Honeywell

VBN2, VBN3 Control Ball Valves With Threaded Connections

PRODUCT DATA

VBN3...0B

VBN2...0D

VBN2...0F

APPLICATION

The VBN2 Two-Way and the VBN3 Three-Way Control Ball Valves control hot and chilled water with glycol solutions up to 50% in heating, ventilating, and air conditioning systems (MasterFormat™ 2004, Division 23, HVAC) to provide two-position or modulating functions.

These valve assemblies can be ordered with or without factory-mounted non-spring return or spring return direct-coupled actuators (DCA).

FEATURES

All Models

- **Sizes from 1/2 to 2-1/2 inches with internal (female) NPT connections. 2-way available to 3 inches.**
- **Straight-through flow between A and AB ports.**
- **Equal percentage flow characteristics using patented, laser-cut flow control ball inserts.**
  - **— Full port balls available for two-position, line-size control**
  - **— Field-serviceable stem assembly.**
- **Nickel-chrome plated brass valve ball and stem.**
- **Choice of four, factory-installed actuation control schemes: Floating, Modulating (2-10 V), 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.**
- **ANSI Class IV seat leakage specification (0.01% of C_V maximum).**
- **Optional weatherproof NEMA 3R (IP54) actuator enclosure for outdoor applications.**
- **Actuator can be mounted on the valve in any of four positions.**

VBN2 (Two-way)

- **Sizes 1/2 to 3 inches.**
- **Wide C_V choices from 0.38 to 266.**
- **Available 316 stainless steel valve ball and stem.**

VBN3 (Three-way)

- **Sizes up to 2-1/2 inches.**
- **Wide C_V choices from 0.33 to 109.**
- **Valve installs in a globe valve "T" pattern, no extra elbows or piping required.**
- **Convertible to straight-through 2-way control by plugging B port (plug not provided.)**
- **Mixing or Diverting control.**

Contents

63-2648-04

SPECIFICATIONS

Models: See Table 3.

Dimensions: See Fig. 1 and 2.

Body Style: Two-way ball valve, straight-through flow, full or reduced port using patented, precision, laser-cut flow control insert.
Three-way ball valve, A-B-AB flow, full or reduced port using patented, precision, laser-cut flow control inserts.
Female NPT connections.

Body Size:
1/2 to 3 inches NPT (two-way, DN15...80).
1/2 to 2-1/2 inches NPT (three-way, DN15...65).

Flow Capacity: 2-way: see Table 1. 3-way: see Table 2.

Body Pressure Rating (maximum): 360 psi (2482 kPa) at 250°F (121°C). See Fig. 5.

Maximum Differential (Close-off) Pressure: See Table 9.

Controlled Media: Water or Glycol solutions up to 50%. Not suitable for oil, combustible gases, or steam.

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

Flow Characteristics:
Two-way: Equal Percentage with flow control insert.
Linear with full port over 90° stroke.
Three-way: Port A to AB: Equal Percentage.
Port B to AB: Linear, with 20% C_V reduction.

Materials:
Body: Forged Brass (ASTM B283).
Flow Optimizer: Noryl®
Ball and Stem:
Two-way: Nickel-chrome Plated Brass or 316 Stainless Steel.
Three-way: Nickel-chrome Plated Brass.
Stem Seals: Teflon™ thrust bearings with EPDM O-ring.
Ball Seals: Patented, reinforced TEFLON™ Seals with EPDM O-rings.

Approvals Standards:
Valves: ANSI Class IV close-off/leakage (maximum 0.01% of C_V let by)
Actuators: See specific actuator literature.

Parts and Accessories:
5112-11 replacement mounting kit for Honeywell direct coupled actuators. See Fig. 17.
5112-19/20/21/22/23/24 replacement stem assembly for valves with yellow pressure plate (date code 0742 and later). See Table 7-8 and Fig. 18.
5112-3R Nema 3R enclosure. See document 62-2031 for more information.

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Table 1. VBN2 Two-Way Valve C_V Ratings.

Valve		C_V Designator																	
Size	Code	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	1	2
1/2"	2A	0.38	0.68	1.3	2.0	2.6	4.7	8.0	11.7[a]										
3/4"	2B	0.31	0.63	1.2		2.5	4.3	7.4	10.1	14.7[a]	29[a]								
1"	2C						4.4	9.0		15.3	26	44[a]	54[a]						
1-1/4"	2D						4.4	8.3	14.9	25	37	41[a]			102[a]				
1-1/2"	2E									23	30	41		74[a]				172[a]	
2"	2F											42	57	71	100	108[a]		210	266[a]
2-1/2"	2G											45	55	72	101		162	202[a]	
3"	2H											49	63	82		124	145[a]		

[a] Denotes full port valve (with no insert). Provides equal percent flow control up to 70° (80%) rotation, linear control over-all to 90° rotation. See Fig. 3. Multiply the C_V value by 0.865 to get the capacity in k_{VS}, if S.I. (metric) units are required.

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
   1885 Douglas Drive North
   Minneapolis, 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 2. VBN3 Three-way valve C_V Ratings.

Valve		C_V Designator[b]															
Size	**Code**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**	**T**
1/2"	**3A**	0.33	0.59		1.0	2.4		4.3	8.0								
3/4"	**3B**		0.40	0.66	1.3	2.4	3.8			11.0[a]							
1"	**3C**		0.40	0.65	1.3	2.3	3.5	4.5	8.6	14.9	22	31					
1-1/4"	**3D**							4.1	8.7	12.7	19[a]	27	34[a]				
1-1/2"	**3E**							4.0	8.3	13.4	24	32[a]		61			
2"	**3F**										24		38	57	83		109
2-1/2"	**3G**												38		74	100[a]	

[a] Denotes full A-port (with no insert). Provides linear flow control.

