b>C</b> - 24 Vac, Floating/2-Position w/ end switches (MN 6105, Fail in place)<br><b>D</b> - 24 Vac, Mod. 0(2)-10 Vdc w/ end switches (MN7505, Fail in place) |  | <b>00</b> - None<br><b>01</b> - C1 - 1 m Cable<br><b>03</b> - C3 - 3 m Cable |
| A---1/2 (DN15)<br>B---3/4 (DN20)<br>C---1 (DN25)<br>D---1-1/4 (DN32)<br>E---1-1/2 (DN40)<br>F---2 (DN50)<br>G---2-1/2 (DN65)<br>H---3 (DN80) (VBN2) |                |            |          |          |                  |          | <b>6</b> - 24 Vac, Mod. 0(2)-10 Vdc/Floating, 2-Position (MS7505, Fail safe)<br><b>7</b> - 24 Vac, 2-Position (MS8105, Fail safe)<br><b>8</b> - 100-250 Vac, 2-Position (MS4105, Fail safe)<br><b>9</b> - 100-250 Vac, 2-Pos. w/ end switches (MS4105, Fail safe)  | <b>1</b> - VBN2 Fail Safe Open (FSO)<br><b>2</b> - VBN2 Fail Safe Closed (FSC)<br><b>3</b> - VBN3 Fail Safe A to AB Open (FSA)<br><b>4</b> - VBN3 Fail Safe B to AB Open (FSB) |  |
| CV Designator. Options range from B-2. See Table 4 and 5.   |                |            |          |          |                  |          | <b>A</b> - 24 Vac, 2-Position w/ end switches (MS8105, Fail safe)<br><b>B</b> - 24 Vac, Mod 0(2)-10 Vdc/ Floating/ 2-Position w/ end switches (MS7505, Fail safe)  |  |  |
| P - Nickel Chrome Plated Brass<br>S - 316 Stainless Steel (VBN2)  |                |            |          |          |                  |          | <b>E</b> - 24 Vac, Mod. 2-10 Vdc (MS7103, Fail safe)***<br><b>F</b> - 24 Vac, Mod. 2-10 Vdc w/ end switches (MS7103, Fail safe)***   | <b>01</b> - 3 ft Cable   |  |
| A* - Standard Base<br>L** - Low Profile<br>X - MN/MS DCA Actuator Bracket   |                |            |          |          |                  |          | <b>G</b> - 24 Vac, Sylk Enabled (MS3103, Fail safe)***<br><b>H</b> - 24 Vac, Sylk Enabled w/ end switches (MS3103, Fail safe)***<br><b>J</b> - 24 Vac, Universal, 0(2)-10Vdc / Floating / 2-Position (MS7503, Fail safe)***<br><b>K</b> - 24 Vac, Universal, 0(2)-10Vdc / Floating / 2-Position, w/ end switches (MS7503, Fail safe)***  |  |  |
| <b>VBN</b>  | <b>2</b>       | <b>A</b>   | <b>B</b> | <b>P</b> | <b>A</b>         | <b>1</b> | <b>0</b>   | <b>00</b>  |  |

Example part number: **VBN2ABPA1000**

\* Standard base provides clearance between valve and actuator for insulation.

\*\* Low profile enables installation of valve and actuator in tight spaces.

\*\*\* Only compatible with valves 1-1/4” or smaller.

**Table 4. C<sub>v</sub> Designator for Two-Way VBN Ball Valves.**

| Valve Body | Size   | B    | D    | E   | F   | G   | H   | J   | K     | L    | M   | N  | P   | R  | S    | T   | U    | 1    | 2    |
|------------|--------|------|------|-----|-----|-----|-----|-----|-------|------|-----|----|-----|----|------|-----|------|------|------|
| VBN2A      | 1/2"   | 0.38 | 0.68 | 1.3 | 2.0 | 2.6 | 4.7 |     | 11.7* |      |     |    |     |    |      |     |      |      |      |
| VBN2B      | 3/4"   |      |      |     |     |     | 4.3 | 7.4 | 10.1  |      | 29* |    |     |    |      |     |      |      |      |
| VBN2C      | 1"     |      |      |     |     |     |     | 9.0 |       | 15.3 | 26  |    | 54* |    |      |     |      |      |      |
| VBN2D      | 1-1/4" |      |      |     |     |     |     |     | 14.9  | 25   | 37  |    |     |    | 102* |     |      |      |      |
| VBN2E      | 1-1/2" |      |      |     |     |     |     |     |       |      |     | 41 |     | 74 |      |     |      | 172* |      |
| VBN2F      | 2"     |      |      |     |     |     |     |     |       |      |     | 42 | 57  | 71 | 100  |     |      |      | 266* |
| VBN2G      | 2-1/2" |      |      |     |     |     |     |     |       |      |     |    |     | 72 | 101  |     |      | 202* |      |
| VBN2H      | 3"     |      |      |     |     |     |     |     |       |      |     |    |     |    |      | 124 | 145* |      |      |

\* Valve does not have flow control insert.

**Table 5. C<sub>v</sub> Designator for Three-Way VBN Ball Valves.**

| Valve Body | Size   | B    | C    | D | E   | F   | G   | H   | J   | K     | L     | M   | N   | P  | R  | S    |
|------------|--------|------|------|---|-----|-----|-----|-----|-----|-------|-------|-----|-----|----|----|------|
| VBN3A      | 1/2"   | 0.33 | 0.59 |   | 1.0 | 2.4 |     | 4.3 | 8.0 |       |       |     |     |    |    |      |
| VBN3B      | 3/4"   |      |      |   |     |     | 3.8 |     | 7.0 | 11.0* |       |     |     |    |    |      |
| VBN3C      | 1"     |      |      |   |     |     |     |     | 8.6 | 14.9  | 22    | 31  |     |    |    |      |
| VBN3D      | 1-1/4" |      |      |   |     |     |     |     |     | 12.7  | 19.4* | 27  | 34* |    |    |      |
| VBN3E      | 1-1/2" |      |      |   |     |     |     |     |     |       | 24    | 32* |     | 61 |    |      |
| VBN3F      | 2"     |      |      |   |     |     |     |     |     |       |       |     | 38  | 57 | 83 | 109  |
| VBN3G      | 2-1/2" |      |      |   |     |     |     |     |     |       |       |     |     |    | 74 | 100* |

\* Valve does not have flow control insert.

## MVN Actuator



## APPLICATION

MVN 3Nm (27 lb-in.) Control Valve Actuator is used with the VBN2 2-way and the VBN3 3-way Control Ball Valves to control hot and chilled water with glycol solutions up to 50% in heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions.

## FEATURES

- **Non-spring Return**
- **Floating and modulating**
- **Space saving, click-on installation – no tool required**
- **Extendable position indicator for easy commissioning**
- **Available with or without cable (1 m or 3 m length)**
- **Compatible with control ball valves from 1/2 to 1-1/4 inches.**
- **Actuator can be mounted on the valve in any of four positions.**

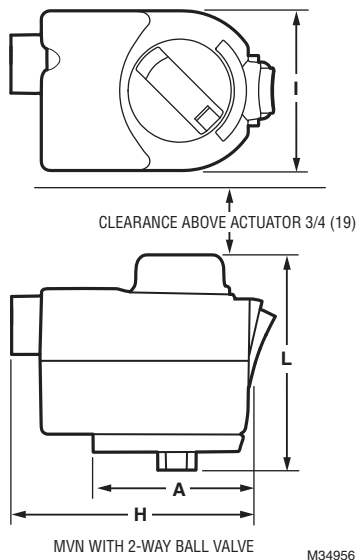


Fig. 1. MVN with 2-way ball valve. See Table 4.

## SPECIFICATIONS

**Actuator Type:** Valve

**Rotational Stroke:** 90° ±3°.

**Fail Safe Mode:** Non-spring return, Fail in place

**Torque:** 27 lb-in. (3 Nm).

**External Auxiliary Switches Available:** No

**Supply Voltage:** 24 Vac +20%, -15%, 24 Vdc

**Power Consumption:** 5 VA- Modulating; 1.5 VA - Floating; 6 VA - Fast Acting SPDT

**Environmental Rating:** NEMA2

**Frequency:** 50 Hz; 60 Hz

**Mounting:** Click-on installation – no tool required

**Noise Rating at 1m (Maximum):** 35 dB(A) max at 1 m [50 dB (A) for MVN643].

**Materials:** Plenum rated plastic housing

**Operating Humidity Range (% RH):** 5 to 95% RH, non-condensing

**Ambient Temperature Range:** -4°F to 131°F (-20°C to 55°C)

**Storage Temperature Range:** -40°F to 176°F (-40°C to 80°C)

**Weight:** See Table 7 (2-way) and Table 8 (3-way)

**Dimensions:** See Fig. 4-6, Table 7 (2-way) and Table 8 (3-way).

**Timing:** 90 sec. for MVN613 and MVN713; 30 sec. for MVN643

**Electrical Connections:** Field wiring 18 to 20 AWG to screw terminals, located under the removable access cover.

**Humidity Ratings:** 5% to 95% RH non-condensing.

**Design Life (at Rated Voltage):** 60,000 cycles; 1 cycle = 0°...90°...0°

**Cable Specification:** 18 AWG, Plenum Rated, 300 V, 10 A, 1 m or 3 m length available.

**Environmental Protection Ratings:** IP40

**Approvals:** UL/cUL; UL60730

Table 6. Actuators and Accessories.

| Actuator    | Description                                  | Accessory                              |
|-------------|--|--|
| MVN613A0000 | Floating control ball valve actuator         | C1- 1 meter cable<br>C3- 3 meter cable |
| MVN613L0000 | Floating control ball valve actuator         |  |
| MVN643A0000 | Fast acting SPDT control ball valve actuator |  |
| MVN643L0000 | Fast acting SPDT control ball valve actuator |  |
| MVN713A0000 | Modulating control ball valve actuator       |  |
| MVN713L0000 | Modulating control ball valve actuator       |  |

To order actuator with accessories order actuator part number + accessory. For example: MVN613A0000 + C1

## Non-Spring Return Direct Coupled Actuator



## APPLICATION

This non-spring return direct-coupled damper actuator provides modulating or floating/2-position control for: air dampers, air handlers, ventilation flaps, louvers, and reliable control for air damper applications with up to 10 sq. ft./ 44lb.-in. (5 Nm) and 20 sq. ft./88 lb.-in. (10 Nm) (seal-less damper blades; air friction-dependent).

