

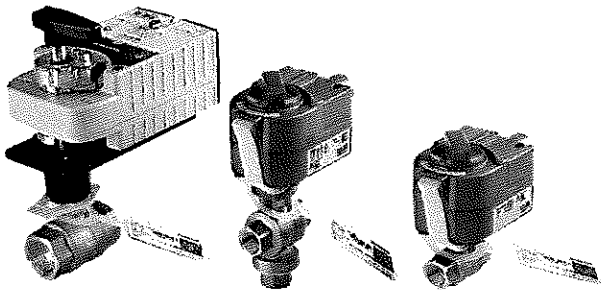
# VBN Threaded Control Ball Valves and Actuators

## SPECIFICATION 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  $C_v$  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.
- 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  $C_v$  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  $C_v$ ) for 3-way A port and ANSI Class III seat leakage specification (0.1% of  $C_v$ ) for 3-way B port.

### 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  $C_v$  maximum) for 3-way A port and ANSI Class III seat leakage specification (0.1% of  $C_v$ ) 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).



VBN THREADED CONTROL BALL VALVES AND ACTUATORS

**Flow Characteristics:**

2-way: Equal Percentage with flow control insert.  
 3-way: Port A to AB: Equal Percentage.  
 Port B to AB: Linear.

**Approvals/Standards:**

Valves: ANSI Class IV close-off/leakage (maximum 0.01% of C<sub>v</sub> let by)  
 Actuators: See literature for the given actuator.

**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\*

VBN THREADED CONTROL BALL VALVES AND ACTUATORS

**Table 2. Actuator Control Description.**

Actuator	Control
MVN613A0000	Floating, Two-position (SPDT or SPST) (90 sec. timing), 24 V, Fail in Place
MVN613L0000	
MVN643A0000	Floating, Two-position (SPDT) Fast Acting (30 sec. timing), 24 V, Fail in Place
MVN643L0000	
MVN713A0000	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	Modulating, 24 V, Fail in Place
MN7505A2209	Modulating, 24 V, Fail in Place with end switches
MS7505A2030	Modulating, Floating, Two-position (SPDT), 24 V, Fail Safe
MS7505A2130	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

**Table 3. Control Ball Valve Short Order Codes ½” – 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>1</b> - 24 Vac, Floating/2-Pos., 90 sec. (MVN613, Fail in place) <sup>***</sup> <b>2</b> - 24 Vac, Floating/2-Pos., 30 sec. (MVN643, Fail in place) <sup>***</sup> <b>3</b> - 24 Vac, Modulating O(2)-10 Vdc (MVN713, Fail in place) <sup>***</sup> <b>4</b> - 24 Vac, Floating/2-Position (MN6105, Fail in place) <b>5</b> - 24 Vac, Mod. O(2)-10 Vdc (MN7505, Fail in place) <b>6</b> - 24 Vac, Mod. O(2)-10 Vdc/Floating (MS7505, Fail safe) <b>7</b> - 24 Vac, 2-Position (MS8105, Fail safe) <b>8</b> - 100-250 Vac, 2-Position (MS4105, Fail safe) <b>9</b> - 100-250 Vac, 2-Pos. w/ end switches (MS4105, Fail safe) <b>A</b> - 24 Vac, 2-Position w/ end switches (MS8105, Fail safe) <b>B</b> - 24 Vac, Mod O(2)-10 Vdc/Floating w/ end switches (MS7505, Fail safe) <b>C</b> - 24 Vac, Floating/2-Position w/ end switches (MN 6105, Fail in place) <b>D</b> - 24 Vac, Mod. O(2)-10Vdc w/ end switches (MN7505, Fail in place)	<b>0</b> - No Actuator or Fail in Place (FIP)  <b>1</b> - Fail Safe Open (FSO) VBN2 only <b>2</b> - Fail Safe Closed (FSC) VBN2 only <b>3</b> - Fail Safe A to AB Open (FSA) VBN3 only <b>4</b> - Fail Safe B to AB Open (FSB) VBN3 only	<b>00</b> - None <b>01</b> - C1 - 1 m Cable <b>02</b> - 3R - NEMA enclosure
2 - 2-way  3 - 3-way  A---1/2 (DN15) B--- 3/4 (DN20) C--- 1 (DN25) D--- 1-1/4 (DN32) E--- 1-1/2 (DN40) F--- 2 (DN50) G--- 2-1/2 (DN65) H--- 3 (DN80)								
Cv Designator. Options range from B-2.  See Tables 4 and 5. P - Nickel Chrome Plated Brass S - 316 Stainless Steel (VBN2 only)  A* - Standard Base L** - Low Profile X - MN/MS DCA Actuator Bracket								
VBN	2	A	B	P	A	1	0	00