[b] B port C_v is 20% less for constant combined flow through coil and bypass. See Fig. 4. Multiply the C_V value by 0.865 to get the capacity in k_{vs}, if S.I. (metric) units are required.

Rangeability

Rangeability is a measure of a valve's controllability (sometimes referred to as its Turndown Ratio). Rangeability is a measured property and is expressed as the ratio of a valve body's maximum flow rate to its minimum controllable flow rate.

Table 3. Model Selection.

Valve	Fitting	Body/Flow Type	Size	C_V	T/P	Trim	Enclosure	Actuator
VB = valve, ball								
	N = Female NPT threaded							
		2 = 2 way equal percentage, or linear flow characteristic, as noted in Table 1.						
		3 = 3 way mixing equal percentage, or linear flow characteristic, as noted in Table 2.						
			inch	S.I. metric				
			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			
				B	C_V Designator			
				C	See Table 1 for Two-way valves.			
				D	See Table 2 for Three-way valves.			
				….				
				T				
				U				
				1				
				2				
					3 = ANSI 300 Valve construction			
						P = Plated (chrome or nickel)		
						S = Stainless Steel		
							0 = no enclosure	
							R = NEMA 3R enclosure	
								X = no actuator
								A = NSR, Floating
								B = NSR, Modulating
								C = SR, 2-Position, 24 Vac
								D = SR, Floating/Modulating
								F = NSR, Floating, less enclosure (1/2–3/4 in. only)

VB	N	2	A	B	3	P	0	A

Table 4. Rangeability of two-way actuated ball valves.

Valve Size	C_v	Rangeability
1/2"	0.38	17
	0.68	41
	1.3	52
	2.0	*
	2.6	321
	4.7	159
	8.0	390
	11.7	251
3/4"	0.31	41
	0.63	17
	1.2	52
	2.5	321
	4.3	159
	7.4	*
	10.1	390
	14.7	251
	29	1503
1"	4.4	159
	9.0	390
	15.3	1040
	26	484
	44	1263
	54	1207

* Data not available at time of printing

Table 4. Rangeability of two-way actuated ball valves. (Continued)

Valve Size	C_v	Rangeability
1-1/4"	4.4	159
	8.3	390
	14.9	1040
	25	*
	37	484
	41	1207
	102	1263
1-1/2"	23	484
	30	*
	41	603
	74	1263
	172	558
2"	42	603
	57	*
	71	287
	100	*
	108	558
	210	750
	266	877
2-1/2"	45	250
	55	*
	72	287
	101	558
	162	750
	202	877
3"	49	250
	63	287
	82	558
	124	750
	145	877

* Data not available at time of printing

Effective C_V

VBN valves offer a wide range of C_v ratings in each pipe size. Where there is no close value, however, a valve of smaller size may have the rating needed. When valves are mounted between pipe reducers, there is a decrease in actual valve capacity because the reducers create additional pressure losses in the system. This is especially true for ball valves because of their high capacity.

The C_V values in Tables 5 and 6 are a guideline. Use the "Effective C_V," not the valve C_V by itself, to more accurately apply a control valve to the controlled element.

Table 5. Effective C_Vs Using Pipe Reducers (Two-way).

Valve Size (in.)	Effective C_V[a] 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					
		29	21.1	17.1	15.4					
1"			4.4	4.4	4.4	4.4	4.4	4.3		
			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		
			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	
				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

[a] Multiply the C_v value by 0.865 to get the capacity in k_{vs}, if S.I. (metric) units are required.

Table 6. Effective C_Vs Using Pipe Reducers (Three-way)

Valve Size (in.)	Effective C_V[a] 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	
				7.7	7.7	7.6	7.6	7.6	7.6	
				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	
				34	33	30	28	27	27	
1-1/2"					4.0	4.0	4.0	4.0	4.0	
					8.3	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	

[a] Multiply the C_v value by 0.865 to get the capacity in k_{vs}, if S.I. (metric) units are required.

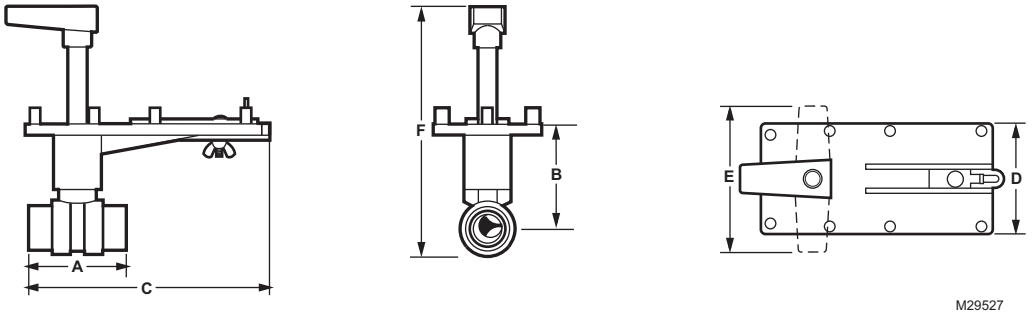


Fig. 1. VBN2 dimensions in inches (millimeters).

