Bulletin MCBV1117e

Motor Controlled Ball Valves for Industrial Refrigeration

Made in U.S.A.

HANTEMP MCBV (Patented)

Motor Controlled Ball Valves are gaining popularity because they are simpler than, but superior to, conventional **canned-motor** control valves. The nearly-zero pressure drop equates to power savings. There is little potential for fluid collection and liquid slugging. There is no gearing in the refrigerant fluid, which often contains dirt, debris and other contaminants. These ball valves can operate safely with most refrigerants. Actuator mounting conforms to international standard ISO 5211; thus many off-the-shelf replacement actuators could be used including electronic, and pneumatic variations. HANTEMP Controlled Ball Valves are corrosion resistant **Stainless Steel** and available for 3/4" to 3" pipe sizes.

For Suction, Hot Gas, Liquid Lines, and other.

MCBV FEATURES

- **STAINLESS STEEL Body; 3/4" to 3"**
- **Full or Characterized Ports Available**
- **Ammonia, Halocarbons, Secondary Refrigerants**
- **Compatible with Easy to Source Standard Actuators**
- **No reverse flow when closed**

SPECIFICATIONS (Mechanical)

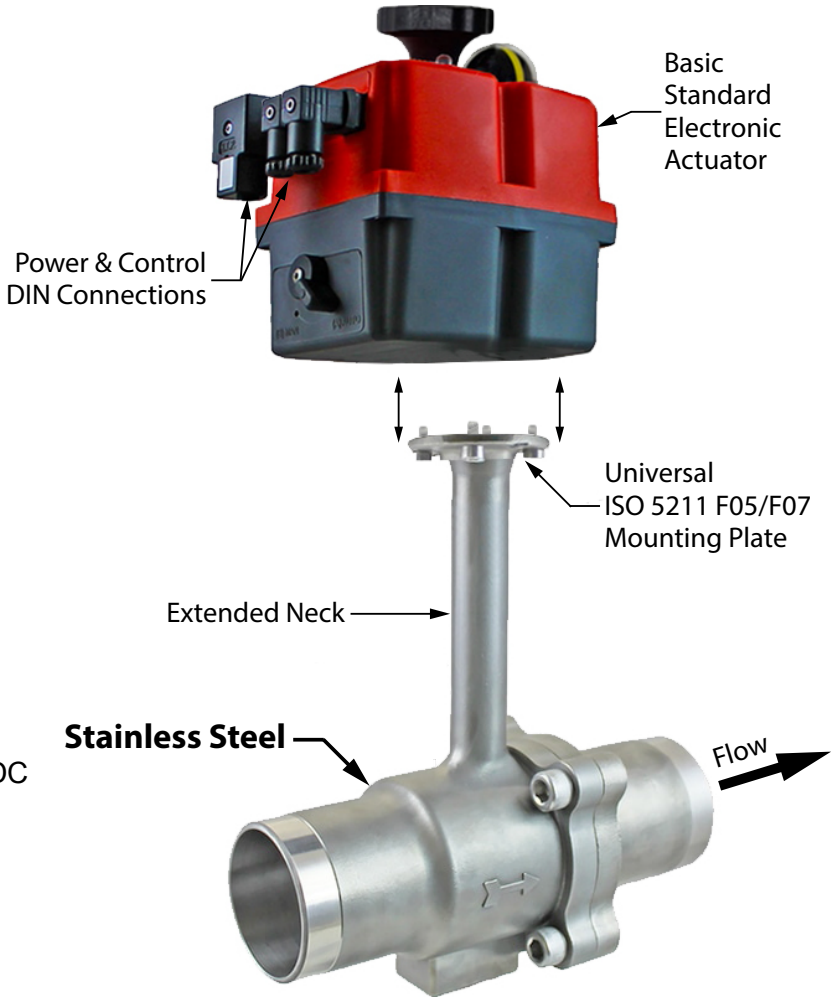
Body: Stainless Steel
Trim: Stainless Steel
Mounting Plate: Stainless Steel F05/F07
Stem Connection 14mm Square
Seats & Seals: PTFE/EPDM
Actuator Housing: Plastic or Metal
Safe Working Pressure: 800 psig
Ambient Operating Temperature: -40°F to 120°F
Fluid Temperatures: -70°F to 240°F

SPECIFICATIONS (Electrical)

NEMA: 6; IP67
Operating Voltage: 24V to 240V; AC/DC
Power Consumption: 20 to 50W
Input Control Signals: 4-20mA; 0-10VDC; or relay
Output Position Control Signal: 4-20mA; 0-10VDC
(CCW to open, CW to close)

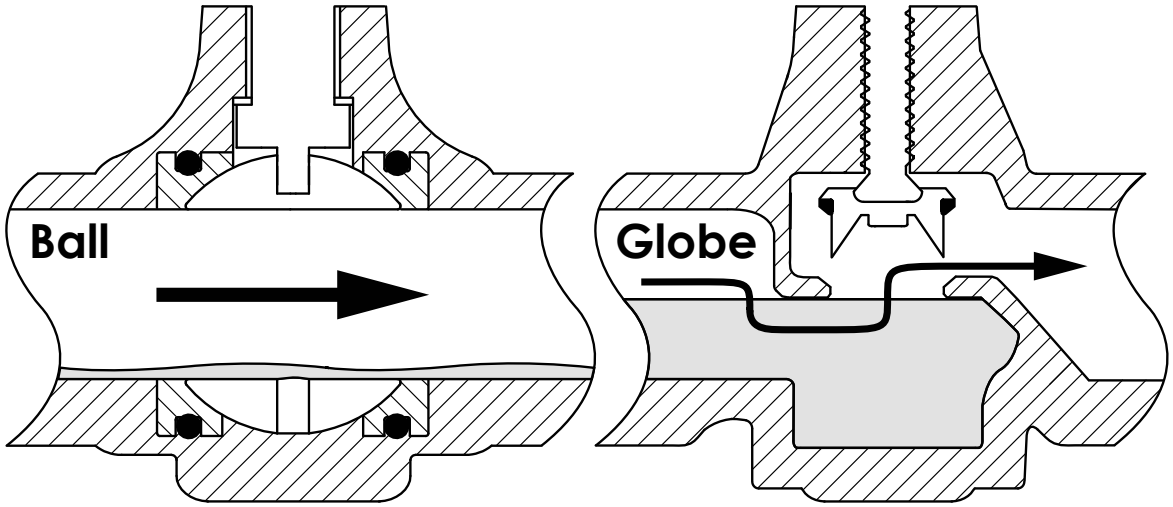
SPECIFICATIONS (Ball Profiles)

Open Port (OP): Maximum Flow (standard)
Characterized V-Port (VP): Throttling Port
Tear Drop Port (TD): Throttling Expansion Port
Slotted Port (SL): Liquid Expansion Port



2˝ MCBV with Electronic Actuator

HANTEMP BALL VALVES HAVE SUPERIOR FLOW



***Flow Comparison** Between Ball Valve and a Globe Valve (Note **Restricted Flow** In Globe Design)*
Ex: A 3" SSBV/MCBV has a Cv of 600 compared to a conventional 3" globe-valve with a Cv of 100

Inlet flow area may be reduced by 50% and collected oil or refrigerant can possibly slug. For a suction line with condensed vapor the impact of slugs can damage elbows or headers; minimize impacts by slow opening of any suction shut-off valve.