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	8.0	11.7*										
VBN2B	3/4"	0.31	0.63	1.2		2.5	4.3	7.4	10.1	14.7*	29*								
VBN2C	1"						4.4	9.0		15.3	26	44*	54*						
VBN2D	1-1/4"						4.4	8.3	14.9	25	37	41*			102*				
VBN2E	1-1/2"									23	30	41		74				172*	
VBN2F	2"											42	57	71	100	108*		210	266*
VBN2G	2-1/2"											45	55	72	101		162	202*	
VBN2H	3"											49	63	82		124	145*		

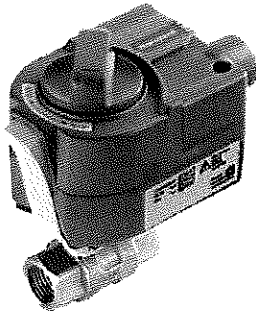
\* Denotes full port valve (with no insert). Provides linear flow control.

**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"		0.40	0.66	1.3	2.4	3.8		7.0	11.0*						
VBN3C	1"		0.40	0.65	1.3	2.3	3.5	4.5	8.6	14.9	22	31				
VBN3D	1-1/4"							4.1	8.7	12.7	19.4*	27	34*			
VBN3E	1-1/2"							4.0	8.3	13.4	24	32*		61		
VBN3F	2"										24		38	57	83	109
VBN3G	2-1/2"												38		74	100*

\* Denotes full port valve (with no insert). Provides linear flow control.

## 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**
- **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.**

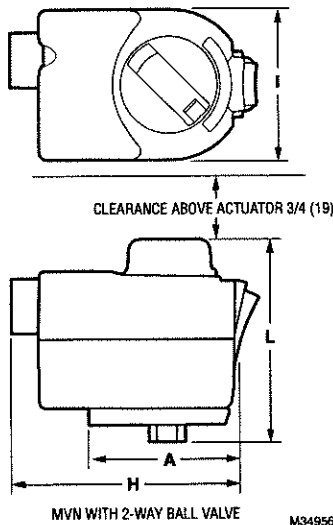


Fig. 1. MVN with 2-way ball valve. See Table 4.

## 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, 3 ft. length from end of access cover.

**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
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).

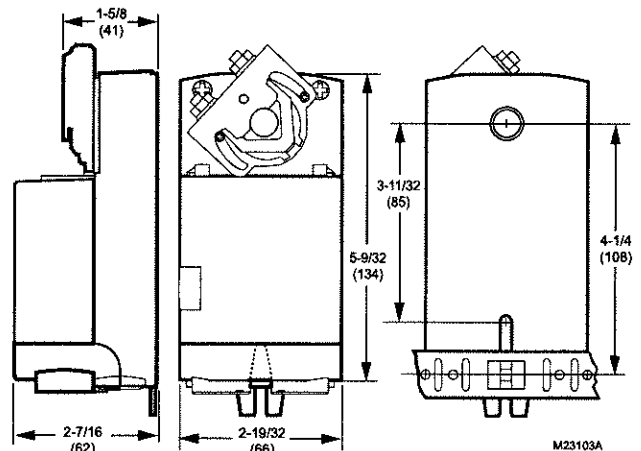
### FEATURES:

- **Declutch 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

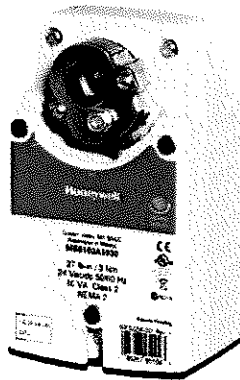
- Actuator Type:** Damper; Valve
- Rotational Stroke:** 95° ±3 degrees
- Fail Safe Mode:** Non-spring return, Fail in place
- Torque:** 44 lb.-in. (5 Nm)
- External Auxiliary Switches Available:** No
- Environmental Rating:** NEMA2
- Frequency:** 50 Hz; 60 Hz
- Manual operation:** Declutch mechanism

- 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 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 +149°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)