## FEATURES

- **Dec clutch for manual adjustment**
- **Adjustable mechanical end limits**
- **Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections**
- **Models available with 3 foot 18 AWG color-coded cable**
- **Mountable in any orientation**
- **Function selection switch for selecting modulating (MN7505) or floating/2-position control (MN6105)**

## SPECIFICATIONS

**Actuator Type:** Damper; Valve

**Rotational Stroke:** 95° ±3 degrees

**Fail Safe Mode:** Non-spring return, Fail in place

**Torque:** 44 lb.-in. (5 Nm)

**External Auxiliary Switches Available:** No

**Environmental Rating:** NEMA2

**Frequency:** 50 Hz; 60 Hz

**Manual operation:** Dec clutch mechanism

**Mounting:** Direct coupled

**Maximum Noise Rating, Driving (dBA @ 1m):** 35

**Rotation to Open:** By switch

**Rotational Stroke Adjustment:** Dual Integral Adj. Stops (3 degree increments)

**Compatible Damper Shafts:** 1/4 to 1/2 in. square or 3/8 to 5/8 in. round (6 to 13 mm square or 8 to 16 mm round)

**Shaft Adapter Type:** U-bolt clamp

**Supply Voltage:** 24 Vac +20%, -15%, 24 Vdc

**Power Consumption:** 5 VA

**Materials:** Plenum rated plastic housing

**Ingress Protection Rating:** IP54

**Operating Humidity Range (% RH):** 5 to 95% RH, non-condensing

**Ambient Temperature Range:** -5°F to +140°F (-20°C to +60° C)

**Storage Temperature Range:** -22°F to +176°F (-30°C to +80°C)

**Weight:** 1 lb (0.45 kg)

**Includes:** Mounting bracket, screws, shaft adapter, water-tight strain-relief cable fittings

**Comments:** Integral 1/2 in. NPSM conduit connection.

### Approvals:

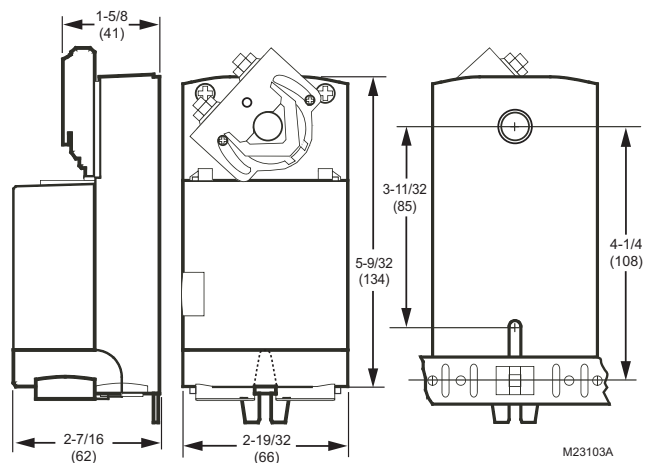
CE: 89/336/ECC, 73/23/EEC

C-Tick: N314

Underwriters Laboratories, Inc.: UL873, Plenum Rated

Canadian Underwriters Laboratories, Inc.:

cUL C22.2 No. 24-93



**Fig. 2. Non-spring return direct coupled actuator dimensions diagram.**



## Spring Return 3 Nm Diamond



## APPLICATION

MS7103 and MS3103 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

## FEATURES

- **Brushless DC submotor with electronic stall protection**
- **Self-centering shaft adaptor (shaft coupling) for wide range of shaft sizes**
- **Fast test mode**
- **MS7103 models for use with 2-10 Vdc control**
- **MS3103 models for use with Syk-enabled controllers**
- **Models available with two internal end switches**
- **Durable plastic housing with built-in mechanical end limits**
- **Spring return direction field selectable**
- **Shaft position indicator and scale**
- **UL (cUL) listed and CE compliant**
- **Plenum rated actuator and control/power cable**

## SPECIFICATIONS

**Actuator Type:** Damper; Valve

**Rotational Stroke:** 95 ±3 degrees

**Fail Safe Mode:** Spring Return

**Torque:** 27 lb-in. (3 Nm)

**Spring Return Torque:** 27 lb-in (3 Nm)

**Spring Return Direction:** By orientation

**External Auxiliary Switches Available:** No

### Cable Specification:

Power Cable: Plenum Rated, 3 ft (0.914 m) length from end of access cover, 18 AWG

Switch Cable: Appliance Rated, 3 ft (0.914 m) length from end of access cover, 18 AWG

**Ingress Protection Rating:** IP54

**Environmental Rating:** NEMA 2

**Frequency:** 50 Hz; 60 Hz

**Mounting:** Direct Coupled

**Maximum Noise Rating, Driving (dBA @ 1m):** < 40

**Maximum Noise Rating, Spring Return (dBA @ 1m):** < 65

**Rotational Stroke Adjustment:** Mechanically limited  
7.5 degree increments

**Compatible Damper Shafts:** 3/8 to 3/4 in. round or 1/4 to 1/2 in. square (9 to 19 mm round or 6 to 13 mm square)

**Shaft Adapter Type:** U-bolt

**Materials:** Plenum rated plastic housing

**Operating Humidity Range (% RH):** 5 to 95% RH, non-condensing

**Ambient Operating Temperature:** -40 F to +150F (-40 C to +65 C)

**Shipping and Storage Temperature:** -40 F to +150F (-40 C to +65 C)

**Weight:** 1.7 lb (0.78 kg)

### Approvals

UL60730

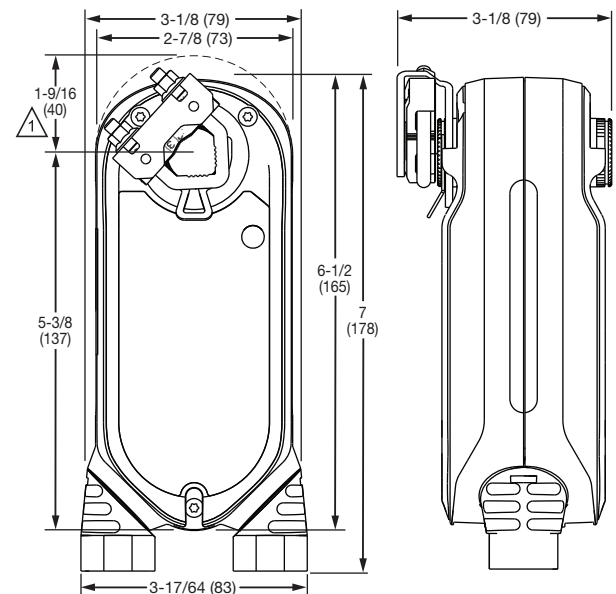
IEC 60730-1 and Part 2-4

UL1097 for Double Insulation

CE Certification Low Voltage Directive 2014/35/EU

CE EMC 2004/108/EC

Switch cables are UL certified only



△ FOR 1/2 INCH SHAFT.

M37351

**Fig. 3. Dimensions in in. (mm).**

## Spring Return Direct Coupled Actuator



## APPLICATION

MS4105, MS7405, MS7505, and MS8105 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

## FEATURES

- **Brushless DC submotor with electronic stall protection on all models**
- **Self-centering shaft adaptor (shaft coupling) for wide range of shaft sizes**
- **Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections.**
- **Models available with 3 foot 18 AWG color-coded cable**
- **Durable plastic housing with built-in mechanical end limits**
- **Spring return direction field selectable**
- **Shaft position indicator and scale**
- **UL (cUL) listed and CE compliant**
- **All models are plenum rated per UL873**

## SPECIFICATIONS

**Actuator Type:** Damper; Valve

**Rotational Stroke:** 95 ±3 degrees

**Fail Safe Mode:** Spring Return

**Torque:** 44 lb-in. (5 Nm)

**Spring Return Torque:** 44 lb-in. (5 Nm)

**Spring Return Direction:** By orientation

**External Auxiliary Switches Available:** No

**Environmental Rating:** NEMA2

**Frequency:** 50 Hz; 60 Hz

**Mounting:** Direct Coupled

**Maximum Noise Rating, Holding (dBA @ 1m):** 20 (no audible noise)

**Maximum Noise Rating, Driving (dBA @ 1m):** 50

**Rotation to Open:** By switch

**Supply Voltage:** 24 Vac +20%, -15%, 24 Vdc

**Power Consumption:** 5 VA

**Rotational Stroke Adjustment:** Mechanically limited 5 degree increments

**Compatible Damper Shafts:** 1/4 to 1/2 in. square or 3/8 to 5/8 in. round (6 to 13 mm square or 9 to 16 mm round)

**Shaft Adapter Type:** Self-centering clamping

**Materials:** Plenum rated plastic housing

**Operating Humidity Range (% RH):** 5 to 95% RH, non-condensing

**Ambient Temperature Range:** -40°F to +150°F (-40°C to +65°C) for two-position actuators only

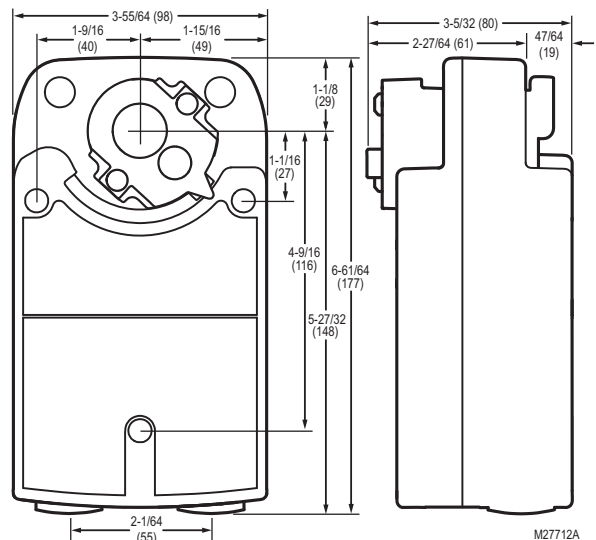
**Storage Temperature Range:** -40°F to +150°F (-40°C to +65°C)

**Weight:** 3.5 lb. (1.6 kg)

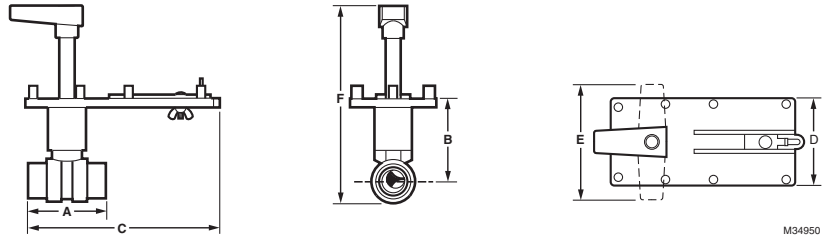
**Includes:** Mounting bracket, self-centering shaft adapter

### Approvals:

CE: EMC 2004/108/EC; Certification Low Voltage Directive 2006/95/EC; IEC 60730-1 and Part 2-14 C-Tick: N314  
Underwriters Laboratories, Inc.: UL873  
Canadian Underwriters Laboratories, Inc.: cUL C22.2 No. 24-93