MCBV APPLICATIONS:

1. Low Temperature Suction Stop
2. Space Temperature Modulation
3. Shell & Tube Chiller
4. Plate & Frame Chiller Control
5. Defrost Termination Slow-Opening
6. Accumulator Make-Up Level
7. Hot Gas Modulating Defrost
8. Gravity Heat Pipes
9. Heat Recovery/Reclaim
10. Suction Crossover
11. Liquid Transfer Systems
12. Liquid Expansion/DX
13. Liquid Overfeed
14. Low ΔP Suction Shut-off
15. Side-Port Feed
16. Heat Reclaim
17. Gravity Drain

ALTERNATIVE TO:

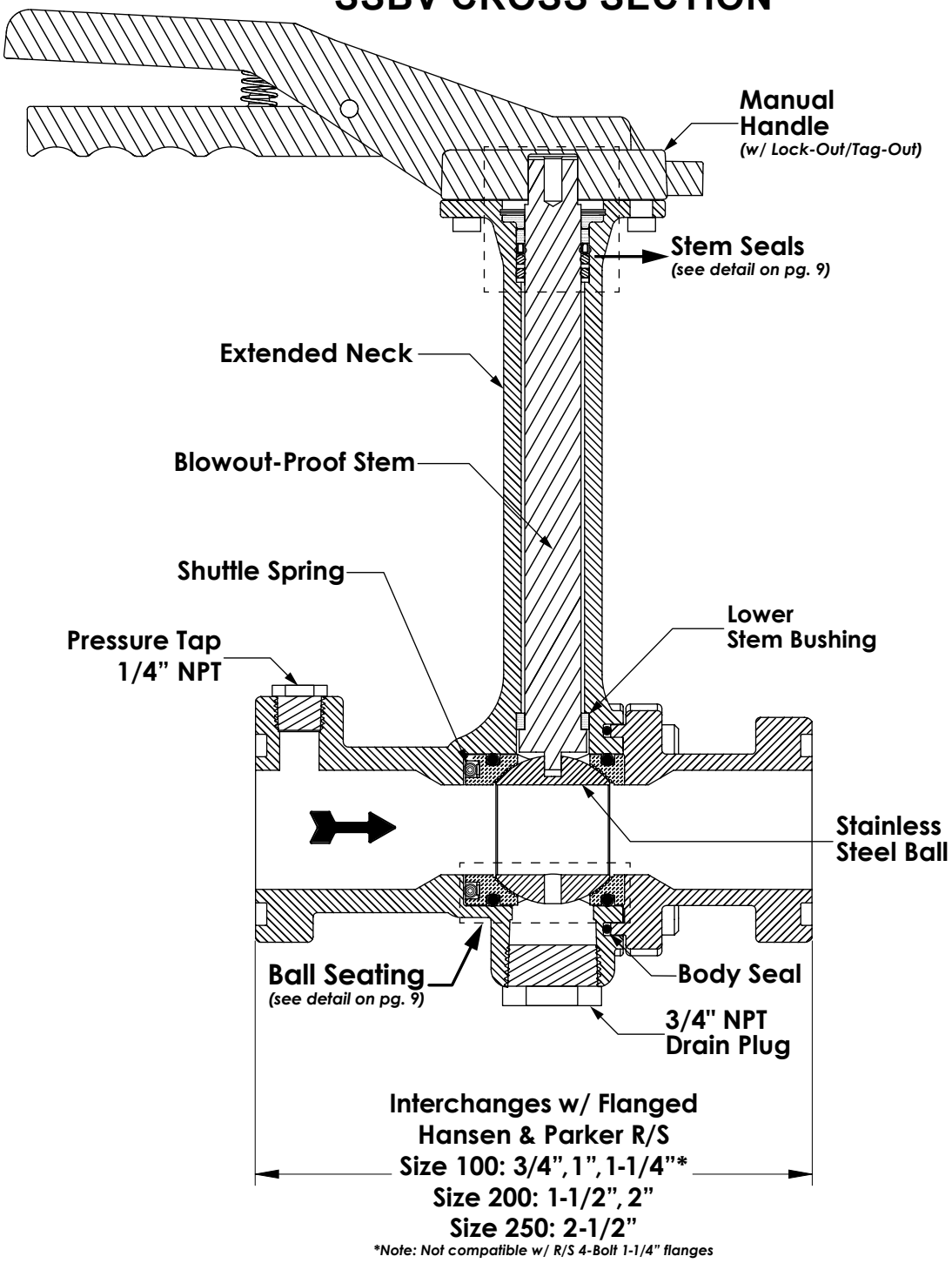
- Sealed Motor Valves
- Solenoid Valves
- Evaporator regulators
- Expansion valves
- Butterfly valves
- Gas Powered Checks

HANTEMP PROPRIETARY LIQUID EXPANSION SOLUTION

The HANTEMP Controls innovative patented design prevents the valve interior pressure from exceeding the higher of the inlet or outlet pipe pressures by utilizing a spring loaded floating ball. The stem region above the ball is also protected by a vent hole in the top of the ball and servicing oil drain hole in the bottom of the ball. This feature of the HANTEMP ball valve will not protect other regions of the piping system from expanding hydrostatic pressure.

Most ball valve designs - unlike ball valves from HANTEMP Controls - require a **bleed hole** drilled upstream in the ball to prevent excessive hydrostatic pressure and the potential disabling of the valve when closed. Hydrostatic damage is caused by trapped liquid, inside of a valve chamber, expanding due to the temperature coefficient of expansion of the liquid. This is especially true of ammonia because its temperature coefficient is greater than water and other refrigerants.