Table 7. VBN2 Dimensions.

Pipe Size			C_v Designators	Dimensions in in. (mm)						Weight		Replacement Stem Assembly**
In.	(DN)	Code		A	B	C	D	E	F	lb	(kg)	
1/2	15	VBN2A...	B,D,E,F,G,H,K*	2-3/8 (60)	2-3/4 (69)	6-5/8 (169)	3 (76)	4 (102)	8-1/8 (206)	1.0	(0.5)	5112-19 5112-22 (SS)
			J	2-5/8 (67)	2-7/8 (72)	6-1/2 (166)			8-5/16 (211)			
3/4	20	VBN2B...	B,D,E,G,H,J,L*		2-3/4 (69)	6-7/16 (163)			8-1/8 (206)			
			K,M*		2-7/8 (72)	6-1/2 (166)			8-5/16 (211)			
1	25	VBN2C...	J	2-3/4 (70)		7-1/16 (180)						
			H,L,P*	3-1/16 (77)	3-1/16 (77)	6-3/4 (171)			8-11/16 (220)	1.4	(0.6)	5112-20 5112-23 (SS)
			M,N*	4-5/16 (109)	3-4/16 (82)	7-3/8 (188)			8-7/8 (225)	2.4	(1.1)	
1-1/4	32	VBN2D...	H,J,K,L,N*	3 (76)	3-1/8 (79)	6-11/16 (170)			8.67 (220)	1.4	(0.6)	
			M,S*	3-5/8 (92)	3-1/4 (82)	7 (178)			9-1/16 (231)	2.4	(1.1)	
1-1/2	40	VBN2E...	L,M,R*	3-7/16 (87)		6-15/16 (176)						
			N,1*	4-1/16 (103)	3-3/4 (95)	7-1/16 (179)			8-7/8 (225)	3.2	(1.5)	5112-21 5112-24 (SS)
2	50	VBN2F...	N,T*	4 (101)		7-3/16 (183)						
			P,R,S,1,2*	4-15/16 (125)	4-1/16 (103)	7-7/16 (188)			10-1/2 (266)	5.0	(2.3)	
2-1/2	65	VBN2G...	N,P,R,S,U,1*	5-5/16 (135)		7-9/16 (192)				5.5	(2.5)	
3	80	VBN2H...	N,P,R,T,U*	5-3/4 (146)		7-11/16 (196)			10-11/16 (272)	5.9	(2.7)	

* Indicates full port valve: no flow characterizing insert.
**Replacement stems available in brass or stainless steel—use according to valve part number.

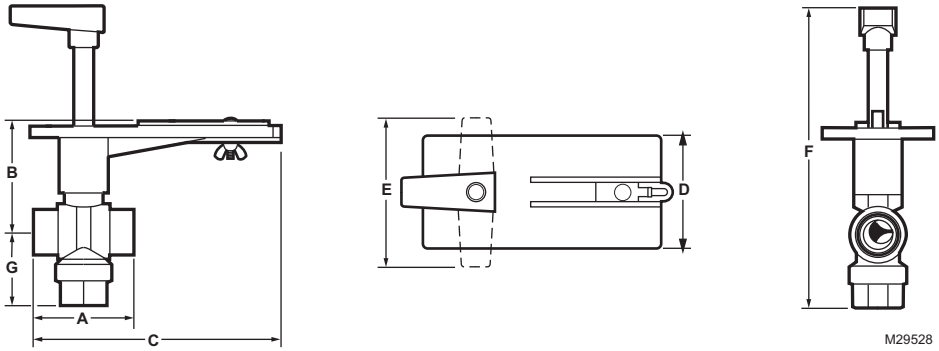


Fig. 2. VBN3 dimensions in inches (millimeters).

Table 8. VBN3 Dimensions.

Pipe Size			C_v Designators	Dimensions, inches (mm)							Weight		Replacement Stem Assembly
In.	(DN)	Code		A	B	C	D	E	F	G	lb	(kg)	
1/2	15	VBN3A...	B,C,D,E,F,H,J	3-1/2 (89)	3-5/16 (84)	7 (178)	3(76)	4(102)	9-3/8 (239)	2 (51)	2.4	(1.1)	5112-19
3/4	20	VBN3B...	C,D,E,F,G,K*	2-13/16 (71)		6-1/2 (165)			8-13/16 (224)		2.0	(0.9)	
1	25	VBN3C...	C,D,E,F,G	3-13/16 (97)		7-5/16 (185)			9-1/2 (241)	2-1/16 (52)	2.8	(1.3)	
			J,L	3 (76)	3-13/16 (97)	6-13/16 (173)			9-13/16 (249)	2-7/16 (62)	2.6	(1.2)	5112-20
			H,K,M	4-5/16 (114)	4 (102)	7-13/16 (198)			10-13/16 (274)	3-1/8 (80)	3.3	(1.5)	
1-1/4	32	VBN3D...	H,J,L*	3 (76)	3-13/16 (97)	6-13/16 (173)			9-13/16 (249)	2-13/16 (72)	2.5	(1.1)	
			K,M,N*	3-5/8 (91)	4 (102)	7-5/16 (185)			10-5/16 (262)	2-7/16 (61)	2.8	(1.3)	
1-1/2	40	VBN3E...	H,J,K,M*	4-5/16 (114)		7-13/16 (198)			10-13/16 (274)	2-3/4 (69)	3.3	(1.5)	
			L,P	4 (102)	4-1/2 (114)	7-5/16 (185)			11 (279)	3-3/16 (81)			5112-21
2	50	VBN3F...	L,N,P							3-1/8 (79)			
			R,T	5 (127)	5-13/16 (147)	7-13/16 (198)			12-5/16 (312)	3-7/8 (98)	3.8	(1.7)	
2-1/2	65	VBN3G...	P,R,S*							4-1/8 (104)			

* Indicates full A-port: no flow characterizing insert.