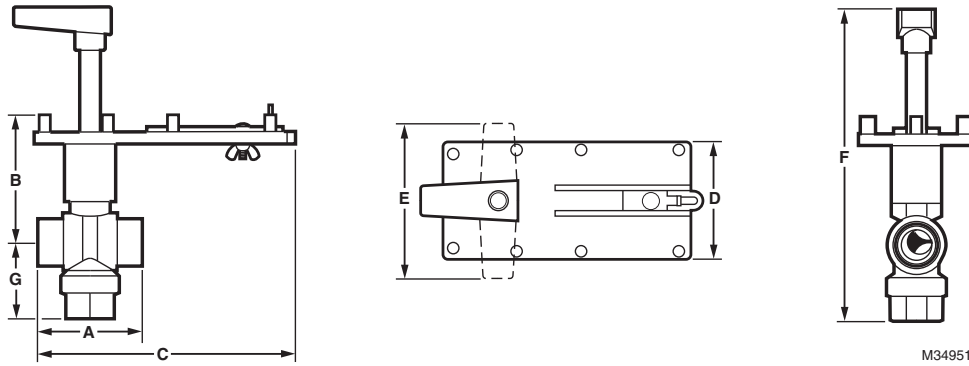


**Fig. 4. Spring return direct coupled actuator dimensions diagram.**



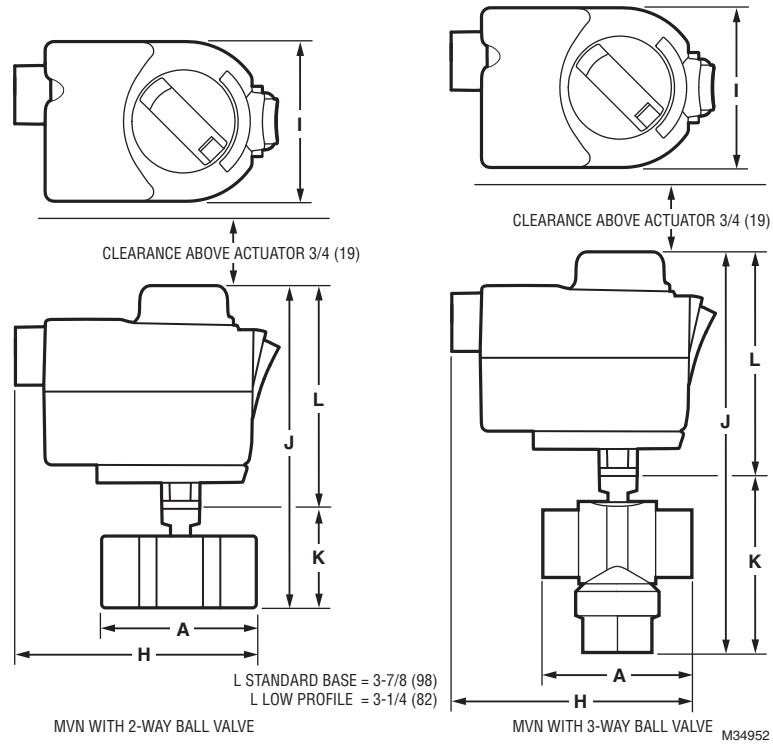
M34950

**Fig. 5. 2-way ball valve dimensions for models with MN and MS actuators. See Table 7.**



M34951

**Fig. 6. 3-way ball valve dimensions for models with MN and MS actuators. See Table 8.**



M34952

**Fig. 7. MVN actuator with 2-way and 3-way ball valve dimensions in inches (millimeters). See Table 7 and Table 8.**

**Table 7. VBN2 dimensions in inches (millimeters).**

| Pipe Size |      |       | C <sub>v</sub><br>Designators                    | MVN, MN, AND MS ACTUATORS WITH 2-WAY BALL VALVE<br>Dimensions in in. (mm) |                  |                      |           |            |                       |                      |                 |                |                 |                      | Weight<br>(valve<br>only)<br>lbs. | Replacement<br>Stem<br>Assembly** |                         |                         |
|-----------|------|-------|--|---|------------------|----------------------|-----------|------------|-----------------------|----------------------|-----------------|----------------|-----------------|----------------------|-----------------------------------|-----------------------------------|-------------------------|-------------------------|
| In.       | (DN) | Code  |  | A   | B                | C                    | D         | E          | Fms <sup>a</sup>      | Fmn <sup>b</sup>     | H               | I              | J<br>(w/std)    | J<br>(w/low)         |                                   |                                   | K                       |                         |
| 1/2       | 15   | VBN2A | 0.38, 0.68, 1.30,<br>2.00, 2.60, 4.70,<br>11.70* | 2-3/8<br>(60)   | 3-7/16<br>(87)   | 6-5/8<br>(168)       | 3<br>(76) | 4<br>(102) | 8-1/8<br>(206)        | 6-7/8<br>(175)       | 4-9/16<br>(116) | 2-3/16<br>(71) | 5-7/16<br>(139) | 4-<br>13/16<br>(123) | 1-5/8<br>(41)                     | 1                                 | 5112-19<br>5112-22 (SS) |                         |
| 3/4       | 20   | VBN2B | 4.30, 7.40                                       | 2-3/8<br>(60)   | 3-7/16<br>(87)   | 6-7/16<br>(164)      | 3<br>(76) | 4<br>(102) | 8-1/8<br>(206)        | 6-7/8<br>(175)       |                 |                | 5-7/16<br>(139) | 4-<br>13/16<br>(123) | 1-5/8<br>(41)                     | 1                                 |                         |                         |
|           |      |       | 10.10, 29.00*                                    | 2-5/8<br>(67)   | 3-11/16<br>(94)  | 6-1/2<br>(165)       | 3<br>(76) | 4<br>(102) | 8-5/16<br>(211)       | 7-1/16<br>(180)      |                 |                | 5-5/8<br>(143)  | 5(127)               | 1-<br>13/16<br>(45)               | 1                                 |                         |                         |
| 1         | 25   | VBN2C | 9.00   | 3-3/4<br>(95)   | 3-11/16<br>(94)  | 7-1/16<br>(179)      | 3<br>(76) | 4<br>(102) | 8-5/16<br>(211)       | 7-1/16<br>(180)      |                 |                | 5-5/8<br>(143)  | 5(127)               | 1-<br>13/16<br>(45)               | 1                                 |                         |                         |
|           |      |       | 15.30, 26.00,<br>54.00*                          | 3-1/16<br>(77)  | 3-15/16<br>(100) | 6-3/4<br>(171)       | 3<br>(76) | 4<br>(102) | 8-<br>11/16<br>(221)  | 7-7/16<br>(189)      |                 |                | 6(153)          | 5-3/8<br>(137)       | 2-3/16<br>(55)                    | 1.4                               |                         | 5112-20<br>5112-23 (SS) |
| 1-1/4     | 32   | VBN2D | 14.90, 25.00                                     | 3(76)   | 3-15/16<br>(100) | 6-<br>11/16<br>(170) | 3<br>(76) | 4<br>(102) | 8-<br>11/16<br>(221)  | 7-7/16<br>(189)      |                 |                | 6<br>(152)      | 5-3/8<br>(137)       | 2-1/8<br>(54)                     | 1.4                               |                         |                         |
|           |      |       | 37.00, 102.00*                                   | 3-5/8<br>(92)   | 4-7/16<br>(113)  | 7<br>(178)           | 3<br>(76) | 4<br>(102) | 9-1/16<br>(231)       | 7-<br>13/16<br>(198) |                 |                | 6-3/8<br>(162)  | 5-3/4<br>(146)       | 2-9/16<br>(64)                    | 2.4                               |                         |                         |
| 1-1/2     | 40   | VBN2E | 74.00*   | 3-7/16<br>(87)  | 3-15/16<br>(100) | 6-<br>15/16<br>(176) | 3<br>(76) | 4<br>(102) | 9-1/16<br>(231)       | 7-<br>13/16<br>(198) |                 |                |                 |                      |                                   |                                   | 2.4                     |                         |
|           |      |       | 41.00, 172.00*                                   | 4-1/16<br>(103)   | 5-3/16<br>(132)  | 7-1/16<br>(179)      | 3<br>(76) | 4<br>(102) | 8-7/8<br>(225)        | 7-5/8<br>(194)       |                 |                |                 |                      |                                   |                                   |                         |                         |
| 2         | 50   | VBN2F | 42.00  | 4(101)  | 3-3/4<br>(95)    | 7-3/16<br>(183)      | 3<br>(76) | 4<br>(102) | 8-7/8<br>(225)        | 7-5/8<br>(194)       |                 |                |                 |                      |                                   |                                   | 3.2                     |                         |
|           |      |       | 57.00, 71.00,<br>100.00, 266.00*                 | 4-15/16<br>(125)  | 4-1/16<br>(103)  | 7-7/16<br>(188)      | 3<br>(76) | 4<br>(102) | 10-1/2<br>(267)       | 9-1/4<br>(235)       |                 |                |                 |                      |                                   |                                   |                         |                         |
| 2-1/2     | 65   | VBN2G | 72.00, 101.00,<br>202.00*                        | 5-5/16<br>(135)   | 4-1/16<br>(103)  | 7-9/16<br>(192)      | 3<br>(76) | 4<br>(102) | 10-1/2<br>(267)       | 9-1/4<br>(235)       |                 |                |                 |                      |                                   |                                   | 5.5                     |                         |
| 3         | 80   | VBN2H | 124.00, 145.00*                                  | 5(127)  | 5-7/8<br>(149)   | 7-<br>11/16<br>(196) | 3<br>(76) | 4<br>(102) | 10-<br>11/16<br>(271) | 9-7/16<br>(240)      |                 |                |                 |                      |                                   |                                   | 5.9                     |                         |

<sup>a</sup> For models using the MS direct coupled actuator.

<sup>b</sup> For models using the MN direct coupled actuator.

\* Indicates full port valve: no flow characterizing insert.

\*\* Replacement stems available in brass or stainless steel—use accordingly to valve part number.

**Table 8. VBN3 dimensions in inches (millimeters).**

| Pipe Size |      |       | C <sub>v</sub> Designators            | MVN, MN, AND MS ACTUATORS WITH 3-WAY BALL VALVE<br>Dimensions in in. (mm) |                  |                  |           |            |                       |                  |               |                     |                     |                  |                 |                | Weight<br>(valve<br>only)<br>lbs. | Replacement<br>Stem<br>Assembly |         |
|-----------|------|-------|---------------------------------------|---|------------------|------------------|-----------|------------|-----------------------|------------------|---------------|---------------------|---------------------|------------------|-----------------|----------------|-----------------------------------|---------------------------------|---------|
| In.       | (DN) | Code  |                                       | A   | B                | C                | D         | E          | Fms <sup>a</sup>      | Fmn <sup>b</sup> | G             | H                   | I                   | J<br>(w/ std)    | J<br>(w/ low)   | K              |                                   |                                 |         |
| 1/2       | 15   | VBN3A | 0.33, 0.59, 1.00,<br>2.40, 4.30, 8.00 | 3-1/2<br>(89)   | 3-5/16<br>(84)   | 7 (178)          | 3<br>(76) | 4<br>(102) | 9-3/8<br>(238)        | 8-1/8<br>(206)   | 2-3/8<br>(60) | 4-<br>9/16<br>(116) | 2-<br>13/16<br>(71) | 6-11/16<br>(170) | 6-1/16<br>(154) | 2-7/8<br>(72)  | 2.4                               | 5112-19                         |         |
| 3/4       | 20   | VBN3B | 3.80, 7.00,<br>11.00*                 | 2-13/16<br>(71)   | 3-5/16<br>(84)   | 6-1/2<br>(165)   | 3<br>(76) | 4<br>(102) | 8-13/16<br>(224)      | 7-9/16<br>(192)  | 2(51)         |                     |                     | 6-1/8<br>(156)   | 5-1/2<br>(140)  | 2-5/16<br>(58) | 2                                 |                                 |         |
| 1         | 25   | VBN3C | 8.60, 22.00                           | 3 (76)  | 3-13/16<br>(97)  | 6-13/16<br>(173) | 3<br>(76) | 4<br>(102) | 9-13/16<br>(249)      | 8-9/16<br>(217)  | 2-5/8<br>(67) |                     |                     | 7-1/8<br>(181)   | 6-1/2<br>(165)  | 3-5/16<br>(83) | 2.6                               | 5112-20                         |         |
|           |      |       | 14.90, 31.00                          | 4-5/16<br>(114)   | 4 (102)          | 7-13/16<br>(198) | 3<br>(76) | 4<br>(102) | 10-<br>13/16<br>(275) | 9-9/16<br>(243)  | 3-1/4<br>(83) |                     |                     |                  | 8-1/8<br>(206)  | 7-1/2<br>(191) | 4-5/16<br>(109)                   |                                 | 3.3     |
| 1-1/4     | 32   | VBN3D | 19.40*                                | 3 (76)  | 3-13/16<br>(97)  | 6-13/16<br>(173) | 3<br>(76) | 4<br>(102) | 9-13/16<br>(249)      | 8-9/16<br>(217)  | 2-1/2<br>(64) |                     |                     | 7-1/8<br>(181)   | 6-1/2<br>(165)  | 3-5/16<br>(83) | 2.5                               | 5112-21                         |         |
|           |      |       | 12.70, 27.00,<br>34.00*               | 3-5/8<br>(91)   | 4 (102)          | 7-5/16<br>(185)  | 3<br>(76) | 4<br>(102) | 10-5/16<br>(262)      | 9-1/16<br>(230)  | 2-3/4<br>(70) |                     |                     |                  | 7-5/8<br>(194)  | 7 (178)        | 3-<br>13/16<br>(96)               |                                 | 2.8     |
| 1-1/2     | 40   | VBN3E | 32.00*                                | 4-5/16<br>(114)   | 4 (102)          | 7-13/16<br>(198) | 3<br>(76) | 4<br>(102) | 10-<br>13/16<br>(275) | 9-9/16<br>(243)  | 3-1/4<br>(83) |                     |                     |                  |                 |                |                                   | 3.3                             | 5112-21 |
|           |      |       | 24.00, 61.00                          | 4 (102)   | 4-1/2<br>(114)   | 7-5/16<br>(185)  | 3<br>(76) | 4<br>(102) | 11 (279)              | 9-3/4<br>(248)   | 3-1/4<br>(83) |                     |                     |                  |                 |                |                                   |                                 |         |
| 2         | 50   | VBN3F | 38.00, 57.00                          | 4 (102)   | 4-1/2<br>(114)   | 7-5/16<br>(185)  | 3<br>(76) | 4<br>(102) | 11 (279)              | 9-3/4<br>(248)   | 3-1/4<br>(83) |                     |                     |                  |                 |                |                                   | 3.3                             | 5112-21 |
|           |      |       | 83.00, 109.00                         | 5 (127)   | 5-13/16<br>(147) | 7-13/16<br>(198) | 3<br>(76) | 4<br>(102) | 12-5/16<br>(313)      | 11-1/16<br>(281) | 3-3/4<br>(95) |                     |                     |                  |                 |                |                                   |                                 |         |
| 2-1/2     | 65   | VBN3G | 74.00, 100.00                         | 5 (127)   | 5-13/16<br>(147) | 7-13/16<br>(198) | 3<br>(76) | 4<br>(102) | 12-5/16<br>(313)      | 11-1/16<br>(281) | 3-3/4<br>(95) |                     |                     |                  |                 |                |                                   | 3.8                             |         |