SSBV CROSS SECTION



MATERIALS OF CONSTRUCTION:

Body: ¾" - 2-½" 316L; 3" 304L

Stem: 304L

Ball: 316L

Ball Seats: PTFE

Stem Bushings: Glass-Filled PTFE

Back Seat Spring: Stainless Steel

Handle: Epoxy Coated Aluminum

Rotary Seals: Proprietary, Triple seal design

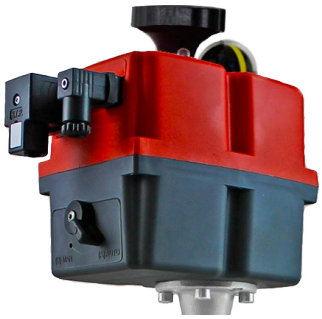
Fasteners & Plugs: 300 Series

Ambient Temperature: -40°F to 120°F

Fluid Temperature: -70°F to 240°F

Companion Flanges: Stainless Steel Standard (not needed for HANTEMP weld in-line models)

ACTUATOR OPTIONS



Electronic Actuator (Typical)

Pneumatic Actuator (Air Open/Spring Close)

DESCRIPTION

HANTEMP Controls offers electronic and pneumatic actuators for open/closed control of the ball valve's movement. The actuators are manufactured for valve compatibility with a standard F05 mounting connection, and are ideally suited for pairing with the HANTEMP Stainless Steel Ball Valves. Electronic actuators from HANTEMP Controls include a manual override feature; other customization features, including modulating models, are also available.

ELECTRONIC ACTUATOR - FEATURES & SPECIFICATIONS

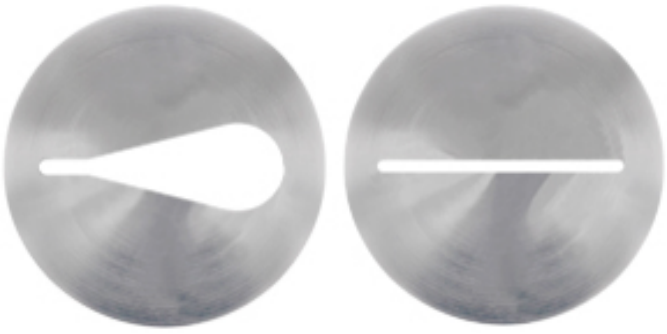
- Easily visible LED lights provide continuous status indication
- Multiple voltages available (12-240V)
- Open/Close control (standard)
- Actuation Time (Fully Closed to Open):
  5 Seconds: 3/4" - 1¼"
  8 Seconds: 1½" - 2½"
  12 Seconds: 3"
- 4-20mA/0-10VDC control (optional)
- Fail-safe battery back-up (optional)
- Speed Control; for slow opening/closing (optional)
- Electric torque limiter protects against valve jams
- Ambient temperature motor heater
- Manual override w/ visual valve position indicator
- Electrical connections are through external DIN plugs; no need to remove cover during installation
- (2) dry contact limit switches confirm open/closed valve position
- Rugged IP65 weatherproof housing
- Explosion Proof (Class 1/Div 2) Available

***Note:** Contact the factory to customize actuators for specific applications.*

PORT PROFILES

The conventional round ball profile (OP) provides maximum flow characteristics with minimal pressure drop, yet has a gradually exposed opening as the ball rotates. While this can provide accurate flow modulation, HANTEMP Controls has developed proprietary characterized ball profiles which can provide better regulation of flow (VP), or liquid expansion (TD)&(SL). These unique ball profiles are available upon request.

OPEN PORT (OP) **CHARACTERIZED V-PORT (VP)**



TEAR-DROP PORT (TD) **SLOTTED PORT (SL)**

OP - Standard; Low ΔP Suction
VP - Variable Load Suction } **For Gases**
TD - Accumulator Level
SL - Direct Expansion } **For Liquids**

SUCTION SHUT-OFF: VERY LOW TEMPERATURE

(BLAST, TUNNEL, AND SPIRAL FREEZERS)

See Table SS1

Valve operating pressure-drop **for temperatures below -20°F** should be about 0.25 psi or less to avoid unnecessary power consumption by the system compressors. For example at -25°F saturated suction pressure (15.96 psia) a certain screw compressor produces for a two-stage system 169.6 tons of refrigeration. A pressure-drop of 1 psi requires operation at -27.4°F (saturation 14.96 psia) at which time the evaporator refrigeration capacity is reduced to 158.6 tons or a 7% refrigeration tons reduction. Thus 0.25 psi drop is very favorable because the tons are greatly increased.

Conventional suction shut-off valves could be manual globe, ball, or butterfly valves. If the shut-off valves are automatic such as gas operated solenoid valves of globe seat design, or internal motorized valves of globe seat design the pressure drop might expectedly be 2 psi. For the same pipe size butterfly, the drop might only be 1 psi despite obstruction of the centralized seating vane. But in the case of a full-port ball valve, the pressure drop might only be 0.25 psi because there is no obstruction. The pipe area is nearly the same size as the ball opening; for most standard gauge schedule 40 pipe the internal open diameter is nearly the same as the nominal pipe size.

Very low pressure-drop occurs through the pipe centered ball orifice. Present globe type suction valves create typically at least 2 psig drop for pilot opening or turbulence from gas-powered check opening spring. Ability to close slowly after defrost eliminates suction pressure-shock and slugging.

The suction MCBV orifice, having been closed for defrost or temperature control, can be gradually opened over a period of time. The ball orifice is centered with the pipe, whereas globe orifices in other control valves form a dam which can collect refrigerant or oil.