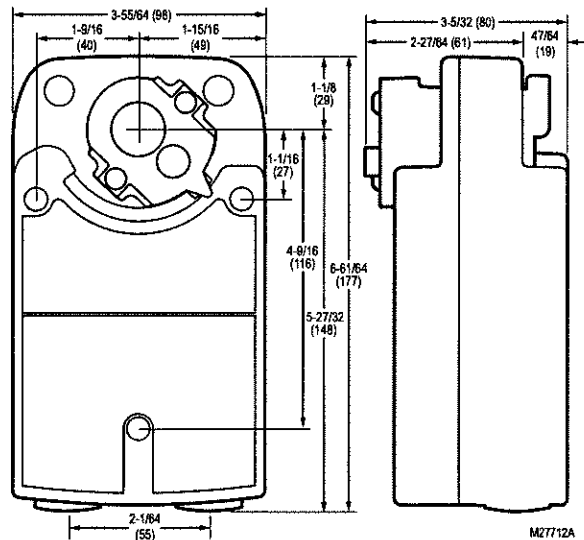
**Includes:** Mounting bracket, self-centering shaft adapter

### 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. 3. Spring return direct coupled actuator dimensions diagram.**

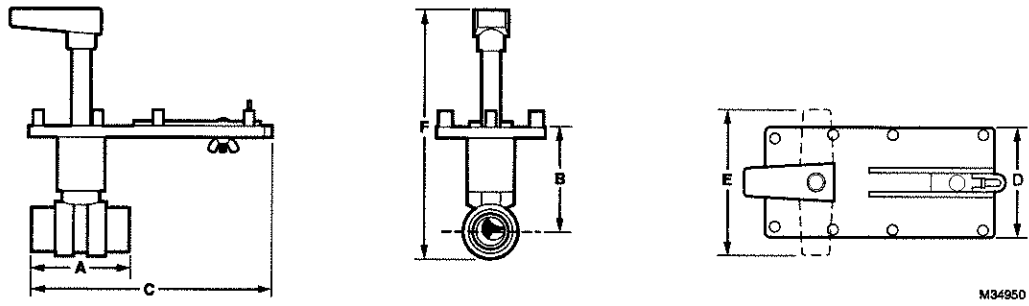


Fig. 4. 2-way ball valve dimensions for models with MN and MS actuators. See Table 7.

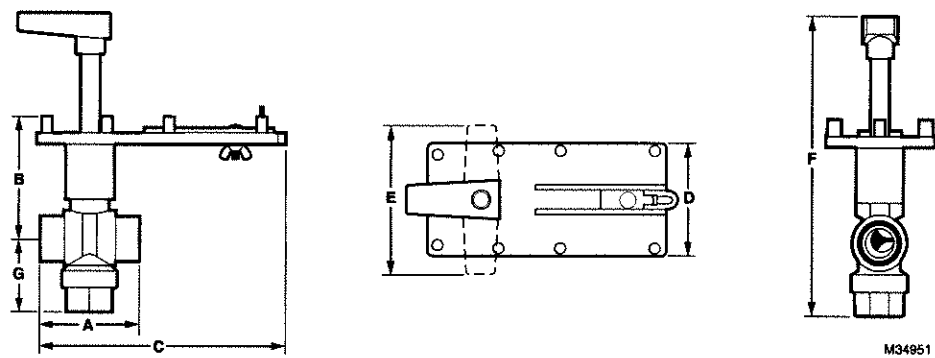


Fig. 5. 3-way ball valve dimensions for models with MN and MS actuators. See Table 8.