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, or hot water HVAC systems. VBN valves have not been approved for use with potable water. They are designed for a medium temperature range of from 35 to 250°F, at a maximum static pressure of 360 psig (see Table 9 for valve close-off ratings). VBN valves are to be operated with the appropriate rotary direct coupled Honeywell actuators only.

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

recommended in general, and strongly recommended for valves with the small port geometries needed for low C_v ratings.

IMPORTANT

The presence of excessive iron oxide (red rust) in the system may accelerate part wear and void the valve warranty.

Flow Characteristics, Fig. 3, 4

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.

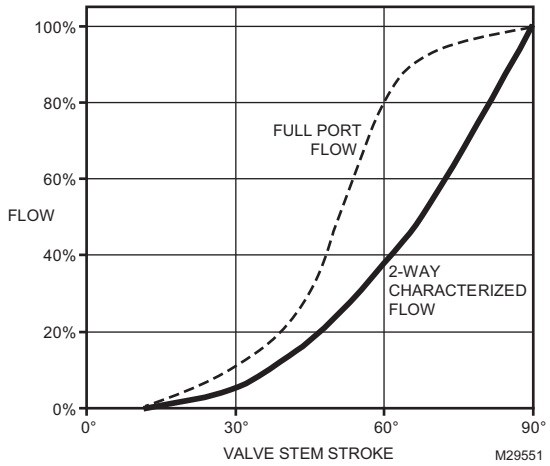


Fig. 3. Typical characterized VBN2 flow.

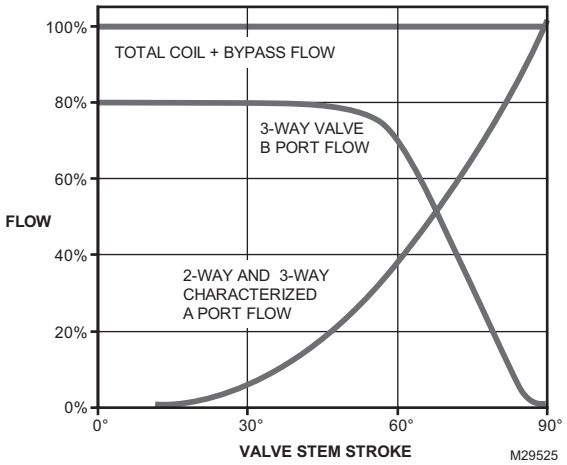


Fig. 4. Typical characterized VBN3 flow.

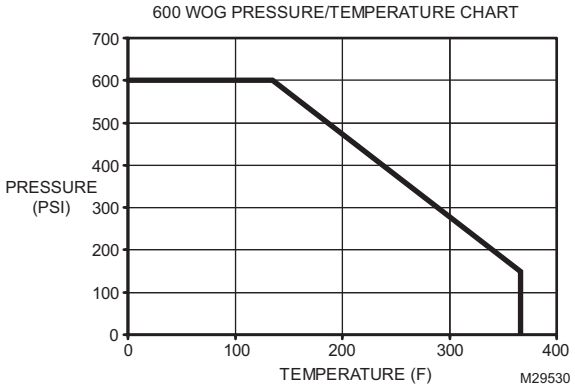


Fig. 5. Pressure derating curve.

Required Operating Torque

Both Honeywell non-spring return 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. A 35 lb-in. (4 Nm) DCA provides sufficient torque to close the valve at rated close-off. (See Table 9.) These ratings exceed most HVAC application requirements.

Table 9. Close-off, Differential Pressure Ratings.

Valve Type	Valve Size	Close-off Pressure Rating (psi)
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

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:

$\Delta P < 1/2$ x (absolute head pressure (psia) - 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.

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, licensed service technician.
4. After installation is complete, check out product operation as provided in these instructions.

Preparation

CAUTION

Equipment Damage Hazard

- Foreign particles like sand (quartz), rust, 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.
- Anti-freeze solutions that can be used, with minimum 50% water dilution, are diethylene glycol, ethylene glycol, and propylene glycol.
- Do not use boiler additives, solder flux and wetted materials which are petroleum based or contain mineral oil, hydrocarbons, or ethylene glycol acetate. These chemicals can cause O-rings to swell and affect product performance.
- 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.
- When installing threaded fittings and pipes, if tape is unavailable use minimum possible amount of pipe dope. Excessive dope may be forced into ball and interfere with valve operation when pipe is assembled to body.

IMPORTANT

Hold valve by hexagonal fitting ONLY when tightening pipe fittings. Do NOT hold the valve body with the pipe wrench; product damage may result.

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. VBN2 valves with flow control inserts are not reversible.

NOTE: For three-way valve mounting, see Fig. 6 through 7.

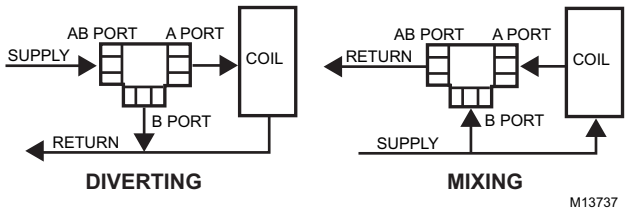


Fig. 6. Three-way ball valve flow orientation (not to scale).