SS1 DRY SUCTION SHUT-OFF CAPACITIES (NOMINAL TONS); NH3

Evap. Temp	Pressure Drop	3/4"		1"		1-1/4"		1-1/2"		2"		2-1/2"		3"	
°F	(psi)	OP	VP	OP	VP	OP	VP	OP	VP	OP	VP	OP	VP	OP	VP
Cv	-	43.2	21.8	48.0	24.2	52.8	26.6	219	102	250	117	275	129	600	293
-40	0.25	13.0	6.6	14.5	7.3	15.9	8.0	66	31	75	35	83	39	181	88
	0.5	17.4	8.8	19.3	9.7	21.2	10.7	88	41	101	47	111	52	241	118
	1	23.2	11.7	25.7	13.0	28.3	14.3	117	55	134	63	147	69	322	157
	2	30.9	15.6	34.3	17.3	37.8	19.0	156	73	179	84	197	92	429	209
-20	0.25	18.4	9.3	20.5	10.3	22.5	11.3	93	44	107	50	118	55	256	125
	0.5	26.3	13.3	29.2	14.7	32.2	16.2	133	62	152	71	167	78	365	178
	1	36.3	18.3	40.3	20.3	44.4	22.4	184	86	210	98	231	108	504	246
	2	43.2	21.8	48.0	24.2	52.8	26.6	219	102	250	117	275	129	600	293
0	0.25	21.2	10.7	23.5	11.9	25.9	13.0	107	50	122	57	134	63	294	144
	0.5	30.2	15.2	33.6	16.9	36.9	18.6	153	72	175	82	193	90	420	205
	1	41.7	21.0	46.3	23.4	51.0	25.7	211	99	241	113	265	124	579	283
	2	49.6	25.0	55.2	27.8	60.7	30.6	251	118	287	134	316	147	689	337
20	0.25	27.4	13.8	30.5	15.4	33.5	16.9	139	65	159	74	175	81	381	186
	0.5	39.2	19.8	43.5	22.0	47.9	24.1	198	93	227	106	250	117	544	266
	1	54.1	27.3	60.1	30.3	66.1	33.3	274	128	313	146	344	161	751	367
	2	64.3	32.4	71.5	36.0	78.6	39.7	326	152	372	174	409	191	894	436

**To accommodate suction with liquid overfeed, use one valve size larger*
Contact HANTEMP Controls with system details or for other refrigerants/fluids

OP is Open Port Ball; VP is Characterized V-Port Ball
OP provides good vapor modulation

SUCTION CONTROL: MEDIUM TEMPERATURE OF VARYING EVAPORATOR LOADS

(PLATE & FRAME EXCHANGERS, FLOODED CHILLERS, CARCASS CHILLERS)

See Table SS1

For applications where the evaporator load might be quite variable or where the space or product temperature is to be controlled, an MCBV Controlled Ball Valve with a characterized V-port orifice as outlined would be recommended. Use of the VP (characterized port for HANTEMP MCBVs) will provide somewhat smoother control of evaporator for achieving desired temperature in the space or product temperature in the case of plate & frame evaporators or various fluid or gas chillers.

Since the characterized port has somewhat less flow capacity then the full circular port, this factor alone provides finer control compared to an oversized port selection. Where the valve is operating at large pressure drops, the characterized port or the tear-drop port will provide closer control, especially at light refrigeration loads. The higher pressure drop will however reduce efficiency compared to OP (open-port) ball.

HOT GAS DEFROST

(HOT GAS DEFROST, REHEAT, HEAT RECLAIM)

See Table HG1

A typical hot gas solenoid valve will fully open in two seconds, thereby possibly causing liquid slugs to or within evaporator. This problem has in the past been partially overcome by two parallel solenoid valve stages of hot gas or by throttling the hot gas hand valve to reduce flow at the expense of defrost time.

Using a slow opening MCBV for hot gas supply avoids the rapid pressure rise, and slugging. Upon conclusion of defrost the hot gas ball valve can be smoothly and promptly closed to avoid unnecessary heating. For extreme conditions the MCBV can open even slower.

Use of an MCBV ball valve can achieve smooth and complete hot-gas defrosting of fan type room cooler evaporators where the evaporator surfaces will accumulate ice or frost to the detriment of efficient cooling. With the evaporator suction closed by an MCBV with VP ball-profile in place of a suction Solenoid Valve, Regulator, or Gas Powered Check, the hot gas can gradually flow into the evaporator for even controlled defrosting. The condensate conventionally exits via a defrost pressure regulator.

At termination of defrost, the suction-controlled MCBV with OP ball-profile gradually opens to smoothly lower evaporator pressure and resume cooling. Suggested MCBV capacity table (HG1, pg. 7) is shown for hot gas supply. (For hot gas recovery or heat reclaim, an MCBV with OP ball-profile which is sized like the system's piping, can control discharge or condenser gas.)

LIQUID CONTROL

See Table HL1 & OL1

For conventional overfeed, or low pressure liquid feed, a hand expansion valve can be used with a liquid solenoid valve or alternatively an MCBV with TD ball-profile having moderate opening/closing speed can be applied.

The shock of solenoid valve opening or closing for large or long liquid lines can be avoided by the use of ball valves which can be adjusted to open or close over a period of ranging from a few to several dozen seconds. This applies to overfeed liquid lines as well as high pressure liquid lines.

For conventional high pressure liquid feed for accumulator level control, or for evaporator or superheat control, a hand expansion valve with solenoid valve or preferably an MCBV with SL (slotted ball-profile) or TD (tear drop ball-profile) could be selected.

LIQUID LEG CONTROL

Rather than using rapid gas-powered shut-off valves, gravity flooded legs of plate coolers can use open port MCBVs to gradually open or close gravity liquid, gas, or suction lines to minimize disturbances of pressure or liquid slugs within the flooded evaporator. In addition, the lower pressure drop in these gravity legs of Ball Valves versus globe-type valves will increase refrigeration evaporator efficiency and capacity.

HG1 HOT GAS NOMINAL DEFROST CAPACITY RANGES (TONS); NH3

MCBV Size	3/4"	1"	1-1/4"	1-1/2"	2"
Tons* ΔP>10psi	15 to 35	18 to 45	21 to 55	60 to 140	75 to 180

HL1 HIGH PRESSURE LIQUID MAKEUP NOMINAL CAPACITIES; NH3

100% OPEN; CAPACITIES TONS

Port Size	Cv TD	Cv SL	TD	SL
3/4"	4.1	1.4	301	100
1"	4.5	1.5	334	111
1-1/4"	5.0	1.7	367	122
1-1/2"	20	3.1	1493	227
2"	23	3.5	1707	260

75% OPEN; CAPACITIES TONS

Port Size	Cv TD	Cv SL	TD	SL
3/4"	2.0	0.6	150	47
1"	2.2	0.7	167	52
1-1/4"	2.5	0.8	184	57
1-1/2"	11.5	2.5	854	185
2"	13.2	2.8	976	211

50% OPEN; CAPACITIES TONS

Port Size	Cv TD	Cv SL	TD	SL
3/4"	0.7	0.41	53	30
1"	0.8	0.45	59	33
1-1/4"	0.9	0.50	65	37
1-1/2"	4.1	0.95	305	70
2"	4.7	1.08	349	80