<sup>a</sup> For models using the MS direct coupled actuator.  
<sup>b</sup> For models using the MN direct coupled actuator.  
\* Indicates full A-port: no flow characterizing insert.

**Rangeability**

Rangeability is a measure of a valve's controllability. It is a measured property and is expressed as the ratio of a valve's maximum flow rate to its minimum controllable flow rate.

**Table 9. 2-way available C<sub>v</sub> and Rangeability.**

|       |                |        |        |        |        |        |      |       |
|-------|----------------|--------|--------|--------|--------|--------|------|-------|
| VBN2A | C <sub>v</sub> | 0.38   | 0.68   | 1.30   | 2.00   | 2.30   | 4.70 | 11.70 |
|       | Rangeability   | 41     | 17     | 52     | *      | 321    | 159  | 251   |
| VBN2B | C <sub>v</sub> | 4.30   | 7.40   | 10.10  | 29.00  |        |      |       |
|       | Rangeability   | 159    | *      | 390    | 1503   |        |      |       |
| VBN2C | C <sub>v</sub> | 9.00   | 15.30  | 26.00  | 54.00  |        |      |       |
|       | Rangeability   | 390    | 1040   | 484    | 1207   |        |      |       |
| VBN2D | C <sub>v</sub> | 14.90  | 25.00  | 37.00  | 102.00 |        |      |       |
|       | Rangeability   | 1040   | *      | 484    | 1263   |        |      |       |
| VBN2E | C <sub>v</sub> | 41.00  | 74.00  | 172.00 |        |        |      |       |
|       | Rangeability   | 603    | 1263   | 558    |        |        |      |       |
| VBN2F | C <sub>v</sub> | 42.00  | 57.00  | 71.00  | 100.00 | 266.00 |      |       |
|       | Rangeability   | 603    | *      | 287    | *      | 877    |      |       |
| VBN2G | C <sub>v</sub> | 72.00  | 101.00 | 202.00 |        |        |      |       |
|       | Rangeability   | 287    | 558    | 877    |        |        |      |       |
| VBN2H | C <sub>v</sub> | 124.00 | 145.00 |        |        |        |      |       |
|       | Rangeability   | 750    | 877    |        |        |        |      |       |

### Effective C<sub>v</sub>

For effective C<sub>v</sub>s for Honeywell control ball valves when used with pipe reducers, refer to Table 10 and 11.

**Table 10. Effective C<sub>v</sub>s Using Pipe Reducers (Two-way).**

| Valve Size (in.) | Effective C <sub>v</sub> <sup>a</sup> |      |      |        |        |      |        |      |      |     |
|------------------|---------------------------------------|------|------|--------|--------|------|--------|------|------|-----|
|                  | Pipe Size (NPT)                       |      |      |        |        |      |        |      |      |     |
|                  | 1/2"                                  | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"   | 2-1/2" | 3"   | 4"   | 5"  |
| 1/2"             | 0.38                                  | 0.38 | 0.38 | 0.38   |        |      |        |      |      |     |
|                  | 0.68                                  | 0.68 | 0.68 | 0.68   |        |      |        |      |      |     |
|                  | 1.3                                   | 1.3  | 1.3  | 1.3    |        |      |        |      |      |     |
|                  | 2.0                                   | 2.0  | 1.9  | 1.9    |        |      |        |      |      |     |
|                  | 2.6                                   | 2.5  | 2.5  | 2.4    |        |      |        |      |      |     |
|                  | 4.7                                   | 4.3  | 4.1  | 3.9    |        |      |        |      |      |     |
| 11.7             | 7.9                                   | 6.7  | 6.2  |        |        |      |        |      |      |     |
| 3/4"             |                                       | 4.3  | 4.3  | 4.2    | 4.2    |      |        |      |      |     |
|                  |                                       | 7.4  | 7.2  | 6.4    | 6.8    |      |        |      |      |     |
|                  |                                       | 10.1 | 9.6  | 9.1    | 8.8    |      |        |      |      |     |
|                  |                                       | 29   | 21.1 | 17.1   | 15.4   |      |        |      |      |     |
| 1"               |                                       |      | 9.0  | 8.9    | 8.8    | 8.7  | 8.6    | 8.6  |      |     |
|                  |                                       |      | 15.3 | 14.9   | 14.4   | 13.8 | 13.5   | 13.4 |      |     |
|                  |                                       |      | 26   | 24     | 22     | 20   | 19     | 19   |      |     |
| 1-1/4"           |                                       |      |      | 54     | 42     | 34   | 28     | 26   | 25   |     |
|                  |                                       |      |      | 14.9   | 14.8   | 14.5 | 14.3   | 14.2 | 14.0 |     |
|                  |                                       |      |      | 25     | 25     | 23   | 22     | 22   | 22   |     |
|                  |                                       |      |      | 37     | 35     | 31   | 30     | 29   | 28   |     |
| 1-1/2"           |                                       |      |      |        | 102    | 79   | 53     | 46   | 42   | 39  |
|                  |                                       |      |      |        | 41     | 39   | 37     | 36   | 35   | 34  |
|                  |                                       |      |      |        | 74     | 64   | 56     | 52   | 48   | 47  |
| 2"               |                                       |      |      |        |        | 172  | 101    | 77   | 67   | 60  |
|                  |                                       |      |      |        |        | 42   | 41     | 41   | 40   | 40  |
|                  |                                       |      |      |        |        | 57   | 56     | 54   | 52   | 51  |
|                  |                                       |      |      |        |        | 71   | 69     | 65   | 62   | 61  |
|                  |                                       |      |      |        |        | 100  | 94     | 87   | 79   | 72  |
| 2-1/2"           |                                       |      |      |        |        |      | 266    | 190  | 146  | 117 |
|                  |                                       |      |      |        |        |      | 72     | 67   | 63   | 61  |
|                  |                                       |      |      |        |        |      | 101    | 88   | 80   | 76  |
| 3"               |                                       |      |      |        |        |      |        | 202  | 132  | 109 |
|                  |                                       |      |      |        |        |      |        | 124  | 90   | 85  |
|                  |                                       |      |      |        |        |      |        | 145  | 97   | 91  |

<sup>a</sup> Multiply the C<sub>v</sub> value by 0.865 to get the capacity in k<sub>v</sub>s, if S.I. (metric) units are required.

**Table 11. Effective C<sub>v</sub>s Using Pipe Reducers (Three-way)**

| Valve Size (in.) | Effective C <sub>v</sub> <sup>a</sup> |      |      |        |        |      |        |      |      |
|------------------|---------------------------------------|------|------|--------|--------|------|--------|------|------|
|                  | Pipe Size (NPT)                       |      |      |        |        |      |        |      |      |
|                  | 1/2"                                  | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"   | 2-1/2" | 3"   | 4"   |
| 1/2"             | 0.33                                  | 0.33 | 0.30 | 0.30   |        |      |        |      |      |
|                  | 0.59                                  | 0.59 | 0.60 | 0.60   |        |      |        |      |      |
|                  | 1.0                                   | 1.0  | 1.0  | 1.0    |        |      |        |      |      |
|                  | 2.4                                   | 2.4  | 2.3  | 2.3    |        |      |        |      |      |
|                  | 4.3                                   | 4.3  | 4.0  | 3.8    |        |      |        |      |      |
|                  | 8.0                                   | 8.0  | 7.9  | 5.7    |        |      |        |      |      |
| 3/4"             |                                       | 3.8  | 3.8  | 3.7    | 3.7    |      |        |      |      |
|                  |                                       | 11.0 | 10.4 | 9.78   | 9.4    |      |        |      |      |
| 1"               |                                       | 8.6  | 8.6  | 8.5    | 8.4    | 8.3  | 8.2    | 8.2  |      |
|                  |                                       | 14.9 | 14.9 | 14.6   | 14.1   | 13.5 | 13.3   | 13.1 |      |
|                  |                                       | 22   | 22   | 21     | 20     | 18.0 | 18.0   | 17.0 |      |
|                  |                                       | 31   | 31   | 28     | 25     | 22   | 21     | 21   |      |
| 1-1/4"           |                                       |      |      | 8.7    | 8.6    | 8.6  | 8.5    | 8.5  | 8.5  |
|                  |                                       |      |      | 12.7   | 12.6   | 12.4 | 12.3   | 12.2 | 12.2 |
|                  |                                       |      |      | 19     | 19     | 19   | 18.1   | 17.9 | 17.6 |
|                  |                                       |      |      | 27     | 26     | 25   | 24     | 23   | 23   |
| 1-1/2"           |                                       |      |      |        | 34     | 33   | 30     | 28   | 27   |
|                  |                                       |      |      |        | 24     | 23   | 23     | 22   | 22   |
|                  |                                       |      |      |        | 32     | 31   | 30     | 29   | 27   |
|                  |                                       |      |      |        | 61     | 55   | 50     | 47   | 44   |
| 2"               |                                       |      |      |        |        | 38   | 38     | 37   | 37   |
|                  |                                       |      |      |        |        | 57   | 56     | 54   | 52   |
|                  |                                       |      |      |        |        | 83   | 70     | 75   | 70   |
|                  |                                       |      |      |        |        | 109  | 101    | 92   | 83   |
| 2-1/2"           |                                       |      |      |        |        |      | 74     | 68   | 65   |
|                  |                                       |      |      |        |        |      | 100    | 87   | 79   |

<sup>a</sup> Multiply the C<sub>v</sub> value by 0.865 to get the capacity in k<sub>v</sub>s, if S.I. (metric) units are required.