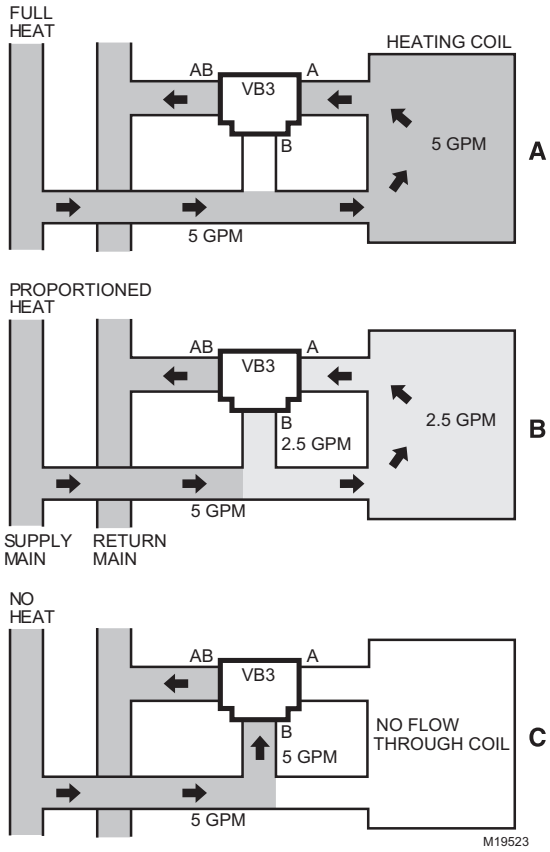


Fig. 7. Three-way mixing valve operation with coil bypass.

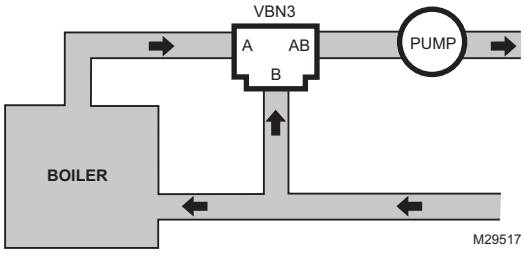


Fig. 8. Boiler bypass for outdoor reset control.

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 length-wise 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. 9.

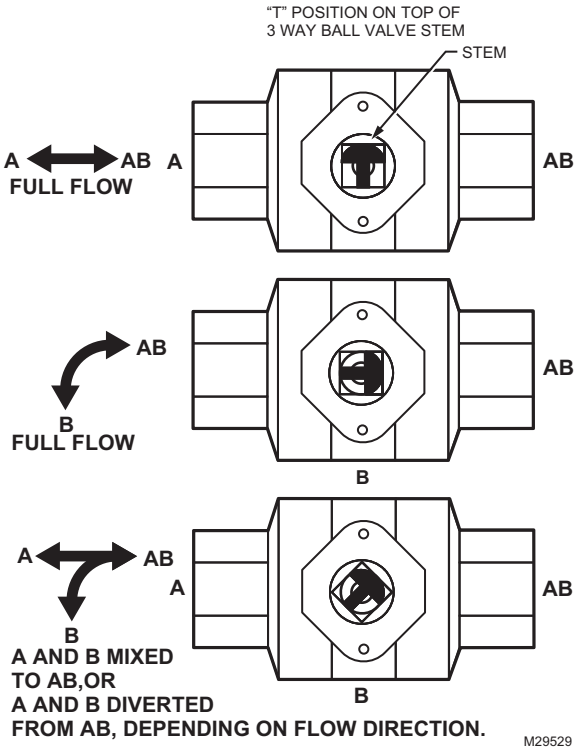


Fig. 9. Orientation of ball in valve.

6. Valve must be mounted with the actuator/bracket above pipe center line. Do not install the valve with the stem below horizontal or upside down. (See Fig. 9 and 10.) Valve may leak due to settling of abrasive material on valve stem seals. When using a NEMA 3R rated weather enclosure, the actuator must be mounted directly above the valve in a horizontal pipe run.

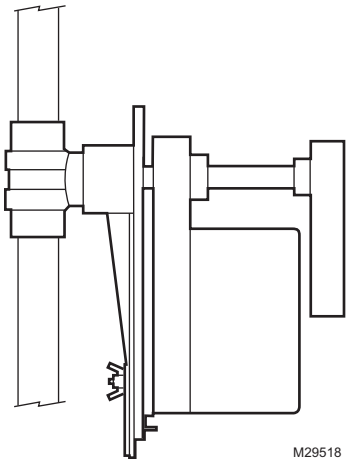


Fig. 10. Vertical valve installation.

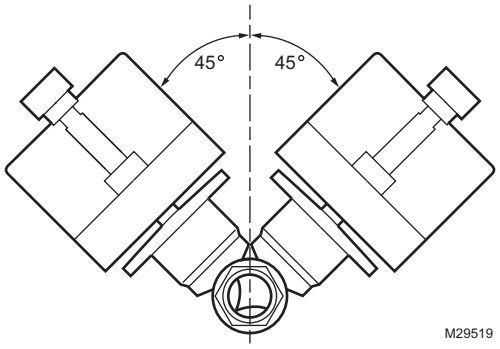


Fig. 11. Acceptable valve angle from vertical.