25% OPEN; CAPACITIES TONS

Port Size	Cv TD	Cv SL	TD	SL
3/4"	0.18	0.14	13	10
1"	0.20	0.15	15	11
1-1/4"	0.22	0.17	16	12
1-1/2"	1.75	0.32	130	23
2"	2.00	0.36	148	27

Contact HANTEMP Controls with details or for other refrigerants/fluids

Note: *TD is Tear Drop Port Ball; SL is Slotted Port Ball*

OL1 OVERFEED LIQUID SUPPLY - 3:1; NH3

100% OPEN; CAPACITIES TONS

Port Size	Cv	ΔP Across Valve (psid) 5	10	15	20	30
3/4"	4.1	58	82	101	116	143
1"	4.5	65	92	113	129	159
1-1/4"	5.0	71	101	124	142	175
1-1/2"	20	288	409	503	577	711
2"	23	330	468	575	659	813

75% OPEN; CAPACITIES TONS

Port Size	Cv	ΔP Across Valve (psid) 5	10	15	20	30
3/4"	2.0	29	41	51	58	72
1"	2.3	32	46	56	65	80
1-1/4"	2.5	36	51	62	71	88
1-1/2"	11.6	166	235	289	331	408
2"	13.2	189	268	330	378	466

50% OPEN; CAPACITIES TONS

Port Size	Cv	ΔP Across Valve (psid) 5	10	15	20	30
3/4"	0.7	10	15	18	21	25
1"	0.8	11	16	20	23	28
1-1/4"	0.9	13	18	22	25	31
1-1/2"	4.1	59	84	103	118	145
2"	4.7	67	96	118	135	166

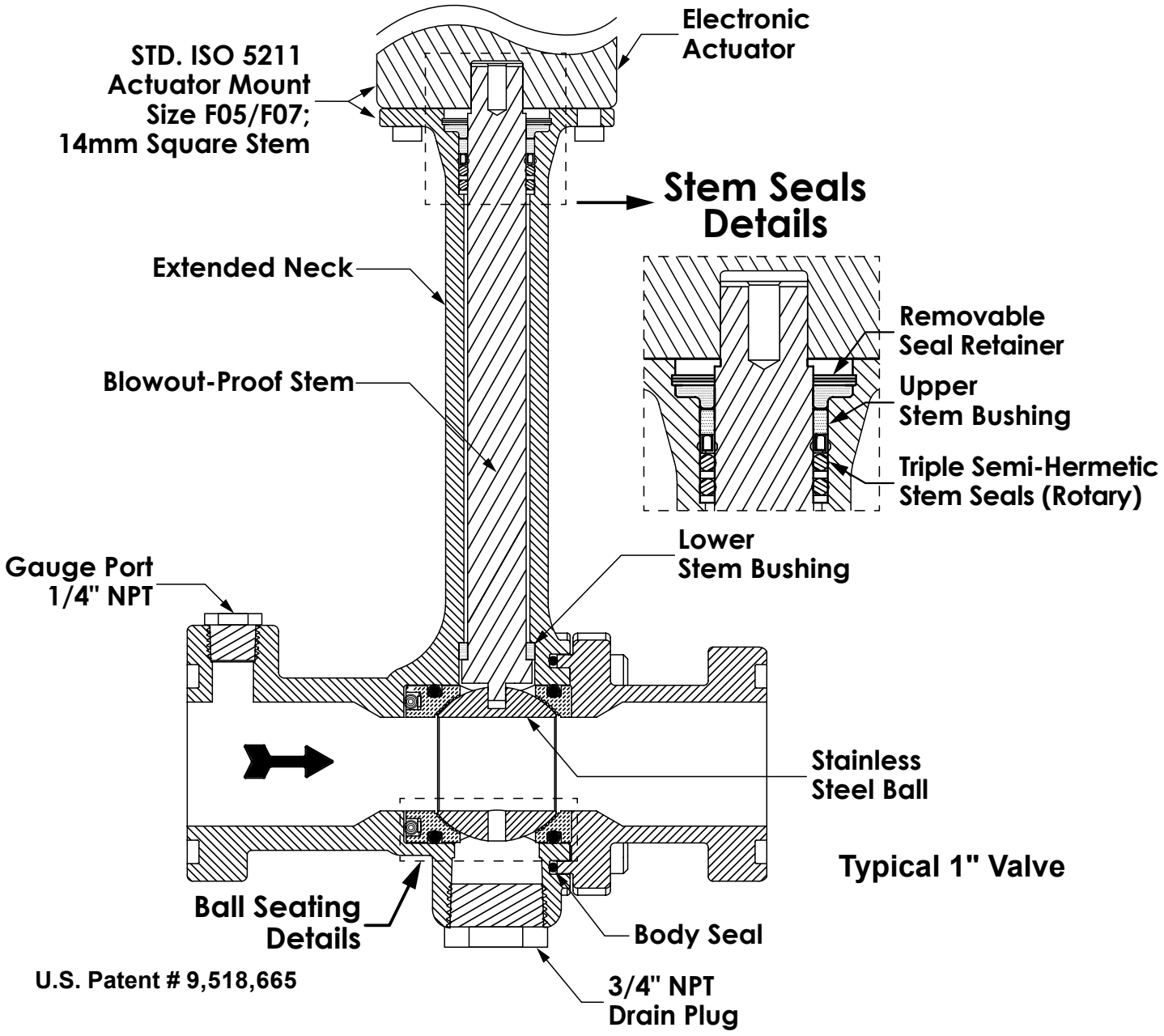
25% OPEN; CAPACITIES TONS

Port Size	Cv	ΔP Across Valve (psid) 5	10	15	20	30
3/4"	0.18	2.6	3.7	4.5	5.2	6.4
1"	0.20	2.9	4.1	5.0	5.7	7.1
1-1/4"	0.22	3.2	4.5	5.5	6.3	7.8
1-1/2"	1.5	21	30	37	42	52
2"	1.7	24	34	42	48	59

Note: *Liquid Selections are for Tear-Drop Ball (TD)*
Contact HANTEMP Controls with details or for other refrigerants/fluids

Note: *Overfeed Rate does not control temperature*

MCBV CROSS SECTION



U.S. Patent # 9,518,665

Ball Seating Details

SERVICE INSTRUCTIONS

CAUTION

Prior to servicing, HANTEMP Ball Valves must be isolated from the system and evacuated of refrigerant. We recommend removing the valve from the pipework and repairing it in a safe and well-lit area. For weld in-line valves, if you have not made the provision of installing a flange union, it may be possible to repair the valve in place after unbolting the valve in the middle and separating the halves.