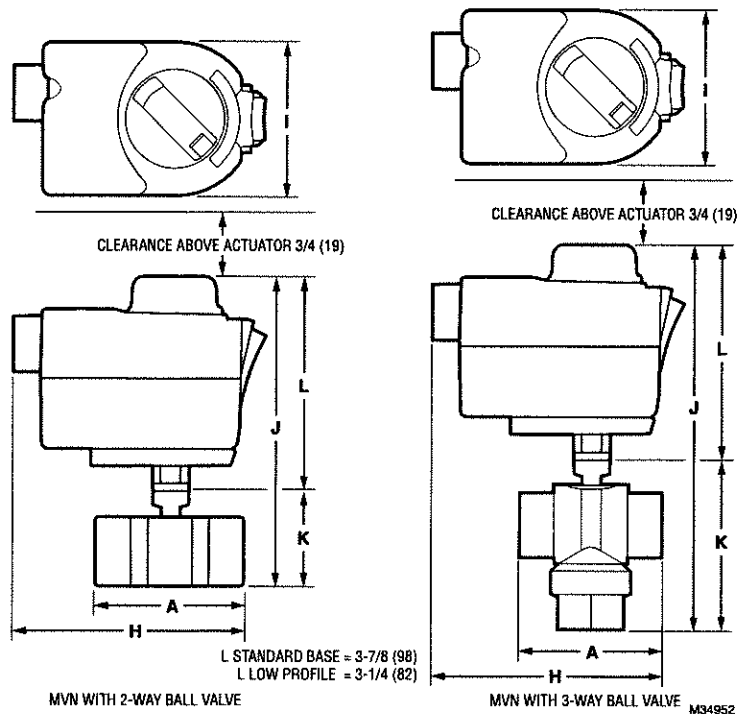


Fig. 6. MVN actuator with 2-way and 3-way ball valve dimensions in inches (millimeters). See Table 7 and Table 8.



VBN THREADED CONTROL BALL VALVES AND ACTUATORS

Table 7. VBN2 dimensions in inches (millimeters).