## Application Notes

### IMPORTANT

Valve sizing is important for correct system operation. Undersized valves do not have sufficient capacity at maximum load. Oversized valves do not have sufficient authority over the load in modulating applications.

Oversized valves can cause excessive cycling and the seat and ball can be damaged because of the restricted opening.

### Proper Use

These valves are only for use in cold, warm, and hot water systems. Not suitable for oil, combustible gases, or steam. They are designed for a medium temperature range of from 35 to 250°F, at a maximum pressure of 360 psig VBN valves are to be operated with the appropriate Honeywell direct coupled actuators only.

Water should be properly filtered, treated and conditioned according to local conditions and the recommendations of the boiler or chiller manufacturers. The installation of a strainers and filters is recommended.

### IMPORTANT

The presence of excessive iron oxide (red rust) in the system voids the valve warranty.

### Required Operating Torque

Both Honeywell non-spring return MVN and spring return low torque direct coupled actuators can be utilized with the VBN2 and VBN3 valves. VB valves use a patented seat design that reduces the torque needed from the actuator.

**Table 12. Close-off, Differential Pressure Ratings.**

| Valve Type | Valve Size (in.)             | Close-off Pressure Rating (psid) |
|------------|------------------------------|----------------------------------|
| 2-way      | 1/2, 3/4                     | 130                              |
|            | 1, 1-1/4, 1-1/2, 2, 2-1/2, 3 | 100                              |
| 3-way      | 1/2, 3/4, 1                  | 50                               |
|            | 1-1/4, 1-1/2, 2, 2-1/2       | 40                               |

NOTE: 3-way close-off ratings apply to 3-way valves with the B port plugged

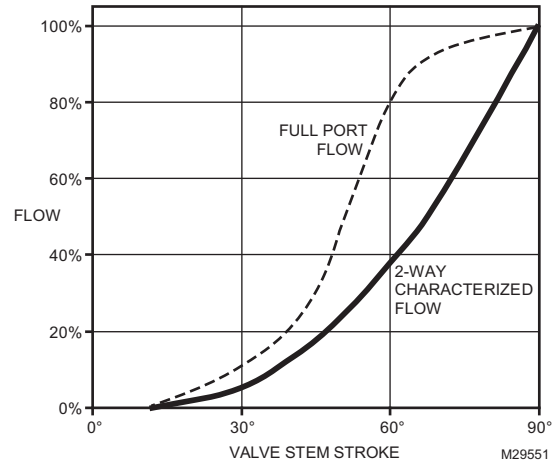
### Flow Characteristics, Fig. 8, 9

The VBN2 Two-Way Ball Valves have:

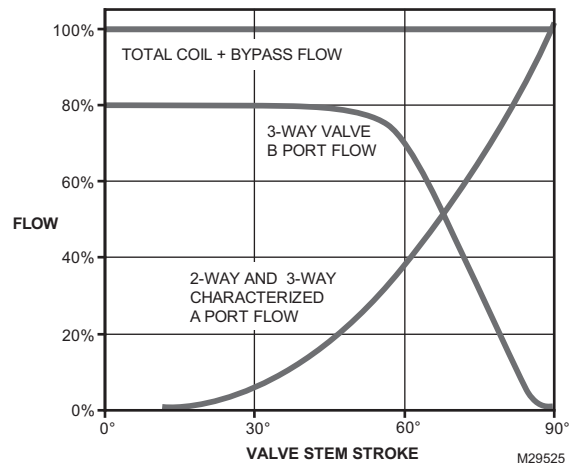
- an equal percentage flow characteristic with characterized flow control insert.
- a linear flow characteristic with full port balls.

The VBN3 Three-Way Ball Valves have:

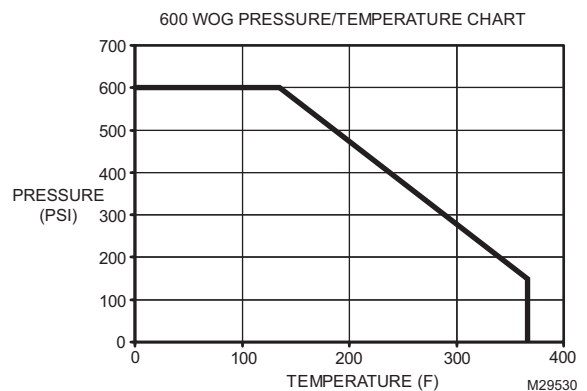
- between ports A and AB: an equal percentage flow characteristic.
- between ports B and AB: a linear flow characteristic at 20% reduced  $C_v$ .



**Fig. 8. Typical characterized VBN2 flow.**



**Fig. 9. Typical characterized VBN3 flow.**



**Fig. 10. Pressure derating curve.**  
The valve body is rated for WOG (water, oil, and gas), but the valve with its internal components are only rated for water and not for oil or gas.

## Cavitation Limits

To prevent cavitation (the formation and collapse of steam bubbles), a conservative rule-of-thumb is to limit the pressure drop across the control valve to:

$$\Delta P < 1/2 \times (\text{absolute head pressure (psia)} - \text{water vapor pressure (psia)})$$

Water vapor pressure increases with fluid temperature, reducing the allowable pressure drop, but even chilled water can cavitate with sufficient pressure differential.

Typical pressure drop across a control valve is in the range of 3 to 5 psid. Two-position valves will typically show 0.5 psid pressure drop. Design coil flow should be limited by a balancing valve.

## TYPICAL SPECIFICATIONS

### Valve Actuator

Direct coupled actuator shall accept analog modulating [(0)2-10 Vdc], floating (tri-state), or two-position signal as indicated in the control sequence. Actuators shall be by Honeywell. Actuator shall provide minimum torque required for full valve shutoff position. Wiring terminals shall be provided for installation to control signal and power wiring.

Actuator shall be available with housing suitable for outdoor installation.

Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with  $C_V$ , model number, and tag location.

## Ball Valve

Valve housing shall consist of forged brass rated at no less than 360 psi at 250°F. Standard valve ball shall consist of chemically nickel-plated brass. Manufacturer shall be able to provide optional 316 stainless steel ball and stem for 2-way valves. Valve shall have a blow-out proof stem with two EPDM O-rings with minimum 600 psi rating. Valve stem assembly shall be of a pack-less design and be field-replaceable without removing the valve body from the piping. Manufacturer shall be able to provide glass-filled polymer ball insert to make flow control equal percentage. Valves shall be Honeywell. The 2-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 100 psi with actuator which provides 35 lb-in. torque for 1/2 to 3 in. sizes. Valve shall be available with a minimum of 32 unique  $C_V$  values. Valve shall be available with threaded (FNPT) end connections. The 3-way valves shall be installed in a "T" configuration with actuator perpendicular to shaft. Valve shall not require elbows of any kind. The 3-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 40 psi with an actuator that provides 35 lb-in. torque for 1/2 to 2-1/2 in. sizes. The 3-way valves must be available in both mixing and diverting configurations and shall be available with a minimum of 26 unique  $C_V$  values. Valve shall be available with threaded (FNPT) end connections.



**Table 13. Actuator Accessories and Replacement Parts.**

| <b>Part Number</b> | <b>Description</b>   | <b>MVN613A0000</b> | <b>MVN613L0000</b> | <b>MVN643A0000</b> | <b>MVN643L0000</b> | <b>MVN713A0000</b> | <b>MVN713L0000</b> | <b>MN Non-Fail-Safe Direct Couple Actuators</b> | <b>MS Fail-Safe Direct Couple Actuators</b> |
|--------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---|---|
| 5112-3R            | Weather Enclosure Assembly   |                    |                    |                    |                    |                    |                    | x   | x   |
| MVNAAA             | Replacement Valve Adaptor  | x                  |                    | x                  |                    | x                  |                    |   |   |
| MVNAAL             | Replacement Valve Adaptor, Low Profile                             |                    | x                  |                    | x                  |                    | x                  |   |   |
| MVNAC7131          | Replacement Cable with Terminal 1m, Modulation (RED, BLACK, WHITE) |                    |                    |                    |                    | x                  | x                  |   |   |
| MVNAC6131          | Replacement Cable with Terminal 1m, Floating (RED, BLACK, WHITE)   | x                  | x                  | x                  | x                  |                    |                    |   |   |
| MVNAT3             | Replacement Screw type Terminal Block, Pluggable                   | x                  | x                  | x                  | x                  | x                  | x                  |   |   |
| 5112-11            | Replacement actuator bracket                                       |                    |                    |                    |                    |                    |                    | x   | x   |
| 205860             | Minimum position Potentiometer                                     |                    |                    |                    |                    |                    |                    | x   | x   |
| 32006306-001       | Resistor Kit (500 ohm); converts 4-20 mA signal to 2-10 Vdc        |                    |                    |                    |                    |                    |                    | x   | x   |
| Q7002B1009         | Universal Interface Module   |                    |                    |                    |                    |                    |                    | x   | x   |
| STRN-SCSA          | Self-centering Shaft Adapter                                       |                    |                    |                    |                    |                    |                    |   | x   |
| 32000085-001       | Strain Relief Fitting (10 pack)                                    |                    |                    |                    |                    |                    |                    | x   |   |
| STRN-STRNRLF       | Stain Relief Fitting (10 pack)                                     |                    |                    |                    |                    |                    |                    |   | x   |

# INSTALLATION

## When installing this product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

## Preparation



### CAUTION

#### Equipment Damage Hazard

Foreign particles like dirt and metal chips can damage the ball seals.

For trouble-free operation of the product, good installation practice must include initial system flushing, and chemical water treatment. Clean the lines upstream of particles larger than 1/16 inch diameter (welding slag, pipe scale, sand and other suspended particulate). Use of a 50 micron (or finer) system side stream filter is suggested. Remove all filters before flushing.

Do not use boiler additives, solder flux and wetted materials which are petroleum based or contain mineral oil, hydrocarbons, or ethylene glycol acetate. Compounds which can be used, with minimum 50% water dilution, are diethylene glycol, ethylene glycol, and propylene glycol (antifreeze solutions).

If installing these valves in an addition to, or retrofitting an existing building, do not assume that the fluid in the existing piping meets these criteria.

## Mechanical Installation

### IMPORTANT

Hold valve with pipe wrench by hexagonal fitting ONLY. Do NOT handle the valve body with the pipe wrench; product damage may result.

The valves are tapped in NPT and should be sealed with an approved pipe sealant. Torque should not exceed 75 lb-ft.

Refer to actuator literature for actuator dimensions.

1. Clean the lines upstream of particles larger than 1/16 in. diameter (welding slag, pipe scale and other contaminants).
2. Proceed with installation once the system specifics (expansion/contraction of the system and its medium as well as operating pressures) are within tolerances.
3. Eliminate air from system.
4. Two-way valves are marked to show flow direction.

### IMPORTANT

Flow arrows must point in the direction of the flow for proper operation.

NOTE: For three-way valve mounting, see Fig. 11 and 12.