DISASSEMBLY

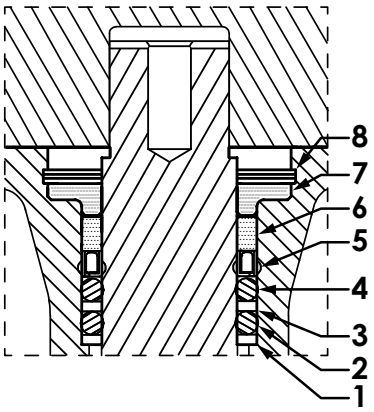
Once the valve has been properly isolated from the system and evacuated of refrigerant, remove the ¾" NPT hex plug from the bottom of the valve. **Caution: There may be a small amount of refrigerant, or oil present beneath the ball.** Loosen the four hex-bolts joining the valve halves. With the body bolts removed and the valve separated in the middle, rotate the stem to the 50% position. This will provide a small gap to pull out the seat. After removing the seat, rotate the valve to the closed position and remove the ball. With the ball removed, push the stem downwards through the bottom of the valve. With the stem removed, use an O-ring pick and place it inbetween the seat and valve body. Pull forward to create enough space to extract the upstream seat along with the canted spring and seat washer.

To remove the stem seals, use an O-ring pick and remove the spiral retaining-ring that holds the retainer in place. With the retainer removed, the stem seals can be pulled out. Take this opportunity to remove the Teflon bushing at the base of the valve neck.

ASSEMBLY

Clean and inspect the valve body before reassembly. Install new O-ring seals on the ball valve seats, and lubricate with the low temperature grease provided or system refrigerant oil. The canted spring and seat -washer need to be inserted into the upstream seat groove before inserting them into the valve body. **Note: The seat washer is placed in the upstream seat groove first with spring placed inbetween the seat-washer and the valve body.** Press the seat into the valve body. Before inserting the stem, replace the Teflon bushing inside the body at the base of the neck, then insert the stem through the bushing. With the stem in place, rotate the stem-spade so it is aligned with the valve opening.

Align the slot on the top of the ball with the stem -spade and push the ball into the opening. With the ball installed, insert the downstream seat with the flat side of the seal facing out. Before bolting the valve body together, turn the stem and check that the ball moves smoothly. With the body gasket and O-ring in place on the body flange, bolt the valve body together with the four hex-bolts. Install and tighten the ¾" bottom port plug. Lubricate the stem seals with the provided low temperature grease. The stem seals must be installed in the following order from bottom to top (refer to Fig.1).



Seal Installation Order:

1. PTFE Spacer

2. O-ring

3. PTFE Spacer

4. O-ring

5. Energized Seal*

6. Bushing

7. Retainer

8. Spiral Retaining-Ring

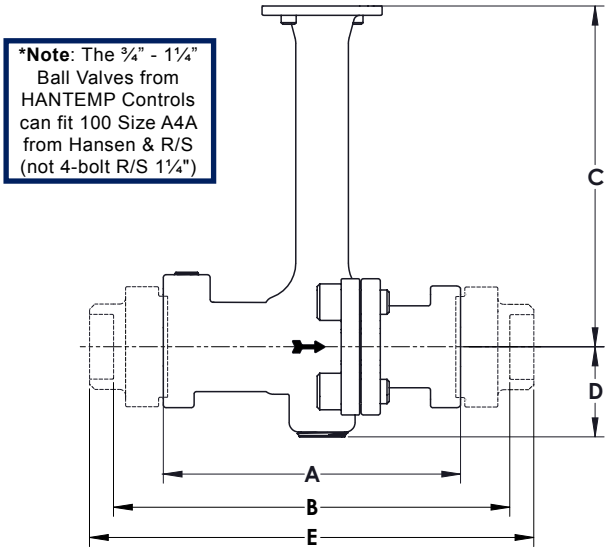
***Note: The energized seal needs to be installed with the spring facing downwards. Avoid damaging the lip of the seal by pushing in on the sides of the seal carefully and evenly with an O-ring pick or small flat-blade screwdriver while pushing downwards.**

With seals in place and the retainer installed, the groove for the spiral ring will be visible. Install the retaining ring and check for full engagement with the groove. Tighten the four hex-bolts and torque to 35 ft. lbs. for ¾"- 2-½" valves and 45 ft. lbs. for 3" valves. Check for leaks before putting the valve back into operation.

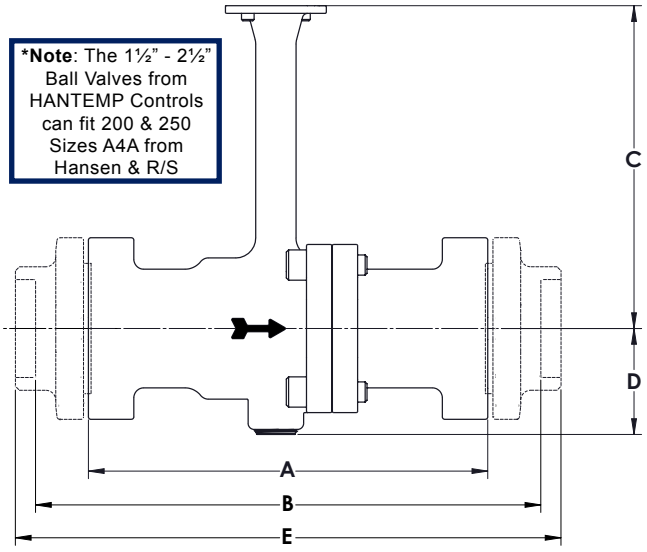
MCBV **FLANGED** INSTALLATION DIMENSIONS; ¾" to 2½"

Note: *Flanged models are advantageous for servicing the internals*

¾" to 1¼" Ball Valves
(20mm – 32mm)



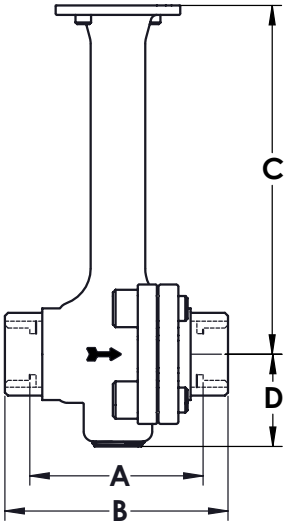
1½" to 2½" Ball Valves
(40mm – 60mm)