Pipe Size			C <sub>y</sub> Designators	MVN, MN, AND MS ACTUATORS WITH 2-WAY BALL VALVE Dimensions in in. (mm)											Weight (valve only) lbs.	Replacement Stem Assembly **						
In.	(DN)	Code		A	B	C	D	E	Fms <sup>a</sup>	Fmn <sup>b</sup>	H	I	J (w/std)	J (w/low)			K					
1/2	15	VBN2A	0.38, 0.68, 1.30, 2.00, 2.60, 4.70, 8.00, 11.70*	2-3/8 (60)	3-7/16 (87)	6-5/8 (168)	3 (76)	4 (102)	8-1/8 (206)	6-7/8 (175)	4-9/16 (116)	2-3/16 (71)	5-7/16 (139)	4-13/16 (123)	1-5/8 (41)	1	5112-19 5112-22 (SS)					
3/4	20	VBN2B	0.31, 0.63, 1.20, 2.50, 4.30, 7.40, 14.70*	2-3/8 (60)	3-7/16 (87)	6-7/16 (164)	3 (76)	4 (102)	8-1/8 (206)	6-7/8 (175)			5-7/16 (139)	4-13/16 (123)	1-5/8 (41)	1		5112-22 (SS)				
			10.10, 29.00*	2-5/8 (67)	3-11/16 (94)	6-1/2 (165)	3 (76)	4 (102)	8-5/16 (211)	7-1/16 (180)			5-5/8 (143)	5 (127)	1-13/16 (45)	1						
1	25	VBN2C	9.00	3-3/4 (95)	3-11/16 (94)	7-1/16 (179)	3 (76)	4 (102)	8-5/16 (211)	7-1/16 (180)			4-9/16 (116)	2-3/16 (71)	5-5/8 (143)	5 (127)	1-13/16 (45)	1	5112-20 5112-23 (SS)			
			4.40, 15.30, 26.00, 44.00, 54.00*	3-1/16 (77)	3-15/16 (100)	6-3/4 (171)	3 (76)	4 (102)	8-11/16 (221)	7-7/16 (189)					6 (152)	5-3/8 (137)	2-3/16 (55)	1.4				
1-1/4	32	VBN2D	4.40, 8.30, 14.90, 25.00, 41.00*	3 (76)	3-15/16 (100)	6-11/16 (170)	3 (76)	4 (102)	8-11/16 (221)	7-7/16 (189)					6 (152)	5-3/8 (137)	2-1/8 (54)	1.4		5112-20 5112-23 (SS)		
			37.00, 102.00*	3-5/8 (92)	4-7/16 (113)	7 (178)	3 (76)	4 (102)	9-1/16 (231)	7-13/16 (198)					6-3/8 (162)	5-3/4 (146)	2-9/16 (64)	2.4				
1-1/2	40	VBN2E	23.00, 30.00, 74.00*	3-7/16 (87)	3-15/16 (100)	6-15/16 (176)	3 (76)	4 (102)	9-1/16 (231)	7-13/16 (198)					4-9/16 (116)	2-3/16 (71)				2.4	5112-21 5112-24 (SS)	
			41.00, 172.00*	4-1/16 (103)	5-3/16 (132)	7-1/16 (179)	3 (76)	4 (102)	8-7/8 (225)	7-5/8 (194)										3.2		
2	50	VBN2F	42.00, 108.00*	4 (101)	3-3/4 (95)	7-3/16 (183)	3 (76)	4 (102)	8-7/8 (225)	7-5/8 (194)												3.2
			57.00, 71.00, 100.00, 210.00, 266.00*	4-15/16 (125)	4-1/16 (103)	7-7/16 (188)	3 (76)	4 (102)	10-1/2 (267)	9-1/4 (235)										5		
2-1/2	65	VBN2G	45.00, 55.00, 72.00, 101.00, 162.00, 202.00*	5-5/16 (135)	4-1/16 (103)	7-9/16 (192)	3 (76)	4 (102)	10-1/2 (267)	9-1/4 (235)											5.5	5112-21 5112-24 (SS)
3	80	VBN2H	49.00, 63.00, 82.00, 124.00, 145.00*	5 (127)	5-7/8 (149)	7-11/16 (196)	3 (76)	4 (102)	10-11/16 (271)	9-7/16 (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			CV Designators	MVN, MN, AND MS ACTUATORS WITH 3-WAY BALL VALVE												Weight (valve only) lbs.	Replacement Stem Assembly	
In.	(DN)	Code		Dimensions in in. (mm)														
			A	B	C	D	E	Fms <sup>a</sup>	Fmn <sup>b</sup>	G	H	I	J (w/ std)	J (w/ low)	K			
1/2	15	VBN3A	0.33, 0.59, 1.00, 2.40, 4.30, 8.00	3-1/2 (89)	3-5/16 (84)	7 (178)	3 (76)	4 (102)	9-3/8 (238)	8-1/8 (206)	2-3/8 (60)			6-11/16 (170)	6-1/16 (154)	2-7/8 (72)	2.4	5112-19
3/4	20	VBN3B	0.40, 0.66, 1.30, 2.40, 3.80, 7.00, 11.00*	2-13/16 (71)	3-5/16 (84)	6-1/2 (165)	3 (76)	4 (102)	8-13/16 (224)	7-9/16 (192)	2 (51)			6-1/8 (156)	5-1/2 (140)	2-5/16 (58)	2	
1	25	VBN3C	0.40, 0.65, 1.30, 2.30, 3.50	3-13/16 (97)	3-5/16 (84)	7-5/16 (185)	3 (76)	4 (102)	9-1/2 (241)	8-1/4 (210)	2-3/4 (70)	4-9/16 (116)	2-13/16 (71)	6-13/16 (173)	6-3/16 (157)	3 (75)	2.8	5112-20
			8.60, 22.00	3 (76)	3-13/16 (97)	6-13/16 (173)	3 (76)	4 (102)	9-13/16 (249)	8-9/16 (217)	2-5/8 (67)			7-1/8 (181)	6-1/2 (165)	3-5/16 (83)	2.6	
1-1/4	32	VBN3D	4.50, 14.90, 31.00	4-5/16 (114)	4 (102)	7-13/16 (198)	3 (76)	4 (102)	10-13/16 (275)	9-9/16 (243)	3-1/4 (83)			8-1/8 (206)	7-1/2 (191)	4-5/16 (109)	3.3	5112-20
			4.10, 8.70, 19.40*	3 (76)	3-13/16 (97)	6-13/16 (173)	3 (76)	4 (102)	9-13/16 (249)	8-9/16 (217)	2-1/2 (64)	7-1/8 (181)	6-1/2 (165)	3-5/16 (83)	2.5			
1-1/2	40	VBN3E	12.70, 27.00, 34.00*	3-5/8 (91)	4 (102)	7-5/16 (185)	3 (76)	4 (102)	10-5/16 (262)	9-1/16 (230)	2-3/4 (70)			7-5/8 (194)	7 (178)	3-13/16 (96)	2.8	5112-21
			4.00, 8.30, 13.40, 32.00*	4-5/16 (114)	4 (102)	7-13/16 (198)	3 (76)	4 (102)	10-13/16 (275)	9-9/16 (243)	3-1/4 (83)						3.3	
2	50	VBN3F	24.00, 61.00	4 (102)	4-1/2 (114)	7-5/16 (185)	3 (76)	4 (102)	11 (279)	9-3/4 (248)	3-1/4 (83)						3.3	5112-21
			24.00, 38.00, 57.00	4 (102)	4-1/2 (114)	7-5/16 (185)	3 (76)	4 (102)	11 (279)	9-3/4 (248)	3-1/4 (83)							
2-1/2	65	VBN3G	83.00, 109.00	5 (127)	5-13/16 (147)	7-13/16 (198)	3 (76)	4 (102)	12-5/16 (313)	11-1/16 (281)	3-3/4 (95)						3.8	5112-21
			38.00, 74.00, 100.00	5 (127)	5-13/16 (147)	7-13/16 (198)	3 (76)	4 (102)	12-5/16 (313)	11-1/16 (281)	3-3/4 (95)							