5. Stem rotation:
  - a. For two-way valves:
    - (1) Clockwise to close.
    - (2) Counterclockwise to open.
  - b. For three-way valves:
    - (1) Clockwise to increase B to AB flow.
    - (2) Counter clockwise to increase A to AB flow.

NOTE: After valves have been installed in the piping, the installer can determine the ball orientation within the valve from the notches in the top of the valve stem. For two-way valves, the lengthwise direction of the notch indicates the flow through the ball (i.e. when the notch is parallel to the axis of the valve between A and B ports, the ball will allow flow through the valve). For three-way valves, the flow can be determined by the orientation of the "T" shaped notch in the valve stem, as shown in Fig. 12.

6. Valve must be mounted with the actuator/bracket above the valve body. Do not install the valve with the stem below horizontal or upside down. (See Fig. 14-16.)

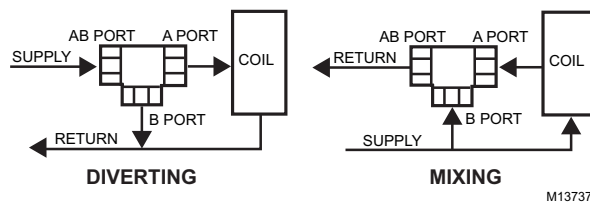
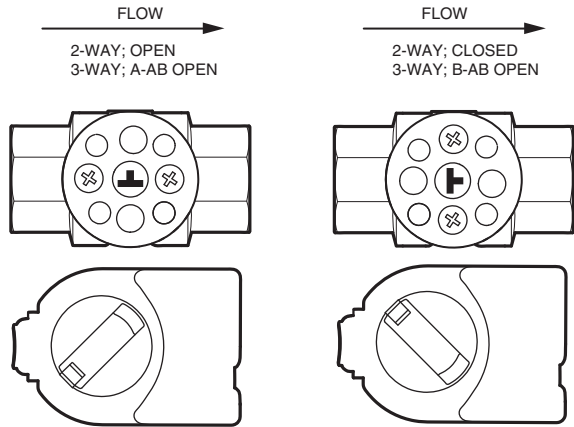


Fig. 11. Three-way ball valve flow orientation (not to scale).

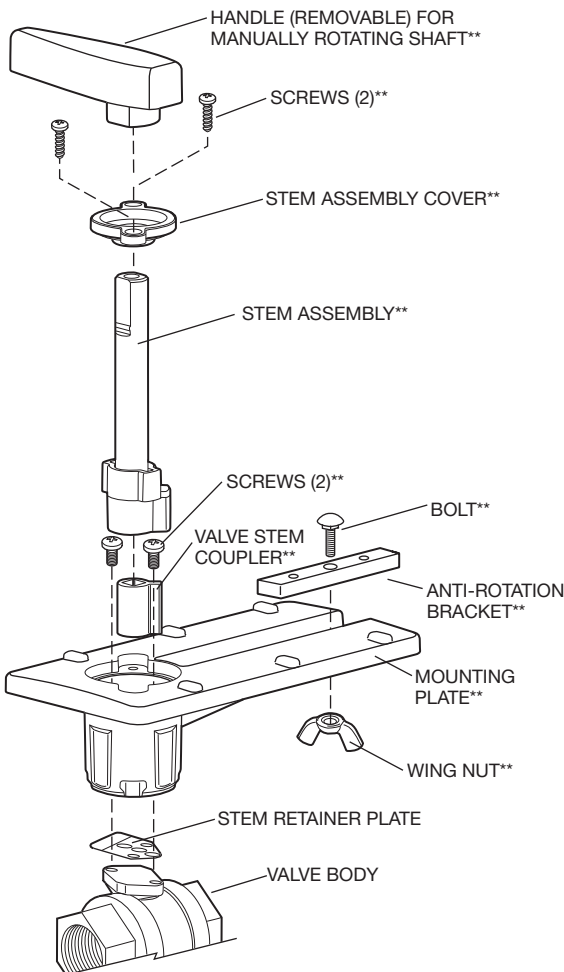


NOTES: **FOR 2-WAY VALVES** TO MOUNT ACTUATOR ON OPEN VALVE, TURN ACTUATOR FULLY COUNTER CLOCKWISE AS SHOWN. FOR 2-WAY VALVES TO MOUNT ACTUATOR ON CLOSED VALVE, TURN ACTUATOR FULLY CLOCKWISE AS SHOWN.

**FOR 3-WAY VALVES** TO MOUNT ACTUATOR ON A-AB VALVE, TURN ACTUATOR FULLY COUNTER CLOCKWISE AS SHOWN. FOR 3-WAY VALVES TO MOUNT ACTUATOR ON B-AB VALVE, TURN ACTUATOR FULLY CLOCKWISE AS SHOWN.

M33201D

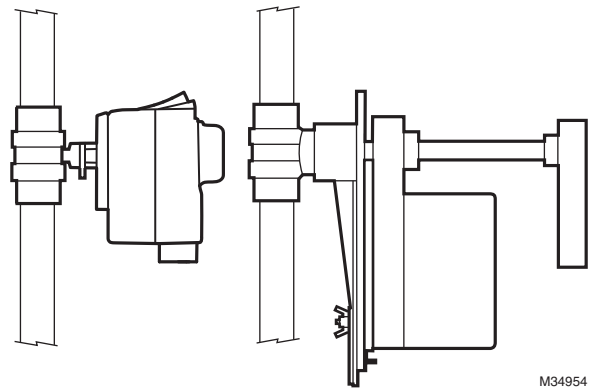
**Fig. 12. Orientation of ball in valve.**



\*\* INCLUDED IN REPLACEMENT KIT (PART NO. 5112-11).

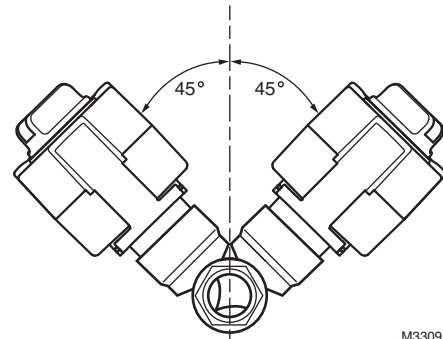
M29526B

**Fig. 13. Valve assembly exploded view.**



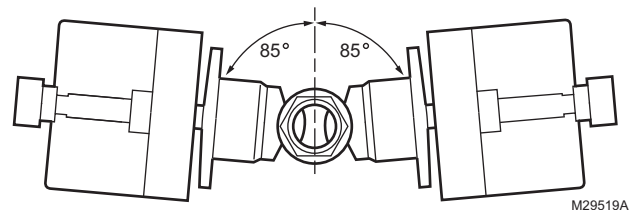
M34954

**Fig. 14. Vertical valve installation.**



M33091

**Fig. 15. Acceptable valve angle from vertical for MVN actuators.**



M29519A

**Fig. 16. Acceptable valve angle from vertical for MN and MS actuators.**

### Mounting Plate Adjustment

The Actuator Mounting Plate can be rotated to a different position for installation in confined spaces. This is accomplished as follows:

1. Remove the handle from the shaft and set it aside.
2. Remove the two screws that hold the stem assembly to the mounting plate and set them aside.
3. Remove and set aside the stem assembly.
4. Remove and set aside the two screws that attach the mounting plate to the valve.
5. Remove and set aside hold-down ring from mounting plate.
6. Rotate mounting plate around valve top to the desired position.

NOTE: Take note of the screw hole positions on the valve. They limit the mounting plate positions.

7. Lower ring down to valve body and engage it in the new position relative to the mounting plate.
8. Tighten screws to valve body securing the mounting plate.
9. Reattach the stem assembly to the mounting plate.
10. If desired, replace the handle on the shaft.

NOTE: See Fig. 13 for valve exploded view.

## Electrical Installation

1. If necessary, remove actuator wiring cover.
2. Wire actuator using Fig. 17 through 41 for the application required.
3. Replace cover.

## Wiring

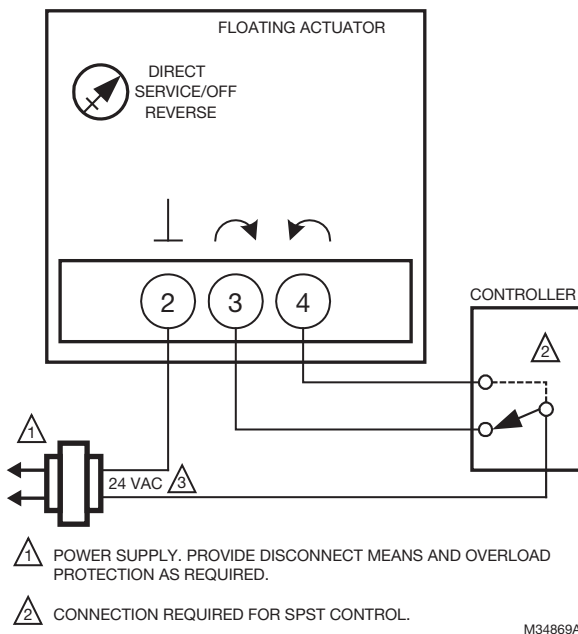


Fig. 17. MN6105 with On/Off SPDT Control.

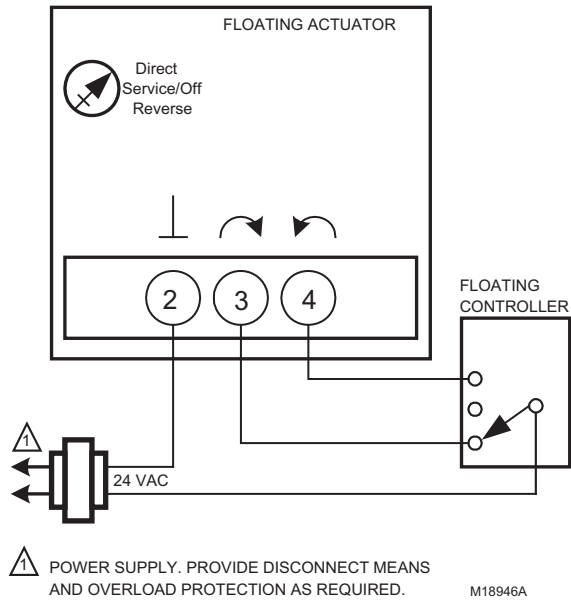


Fig. 18. MN6105 with Floating Control.