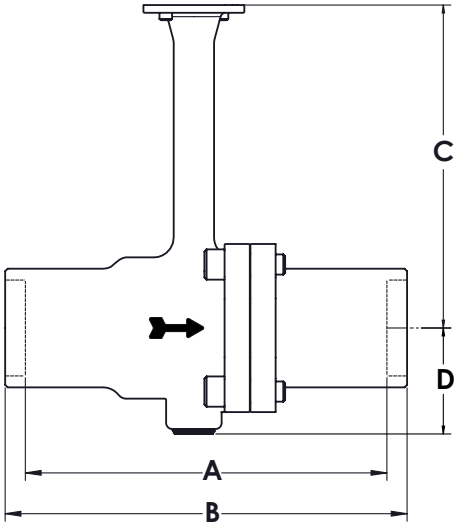
Dimensions						
Valve Size (mm)	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**	**Weight (kg)**
¾" - 1¼" (20-32)	6.19" (157)	8.31" (211)	7.00" (178)	1.85" (50)	9.31" (236)	7.8 lbs (3.5)
1½" - 2½" (40-65)	9.88" (251)	12.50" (318)	8.00" (203)	2.63" (67)	13.50" (343)	19.2 lbs (8.7)

MCBV **WELD IN-LINE** INSTALLATION DIMENSIONS; ¾" to 3"

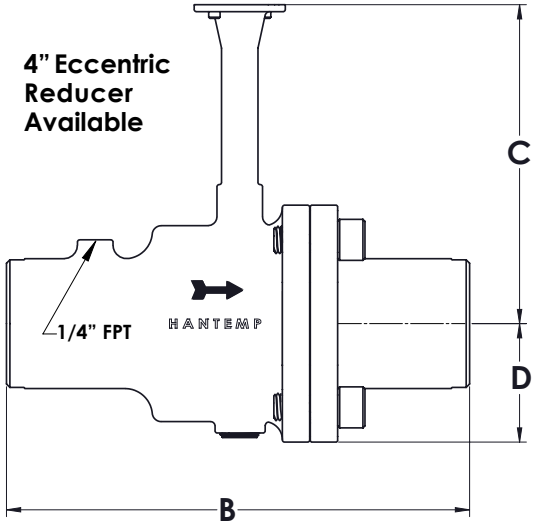
¾" to 1¼" Ball Valves
(20mm – 32mm)



1½" to 2½" Ball Valves
(40mm – 65mm)



3" Ball Valves
(80mm)



Dimensions					
Size (mm)	**A (mm) SW**	**B (mm) BW**	**C (mm)**	**D (mm)**	**Weight (kg)**
¾" - 1¼" (20-32)	3.48" (88)	4.48" (114)	7.00" (178)	1.85" (50)	5.2 lbs (2.2)
1½" - 2½" (40-65)	8.95" (227)	9.95" (253)	8.00" (203)	2.63" (67)	13 lbs (6)
3" (80)	N/A	12.70" (322)	8.75" (222)	3.25" (83)	30 lbs (14)

BALL VALVE PARTS & KITS

Part #	Description	Included
¾" - 1¼" Valves		
16-9001	Gasket Kit	**(1) 16-0019** Body O-ring; **(2) 16-0021** Ball Seat O-ring; **(1) 16-0146** Body Gasket
16-9002	Seat Kit	**(1) 16-0008** Downstream Seat; **(1) 16-0009** Seat Washer; (**1) 16-0019** Body O-ring; **(2) 16-0021** Seat O-Ring; **(1) 16-0025** Canted Spring; **(1) 16-0029** Upstream Seat; **(1) 16-0146** Body Gasket
-	Port Profiles	Choose the desired ball port profile from the following: **(1) 16-0003** Open-Port (OP); **(1) 16-0028** V-Port (VP); **(1) 16-0042** Tear-Drop Port (TD); **(1) 16-0044** Slotted-Port (SL)
16-9006	Stem Kit	**(1) 16-0005** 075-125 Ball Valve Stem; **(1) 16-9003** Stem Seal Kit *(see below)*
16-9004	Master Kit	**(1) 16-9006** Stem Kit *(see above)*; **(1) 16-9002** Seat Kit *(see above)*; **(4) 16-0013** Hex Head Cap Screw; Select Port Profile *(see above)*
-	Flange Gasket	**(2) 16-0032** Size 100 Gasket *(for flanged valves only)*
1½" - 2½" Valves (Open-Port)		
16-9007	Gasket Kit	**(1) 16-0059** Body O-ring; **(2) 16-0060** Ball Seat O-ring; **(1) 16-0067** Body Gasket
16-9008	Seat Kit	**(1) 16-0055** Upstream Seat; **(1) 16-0056** Downstream Seat; **(1) 16-0057** Seat Washer; (**1) 16-0059** Body O-ring; **(2) 16-0060** Seat O-Ring; **(1) 16-0061** Canted Spring; **(1) 16-0067** Body Gasket
-	Open-Port Ball	**(1) 16-0053-02** Open-Port Ball (OP)
16-9016	Stem Kit	**(1) 16-0054** 150-300 Ball Valve Stem; **(1) 16-9003** Stem Seal Kit *(see below)*
16-9010	Master Kit	**(1) 16-9006** Stem Kit *(see table above)*; **(1) 16-9008** Seat Kit *(see above)*; **(4) 18-0335** Hex Head Cap Screw; **(2) 16-0052-02** Open-Port Ball; Select Port Profile *(see above)*
-	Flange Gasket	**(2) 16-0063** Size 200 Flange Gasket; 2-½" **(2) 16-0088** Size 250 Flange Gasket *(for flanged valves only)*
1½" - 2½" Valves (Optional Ports)		
16-9007	Gasket Kit	**(1) 16-0059** Body O-ring; **(2) 16-0060** Ball Seat O-ring; **(1) 16-0067** Body Gasket
16-9022	Seat Kit	**(1) 16-0055-01** Upstream Seat; **(1) 16-0056** Downstream Seat; **(1) 16-0057** Seat Washer; (**1) 16-0059** Body O-ring; **(2) 16-0060** Seat O-Ring; **(1) 16-0061** Canted Spring; **(1) 16-0067** Body Gasket
-	Orifice Kit	All valves in this size range are equipped w/ **(1) 16-0053-02** Open-Port Ball *(select orifice below)* **(1) 16-9028** Tear-Drop Orifice Kit (TD): **(1) 16-0160** Tear-Drop Orifice Plate; **(1) 16-0161** Teflon Insert **(1) 16-9029** V-Port Orifice Kit (VP): **(1) 16-0163** V-Port Orifice Plate; **(1) 16-0167** Teflon Insert **(1) 16-9030** Slotted Orifice Kit (SL): **(1) 16-0166** Slotted Orifice Plate; **(1) 16-0167** Teflon Insert
16-9016	Stem Kit	**(1) 16-0054** 150-300 Ball Valve Stem; **(1) 16-9003** Stem Seal Kit *(see below)*
16-9010	Master Kit	**(1) 16-9006** Stem Kit *(see table above)*; **(1) 16-9022** Seat Kit *(see above)*; **(4) 18-0335** Hex Head Cap Screw; **(2) 16-0052-02** Open-Port Ball; Select Port Profile *(see above)*
-	Flange Gasket	**(2) 16-0063** Size 200 Flange Gasket; 2-½" **(2) 16-0088** Size 250 Flange Gasket *(for flanged valves only)*
3" Valves		
16-9012	Gasket Kit	**(1) 16-0410** Body Gasket; **(1) 16-0418** Body O-ring; **(2) 16-423** Ball Seat O-Ring
16-9013	Seat Kit	**(1) 16-0410** Body Gasket; **(1) 16-0418** Body O-Ring; **(1) 16-0419** Downstream Seat; (**1) 16-0420** Upstream Seat; **(2) 16-0421** Canted Spring; **(1) 16-0422** Ball-Seat Washer; **(1) 16-0423** Body Gasket
-	Port Profile	Choose the desired ball port profile from the following: **(1) 16-0402-01** Open-Port Ball (OP); **(1) 16-0402-02** V-Port Ball (VP)
16-9016	Stem Kit	**(1) 16-0054** 150-300 Ball Valve Stem; **(1) 16-9003** Stem Seal Kit *(see below)*
16-9015	Master Kit	**(1) 16-9013** Stem Kit *(see table above)*; **(1) 16-9016** Seat Kit *(see above)*; **(4) 16-0424** Hex Head Cap Screw; Select Port Profile *(see above)*
All Sizes		
16-9003	Stem Seal Kit	**(1) 16-0006** Retainer; **(2) 16-0010** Bushing; **(1) 16-0011** Virgin PTFE Cantiseal; **(1) 16-0017** Retaining Ring; **(2) 16-0018** Stem O-Ring; **(2) 16-0023** Split Backup Ring
16-9005	Handle Kit	**(1) Handle-BV** Manual Control Handle; **(2) 16-0147** Handle Screw; **(2) 16-0148** Nylon Lock Nut; **(1) 16-0149** Handle Stem-Screw ***Note:****Valves installed prior to 2019 have a solid aluminum handle.*