<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 Cv and Rangeability.**

VBN2A	C <sub>v</sub>	0.38	0.68	1.30	2.00	2.30	4.70	8.00	11.70	
	Rangeability	41	17	52	*	321	159	390	251	
VBN2B	C <sub>v</sub>	0.31	0.63	1.20	2.50	4.30	7.40	10.10	14.70	29.00
	Rangeability	41	17	52	321	159	*	390	251	1503
VBN2C	C <sub>v</sub>	4.40	9.00	15.30	26.00	44.00	54.00			
	Rangeability	159	390	1040	484	1263	1207			
VBN2D	C <sub>v</sub>	4.40	8.30	14.90	25.00	37.00	41.00	102.00		
	Rangeability	159	390	1040	*	484	1207	1263		
VBN2E	C <sub>v</sub>	23.00	30.00	41.00	74.00	172.00				
	Rangeability	484	*	603	1263	558				
VBN2F	C <sub>v</sub>	42.00	57.00	71.00	100.00	108.00	210.00	266.00		
	Rangeability	603	*	287	*	558	750	877		
VBN2G	C <sub>v</sub>	45.00	55.00	72.00	101.00	162.00	202.00			
	Rangeability	250	*	287	558	750	877			
VBN2H	C <sub>v</sub>	49.00	63.00	82.00	124.00	145.00				
	Rangeability	250	287	558	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 Tables 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							
	8.0	6.5	5.7	5.4							
	11.7	7.9	6.7	6.2							
3/4"	0.31	0.31	0.31	0.31							
	0.63	0.63	0.63	0.63							
	1.2	1.2	1.2	1.2							
	2.5	2.5	2.5	2.5							
	4.3	4.3	4.2	4.2							
	7.4	7.2	6.4	6.8							
	10.1	9.6	9.1	8.8							
	14.7	7.1	6.5	6.2							
1"	4.4	4.4	4.4	4.4	4.4	4.4	4.3				
	9.0	8.9	8.8	8.7	8.6	8.6	8.6				
	15.3	14.9	14.4	13.8	13.5	13.4					
	26	24	22	20	19	19					
	44	37	31	26	24	23					
	54	42	34	28	26	25					
	1-1/4"	4.4	4.4	4.4	4.4	4.4	4.4	4.4			
		8.3	8.3	8.2	8.2	8.2	8.1				
14.9		14.8	14.5	14.3	14.2	14.0					
25		25	23	22	22	22					
37		35	31	30	29	28					
41		39	34	32	31	29					
102		79	53	46	42	39					
1-1/2"		23	22	22	22	22	21				
	30	29	28	28	27	27					
	41	39	37	36	35	34					
	74	64	56	52	48	47					
	172	101	77	67	60	57					
	2"	42	41	41	40	40					
		57	56	54	52	51					
		71	69	65	62	61					
100		94	87	79	72						
108		100	92	83	79						
210		165	135	111	102						
266		190	146	117	106						
2-1/2"		45	44	43	42						
	55	53	51	50							
	72	67	63	61							
	101	88	80	76							
	162	119	101	94							
	202	132	109	101							
	3"	49	46	45							
		63	57	55							
82		69	67								
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>vs</sub>, 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"	5"	
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"	0.40	0.40	0.40	0.40							
	0.66	0.66	0.66	0.66							
	1.3	1.3	1.3	1.3							
	2.4	2.4	2.4	2.4							
	3.8	3.8	3.7	3.7							
	11.0	10.4	9.78	9.4							
1"	0.40	0.40	0.40	0.40	0.40	0.40	0.40				
	0.65	0.65	0.65	0.65	0.65	0.65	0.65				
	1.3	1.3	1.3	1.3	1.3	1.3	1.3				
	2.3	2.3	2.3	2.3	2.3	2.3	2.3				
	3.5	3.5	3.5	3.5	3.5	3.5	3.5				
	4.5	4.5	4.5	4.5	4.5	4.4	4.4				
	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"	4.1	4.0	4.0	4.0	4.0	4.0	4.0				
	7.7	7.7	7.6	7.6	7.6	7.6	7.6				
	8.7	8.6	8.6	8.5	8.5	8.5	8.5				
	12.7	12.6	12.4	12.3	12.2	12.2	12.2				
	19	19	19	18.1	17.9	17.6					
	27	26	25	24	23	23					
	34	33	30	28	27	27					
	1-1/2"	4.0	4.0	4.0	4.0	4.0	4.0				
8.3		8.2	8.2	8.2	8.2	8.2					
13.4		13.3	13.2	13.2	13.1						
24		23	23	22	22						
32		31	30	29	27						
61		55	50	47	44						
2"		24	24	24	24						
		38	38	37	37						
	57	56	54	52							
	83	70	75	70							
	109	101	92	83							
	2-1/2"	38	37	37							
		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>vs</sub>, 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. 7, 8