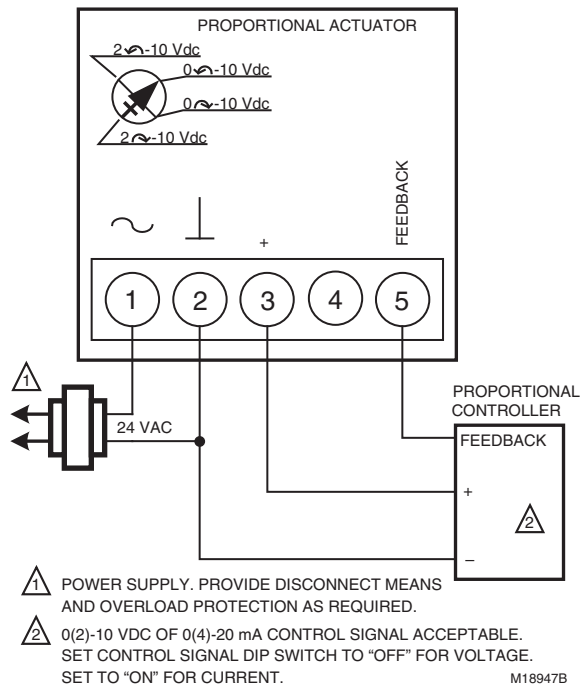
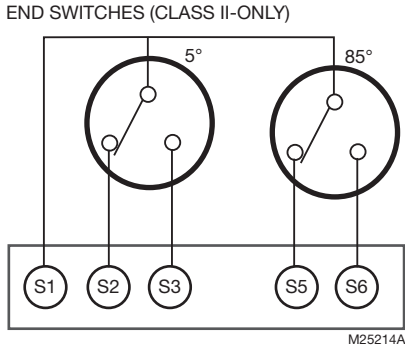
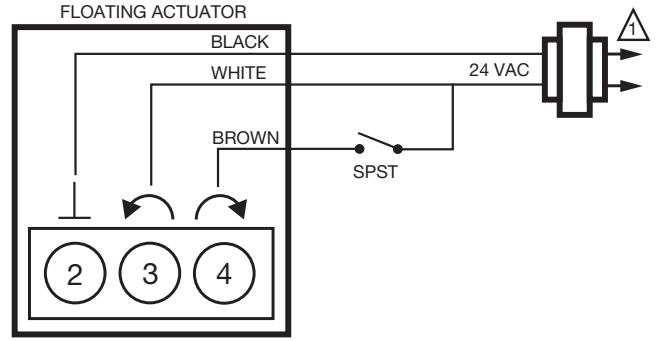


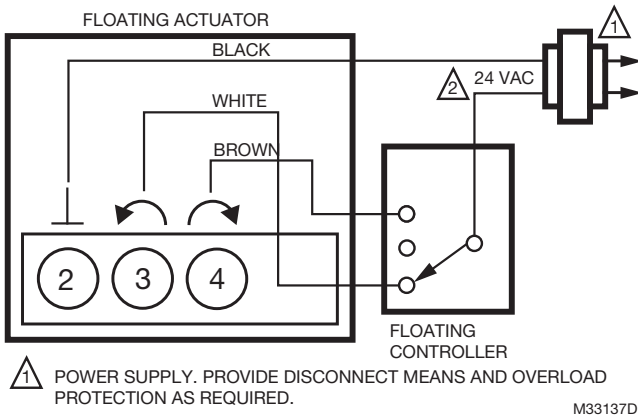
Fig. 19. MN7505 with 0(2)-10 Vdc Control.



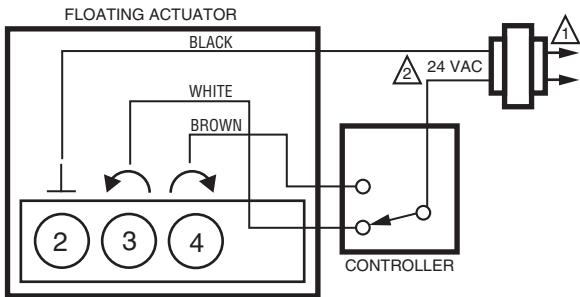
**Fig. 20. Wiring for MN6105 and MN7505 models with aux./end switches.**



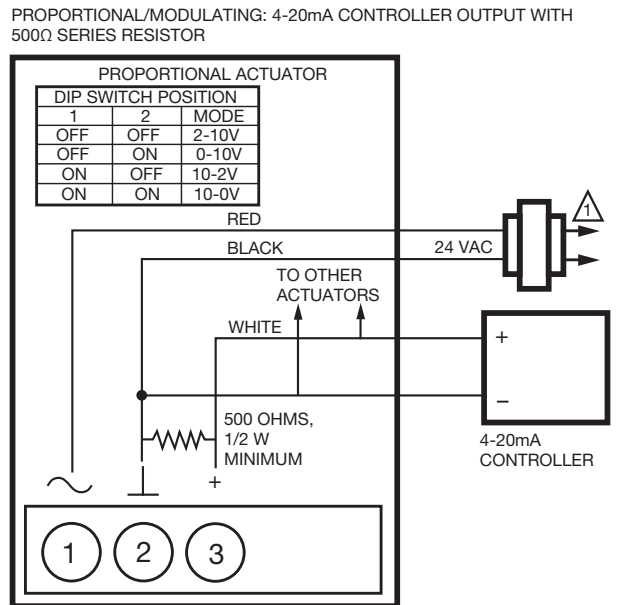
**Fig. 23. MVN643 with Two Position SPST Control.**  
 ⚠️ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. M33557C



**Fig. 21. MVN613 with Floating Control.**



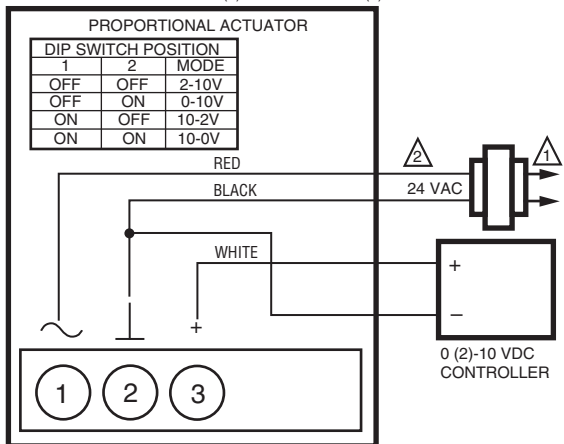
**Fig. 22. MVN613 or MVN643 with Two Position SPDT Control.**  
 ⚠️ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.  
 ⚠️ USE CLASS II 24V TRANSFORMER FOR MVN643. M33138C



**Fig. 24. MVN713 with 4-20mA Control.**

⚠️ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. M33141C

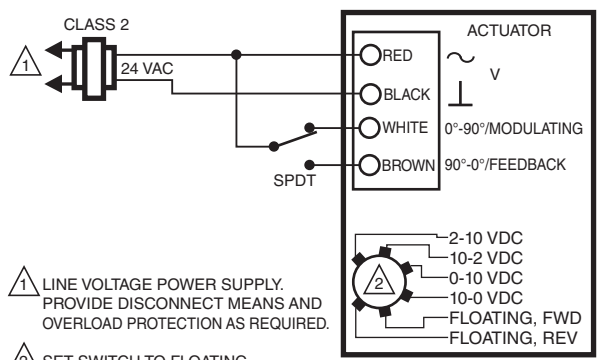
PROPORTIONAL/MODULATING: 0(2)...10 VDC OR 10...0(2) VDC CONTROLLER OUTPUT



- ⚠️ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚡ 24 VDC SUPPLY ACCEPTABLE.

M33140A

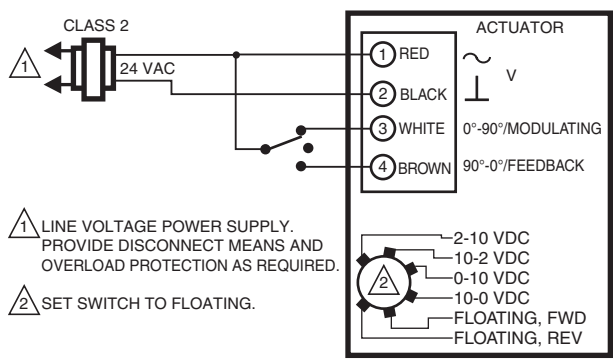
**Fig. 25. MVN713 with 0(2)-10 Vdc Control.**



- ⚠️ LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚡ SET SWITCH TO FLOATING.

M37304

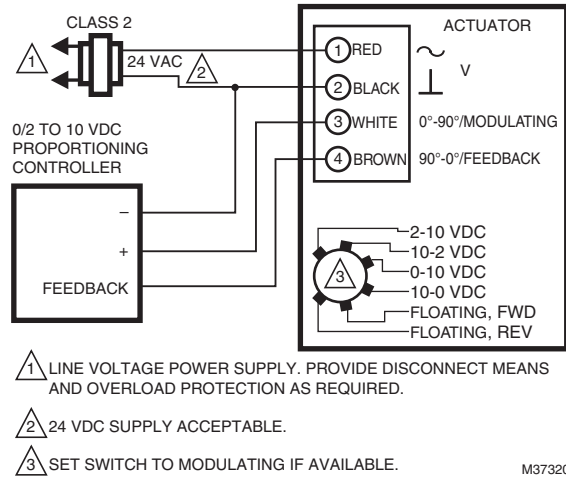
**Fig. 26. MS7505 with Two Position SPDT Control.**



- ⚠️ LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚡ SET SWITCH TO FLOATING.

M37319

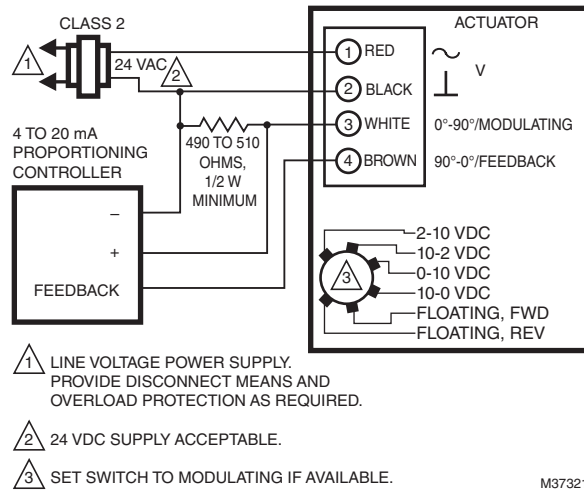
**Fig. 27. MS7505 with Floating Control.**



- ⚠️ LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚡ 24 VDC SUPPLY ACCEPTABLE.
- ⚙️ SET SWITCH TO MODULATING IF AVAILABLE.

M37320

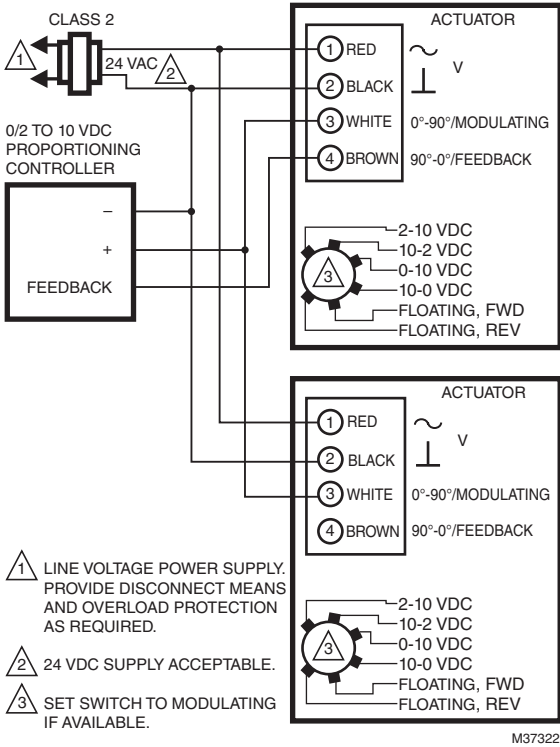
**Fig. 28. MS7103 with 2-10 Vdc Control (MS7503 shown, ignore selection switch).**



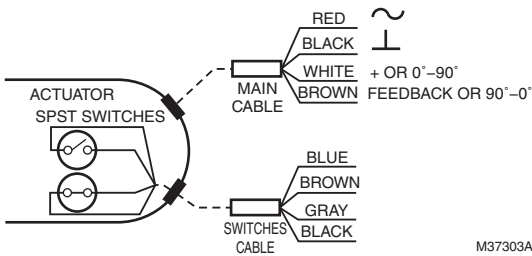
- ⚠️ LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚡ 24 VDC SUPPLY ACCEPTABLE.
- ⚙️ SET SWITCH TO MODULATING IF AVAILABLE.