CONTROLS FOR HANTEMP MCBV BALL VALVES

Motor Controlled Ball Valves are operated via temperature, pressure, level sensors, and controlling devices. Typical basic control (similar to Honeywell, etc.) would be temperature on-off switches, like thermostats, having sensors located in the air or liquid to be controlled. Whereas such control could cause a Solenoid Valve to quickly open or close, an MCBV will move steadily between totally closed and totally open. For even smoother and more accurate control, variable output temperature controllers are available which can supply a variable signal, like 4-20mA or 0-10V which will move the MCBV proportionally and steadily toward ball open or ball closed. Such temperature controllers are readily available from Honeywell, Johnson Controls, Omega Engineering, or numerous others.

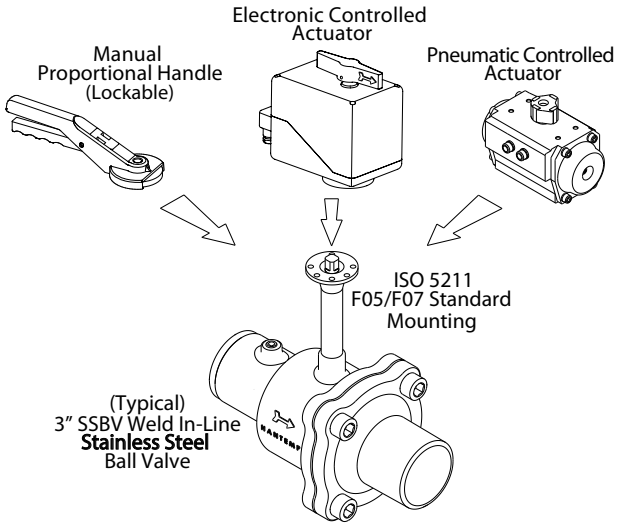
For changing load applications or precise control, more sophisticated controllers are available with built in algorithms to handle the load variances; typically these would have PID (proportional, integral, derivative) variable response capability to enable the MCBV to move its opening percentage as needed to maintain the desired temperature. There are forms of PLC's (programmable logic controllers) which can be used in combination for various desired responses. For a given MCBV the desired port opening response can be thus altered for different products, processes, or sequences, including temperature pull-down or defrosting.

Similar controllers are available for pressure (transducers) and for liquid level (probes or ball floats). HANTEMP can assist with control systems, components, and wiring schematics, or the purchase of such components. While globe-type control valves exist, they do not have the inherent simplicity, low pressure-drop, non-puddling geometry, and visibility of HANTEMP Controlled Ball Valves.

SIZING OF CONTROL VALVES

For control valves which are to be opened wide for maximum flow at minimum pressure drop, or totally closed to halt all flow, sizing is usually no problem: the largest port size and Cv factor which cost will allow is the best. Examples are spiral freezers, blast freezing tunnels, and plate freezers.

STANDARDIZED CONTROL OPTIONS



SAFETY WARNING

Valves should be installed, maintained, and serviced only by experienced refrigeration professionals. This includes reading and understanding pertinent product safety bulletins and installation instructions. Before servicing, the valve should be isolated from the system and all refrigerant evacuated from the piping. Always wear safety glasses. Avoid system arrangements that could cause thermal or pressure shock.

DISCLAIMER

HANTEMP Controls reserves the right to alter product design, materials, and specifications without notice, as necessary.

WARRANTY

All HANTEMP Controls products are warranted against defects in workmanship and materials for a period of one year (90 days for electronics) from date of shipment from the factory. This warranty period is applicable only when products are properly applied, installed, operated, and serviced as specifically stated in HANTEMP Controls product bulletins unless otherwise approved in writing. Field labor and travel are not warranty included.

33 Chestnut Avenue, Westmont, IL, USA
(630) 537-1049
www.hantempcontrols.com

< TO PRODUCT PAGE