Mechanical Installation

WARNING

System may be under pressure.
Isolate VBN control valve with shut-off valves before proceeding or personal injury and property damage may result.

The valves are supplied with female National Pipe Tapered threads and should be sealed with an approved pipe thread tape or sealant. Installation torque should not exceed 75 lb-ft.

See Fig. 1 and 2 for valve dimensions. Refer to actuator literature for actuator dimensions.

Actuator Mounting Plate Adjustment (Fig. 17-18)

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. Remove actuator from bracket and valve stem.
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. ENSURE VALVE IS ISOLATED AND DEPRESSURIZED BEFORE PROCEEDING. Remove yellow pressure plate marked “HIGH PRESSURE” from valve bonnet, rotate 90° or 180°, and re-install screws using same holes in pressure plate and the appropriate pair of tapped holes in the valve bonnet.

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

6. Double-check pressure plate screws then re-install actuator mounting bracket onto valve.
7. Re-install.
8. Re-install actuator and handle.
9. Re-pressurize valve.

Electrical Installation

1. If necessary, remove actuator wiring cover.
2. Wire actuator using Fig. 12–16. For other wiring configurations, see actuator data sheet.
3. Replace cover.

Wiring

Typical connections shown here are for reference. Please refer to individual actuator data sheets for complete installation instructions.

Shielded cable is recommended when using 0-10 Vdc modulating control signals for signal protection from RFI/EMI. *Ground shield at **one** single point **only***, preferably where signal is weakest. Do not ground transformer secondary, and isolate burner ignition systems, which are grounded.

Any 4-20 mA proportional control signal can be converted to 2-10 Vdc by connecting a 490 to 510 ohm, 1/2 W or larger, resistor across MN7/MS7 actuator terminals 2 and 3.

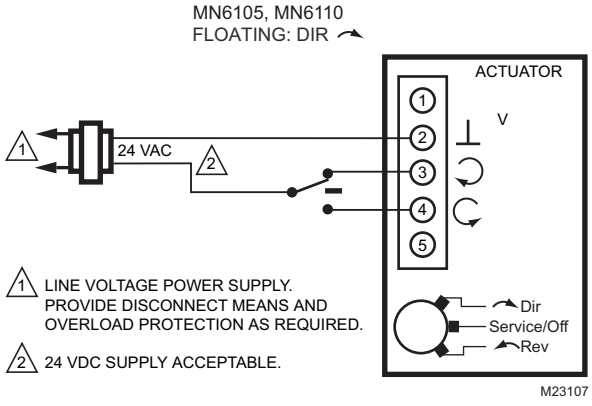


Fig. 12. Wiring MN6105 for Floating Control.

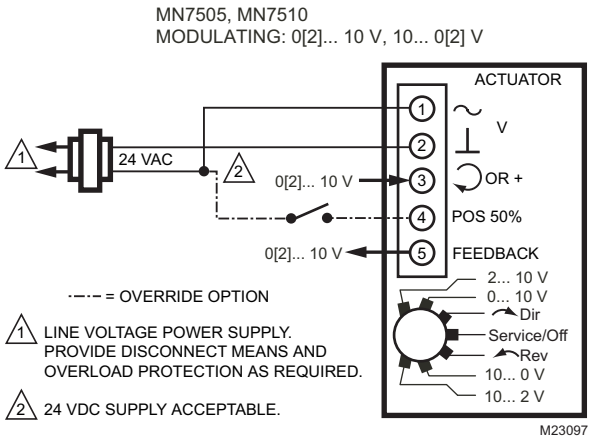


Fig. 13. Wiring MN7505 for Modulating Control.

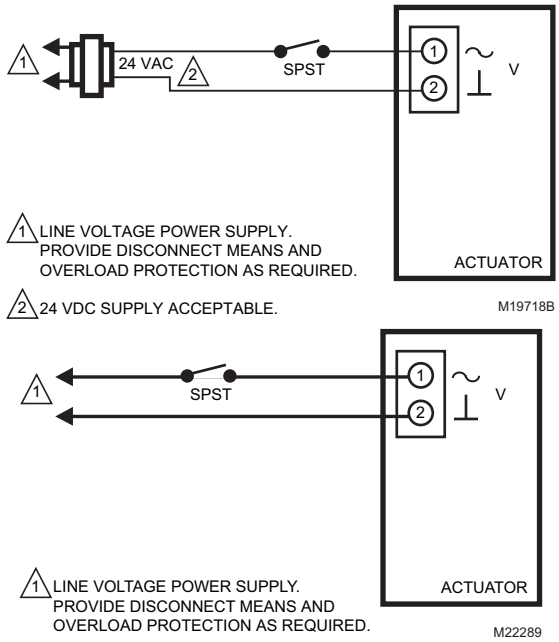


Fig. 14. Wiring MS7505, MS8105 for On/Off Control.

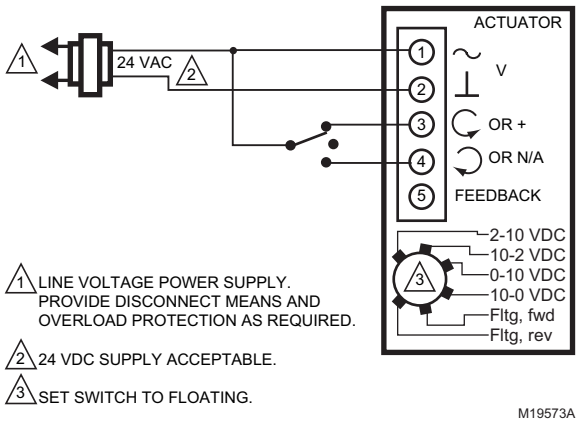


Fig. 15. Wiring MS7505 for Floating Control (Floating mode setting).