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  $C_v$ .

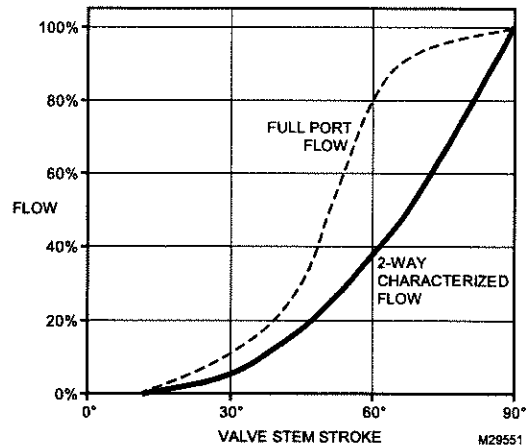


Fig. 7. Typical characterized VBN2 flow.

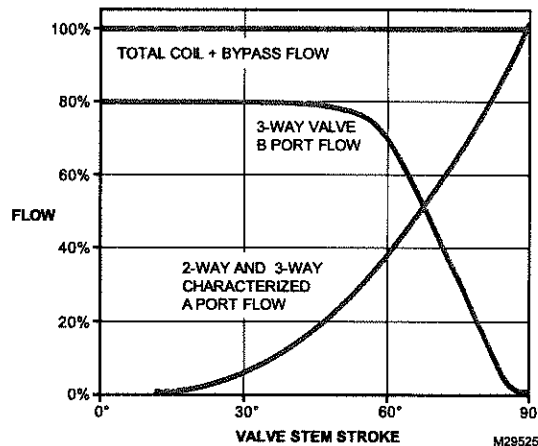


Fig. 8. Typical characterized VBN3 flow.

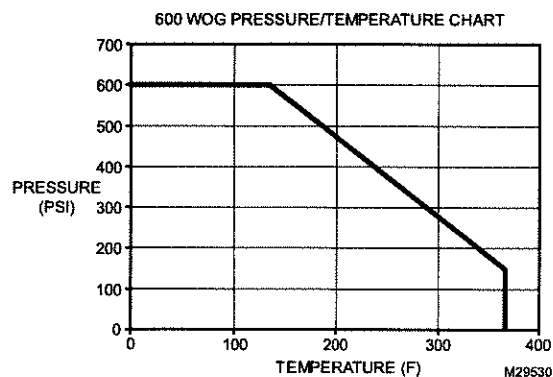


Fig. 9. Pressure derating curve. The valve body is rated for WOG (water, oil, and gas), but the valve with its internal components are only rated for water and not for oil or gas.

## 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 53 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 42 unique  $C_V$  values. Valve shall be available with threaded (FNPT) end connections.

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

Part Number	Description	MVN613A0000	MVN613L0000	MVN643A0000	MVN643L0000	MVN713A0000	MVN713L0000	MN Non-Fail-Safe Direct Couple Actuators	MS Fail-Safe Direct Couple Actuators
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	
AT120A1004	120 to 24 Vac Transformer (20 VA)	x	x	x	x	x	x	x	x
AT140A1000	120 to 24 Vac Transformer (40 VA)	x	x	x	x	x	x	x	x
STRN-STRNRLF	Stain Relief Fitting (10 pack)								x

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 63-4378-06 M.S. Rev. 04-16  
 Printed in United States