M37321

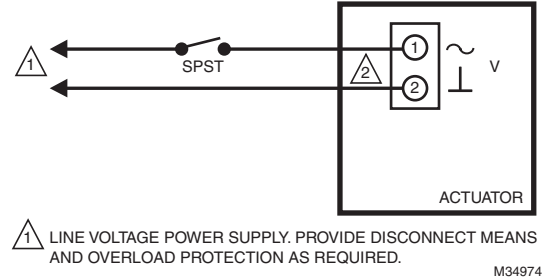
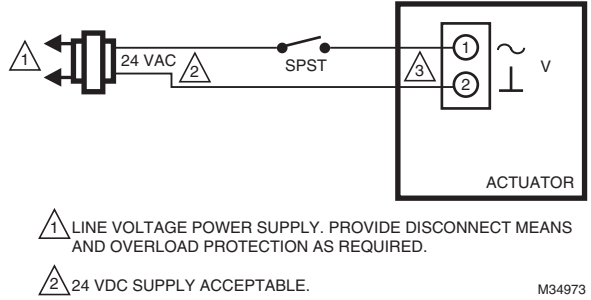
**Fig. 29. MS7103 with 4-20 mA Control (MS7503 shown, ignore selection switch).**



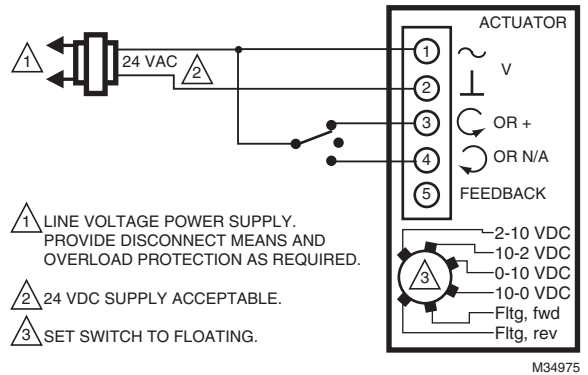
**Fig. 30. MS7103 with 2-10 Vdc Control using two actuators (MS7503 shown, ignore selection switch).**



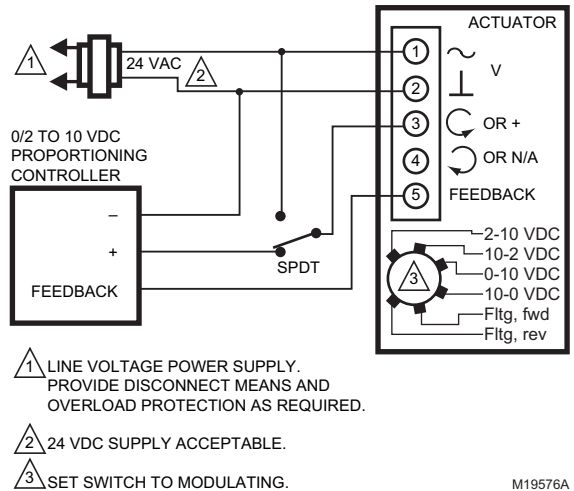
**Fig. 31. Wiring for MS7103 and MS3103 Auxiliary Switches. Gray/Black = Normally Open. Closed in range 80 degrees to Fully Open. Blue/Brown = Normally Closed. Open in range 10 degrees to Fully Open.**



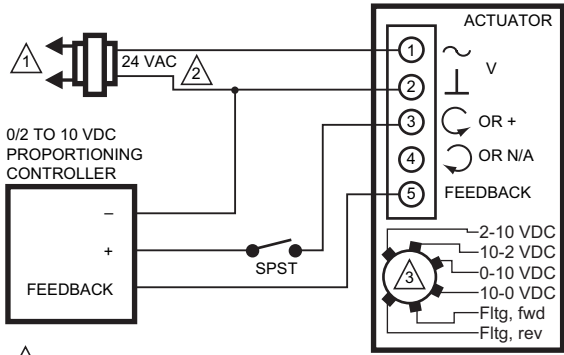
**Fig. 32. MS8105 with Two Position SPDT Control.**



**Fig. 33. MS7505 with Floating Control.**



**Fig. 34. MS7505 with override to full open.**



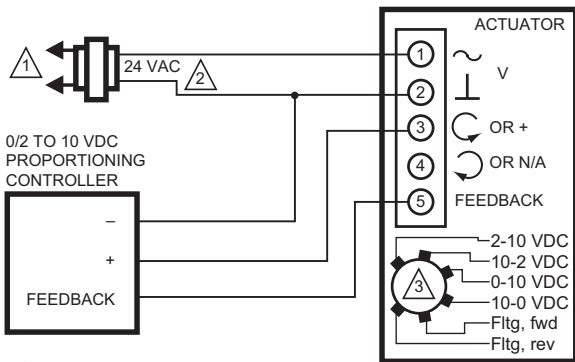
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M19577A

Fig. 35. MS7505 with override to full closed.



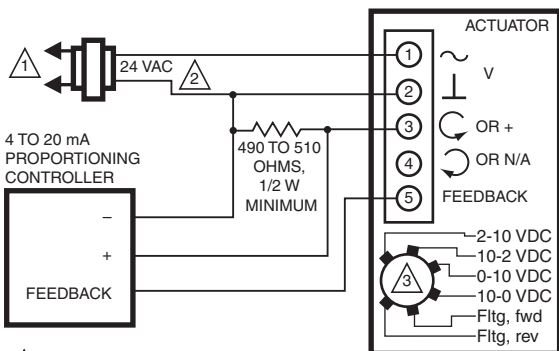
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M34976

Fig. 36. MS7505 with 0(2)-10 Vdc Controllers.



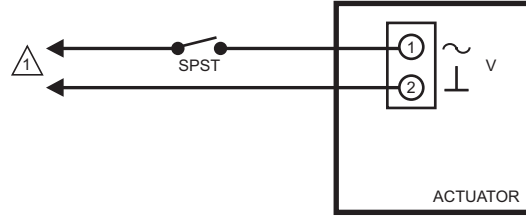
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M34977

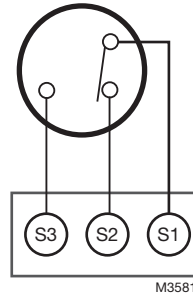
Fig. 37. MS7505 with 4-20mA Controllers.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

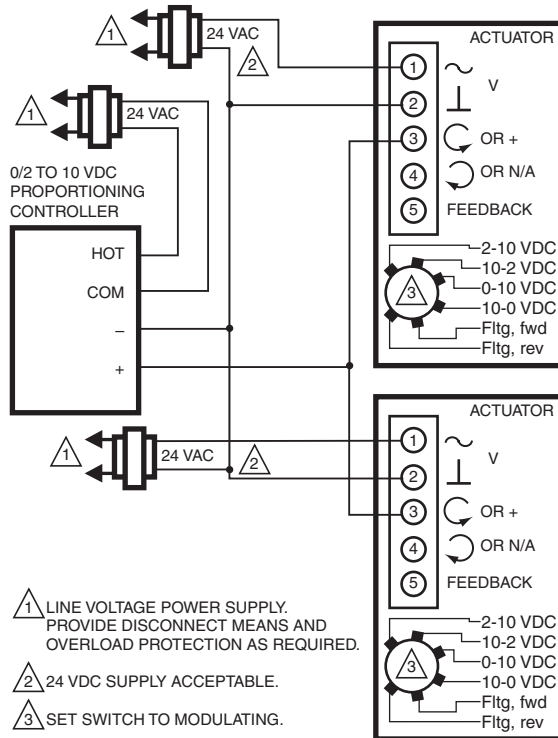
M29122

Fig. 38. MS4105 with 120 Vac Two Position SPDT control.



M35813

Fig. 39. Wiring for MS4105, MS7505, and MS8105 models with aux./end switches.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

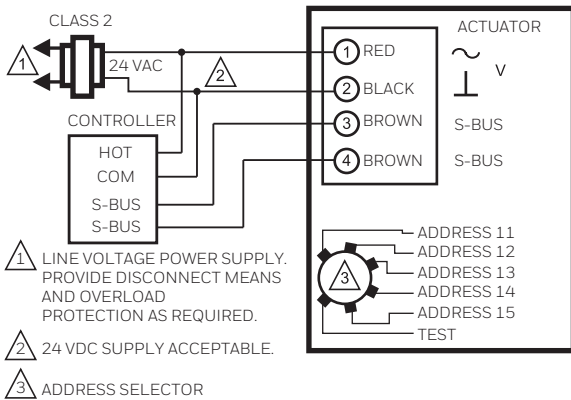
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M34978

Fig. 40. MS7505 with 0(2)-10 Vdc controller operating multiple actuators.





**Fig. 41. MS3103 with Sylk Bus control.**

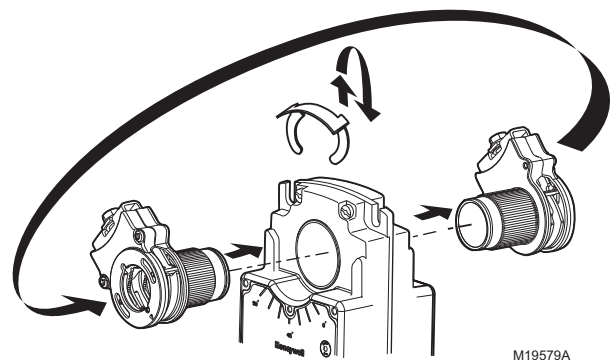
NOTE: All identified parts except for the valve body and aluminum valve stem coupler are included in Replacement Kit (part no. 5112-11).

## OPERATION AND CHECKOUT

Once both the mechanical and electrical installations are complete:

1. Cycle the actuator to verify that the direction of rotation suits the control sequence.
2. If the rotation direction is incorrect:
  - a. For 2-position and Sylk-enabled actuators: Remount actuator on the bracket.
  - b. For floating control actuators: Reverse two control signal wires (CW/CCW).
  - c. For analog control actuators either:
    - (1) Reposition reverse/direct acting switch, or
    - (2) Remount actuator on the bracket.
  - d. For modulating control actuators, reposition reverse/direct acting switch 1.

3. If the control scheme requires fail-safe operation, ensure that, upon removal of power, the fail position coincides with the control sequence.
4. If the fail safe position is incorrect, remove and reinstall the actuator in the opposite orientation as follows:
  - a. Loosen the shaft coupling bolt using a 10 mm wrench.
  - b. Loosen all other mounting bolts connecting the actuator to the mounting bracket, and set aside.
  - c. Remove the actuator from the valve shaft.
  - d. Move the actuator coupling to the opposite side of the actuator, as displayed in Fig. 42.
    - (1) Remove the retainer clip from the shaft coupling and set it aside for later use.
    - (2) Remove shaft coupling from one side of the actuator.
    - (3) Replace the shaft coupling on the opposite side of the actuator, aligning it based on the stroke labelling.
    - (4) Replace the retainer clip on the shaft coupling using the groove of the coupling.
  - e. Reconnect the actuator to the valve mounting bracket by replacing the screws previously removed (step b)
  - f. Tighten the shaft coupling bolt using a 10 mm wrench.



**Fig. 42. Mounting shaft coupling to actuator opposite side.**





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63-2648-09 M.S. Rev. 12-20  
Printed in United States

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