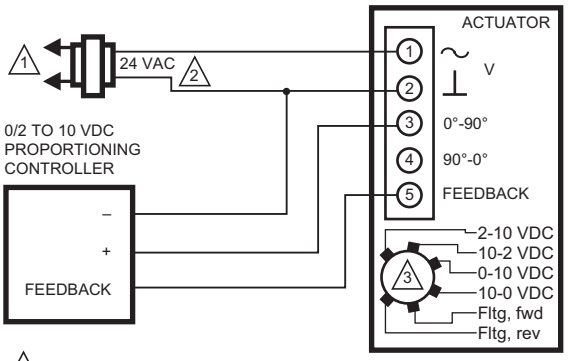


Fig. 16. Wiring MS7505 for modulating control with optional override switch (Modulating mode setting).

Actuated Stem Replacement Instructions (Fig. 17-18)

1. ISOLATE THE VALVE OR CONTROL LOOP AND BLEED OFF EXCESS PRESSURE.
2. Close the ball valve.
3. Remove handle and actuator from mounting plate.
4. Remove shaft cover, shaft, thermal break, and sub shaft. Then remove mounting plate.
5. Carefully remove stem retainer plate and stem.
6. If the lower packing gland is stuck, remove it with the gland removal tool.

CAUTION

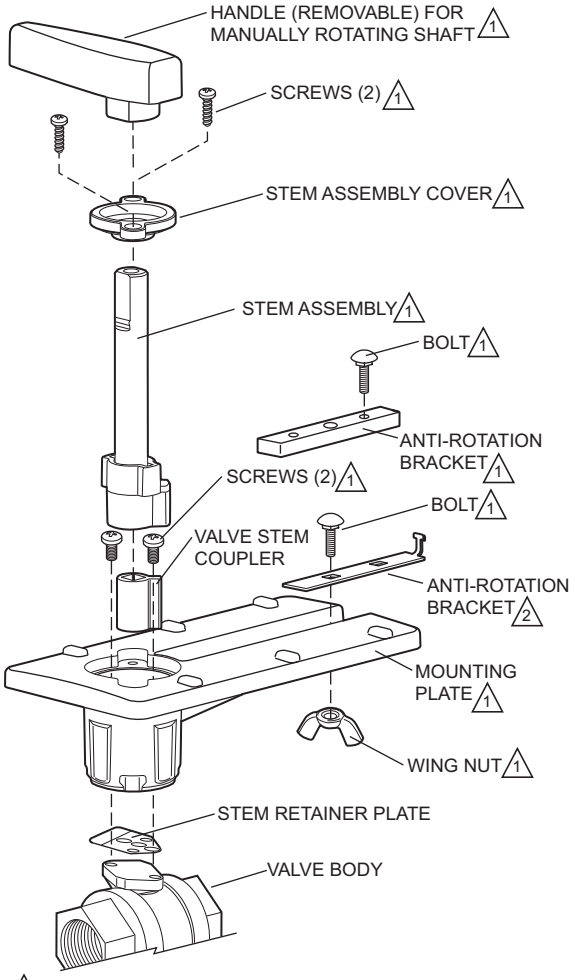
Avoid scratching the inside of the valve!

7. *Carefully remove any fouling or corrosion from the inside of the valve.*
8. Align arrow with short leg of "T" symbol on new stem assembly.

   NOTE: "T" symbol will vary.
9. Insert the new stem assembly. Be sure to line up the stem key with the ball slot.
10. Fasten the new stem retainer plate to the valve using the new countersunk screws. Then fasten the mounting plate to the valve.
11. Slide the sub shaft over the stem with the tab oriented.
12. Replace the thermal break, shaft, and shaft cover. If shaft has come loose from thermal break, push firmly on end of shaft until pin in shaft snaps into thermal break.
13. Replace actuator and secure it to shaft and mounting plate.
14. Snap handle onto top of shaft.

NOTES:

— Be careful not to get the stem dirty.
— Stem, o-ring, and packing glands must be covered in protective silicone grease supplied (DOW -111).
— Actuator operation and shaft connections vary. See actuator instructions.



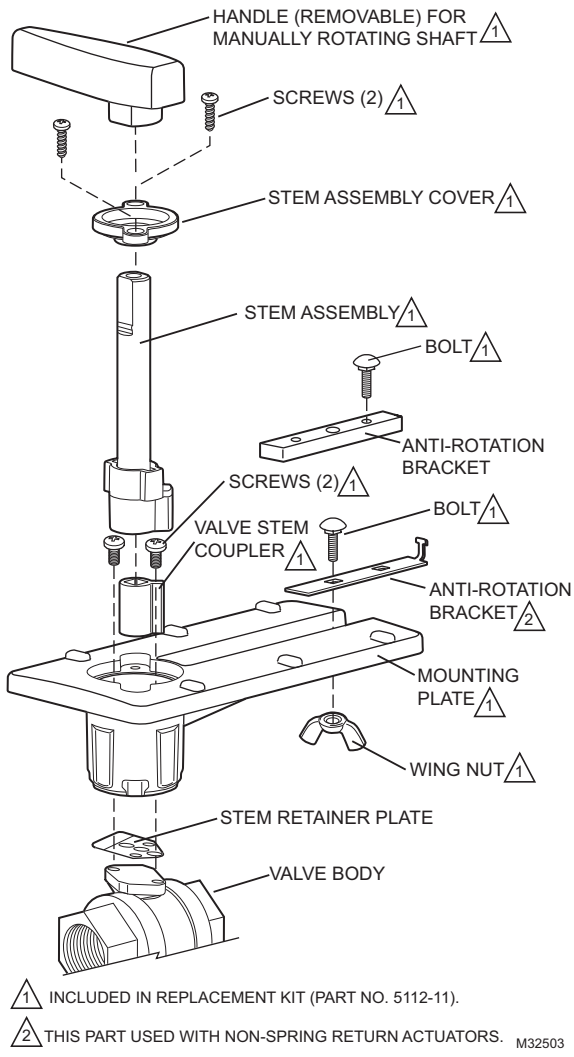


Fig. 17. Valve assembly exploded view.

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

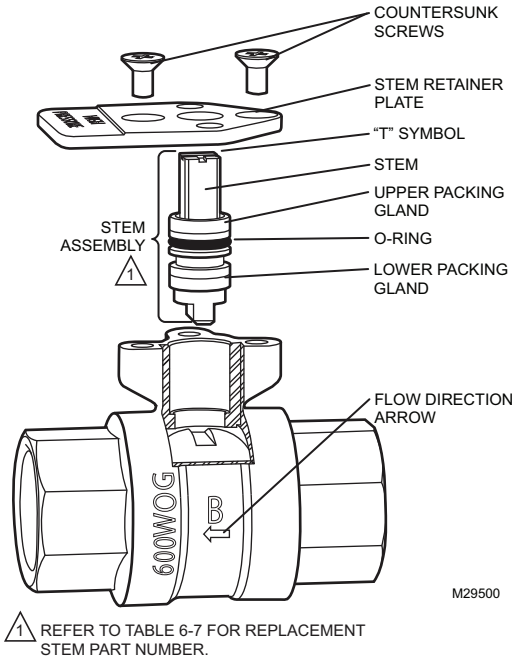


Fig. 18. Stem assembly exploded view.

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 spring return 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.
3. If the control scheme requires fail-safe operation, ensure that, upon removal of power, the fail position coincides with the control sequence.
4. Spring return actuators are factory-configured for A-port normally-closed fail-safe operation. To change this to normally-open, 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 shaft coupling to the opposite side of the actuator, as displayed in Figure 19.

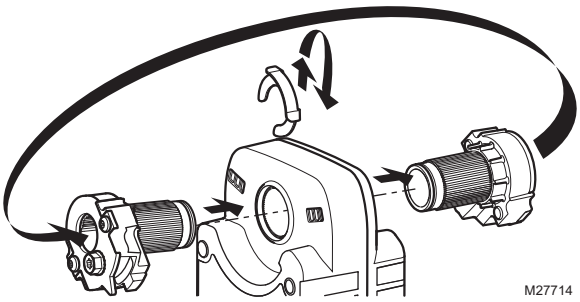


Fig. 19. Mounting SCSA to actuator opposite side.

(1) Remove the retainer clip from the Self-Centering Shaft Adapter and set it aside for later use.
(2) Remove SCSA from actuator.
(3) Reinstall SCSA 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 or socket. Recommended tightening torque of SCSA bolt is minimum 120 lb-in [14 Nm], maximum 180 lb-in [20 Nm].

For detailed actuator information, see Honeywell literature:
- 62-0274—MS7505/MS8105 Spring Return Actuator Installation Instructions
- 63-2632—MN6105 Floating Actuator Product Data
- 63-2633—MN7505 Modulating Actuator Product Data
- 63-2209—ML6161/ML6164/ML7161/ML7164 Non-spring return direct Coupled Actuators Product Data

TYPICAL SPECIFICATIONS

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 two-way valves. Manufacturer shall be able to provide glass-filled polymer, precision-cut ball insert to make flow control equal percentage. Flow characterization methods external to the ball shall not be acceptable. Valves shall be Honeywell.

Two-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 100 psi at no more than 0.01% of C_V seat leakage with actuator which provides 35 lb-in. (4 Nm) torque for 1/2 to 3 inches sizes. Valve shall be available with a minimum of 53 unique C_V values. Valve shall be available with threaded (Female NPT) end connections. Three-way valves shall be installed in an A-B-AB (“T”) configuration with actuator perpendicular to shaft. Valve shall not require elbows of any kind.

Three-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 40 psi at no more than 0.01% of C_V seat leakage on all ports with an actuator that provides 35 lb-in. torque for all body sizes from 1/2 to 2-1/2 inches. Three-way valves must be capable of both mixing and diverting applications and shall be available with a minimum of 42 unique C_V values. Valve shall be available with threaded (FNPT) end connections. Valve stem assembly shall be of a packless design and be field-replaceable without removing the valve body from the piping. Teflon™ seals shall hold the stem in alignment, and protect the O-ring from system temperature fluctuations. Stem O-ring shall be made of peroxide-cured EPDM and be isolated from system treatment chemicals by a reservoir of silicon grease. Valve stem shall have a blow-out proof rating of 600 psi, minimum.

Valve Actuator

Control valve 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 weatherproof 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 as required.

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