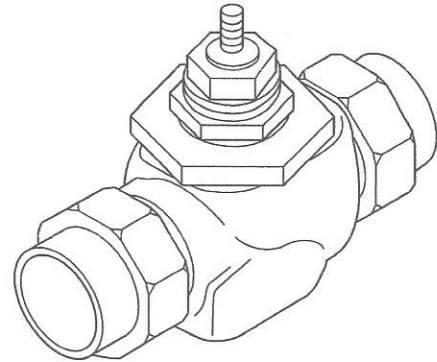


Application

VB-7214 series single seat, stem up open, two-way valves control water from 20 to 281°F (-7 to 138°C) or steam to 281°F (138°C) maximum in heating or air conditioning systems. They are used for two-position or proportional control applications. Valve assemblies require an actuator and a valve linkage that must be purchased separately.



Danger: Do not use for combustible gas applications. The VB-7214 series valve packings are not rated for combustible gas applications, and if used in these applications, gas leaks and explosions could result.



Features

- Valve sizes 1/2" to 2"
- 250 psig pressure rating per ANSI Standards (B16.15-1985) for screwed cast bronze bodies
- Spring-loaded TFE packing
- Union sweat end connections

Applicable Literature

- Valve Products Catalog, F-27384
- Cross-Reference Guide, F-23638
- Reference Manual, F-21683
- Application Manual, F-21335
- Control Valve Sizing, F-13755
- Valve Selection Chart for Steam, F-11366
- Valve Selection Chart for Water, F-11080
- EN-205 Water System Guidelines, F-26080

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SPECIFICATIONS

Table-1 Specifications/Models.

Specifications		Valve Body Series VB-7214-0-4-P	
Service		Chilled or Hot Water and Steam	
Flow Characteristics (Figure-1)		Equal Percentage	
Action		Stem Up Open	
Sizes		1/2" to 2"	
Type of End Fitting		Union Sweat, Solder Joint	
Valve Materials	Body	Bronze	
	Seat	Bronze	
	Stem	Stainless Steel	
	Plug	Brass	
	Packing	Spring-loaded TFE	
	Disc	EPDM	
ANSI Pressure Class (Figure-2)		250 (up to 400 psig below 150°F) ^a	
Maximum Inlet Pressure, Steam		35 psig (241 kPa)	
Allowable Control Media Temperature		20 to 281°F (-7 to 138°C)	
Allowable Differential Pressure for Water ^b		35 psi (241 kPa) Max. for Normal Life (refer to "Cavitation Limitations on Valve Pressure Drop" on page 7)	
Allowable Differential Pressure for Steam ^b		20 psi (138 kPa)	
Valve Size	C _v Rating	k _{vs} Rating ^c	Complete Valve Body Part Number
1/2"	0.4	0.3	VB-7214-0-4-1
	1.3	1.1	VB-7214-0-4-2
	2.2	1.9	VB-7214-0-4-3
	4.4	3.8	VB-7214-0-4-4
3/4"	5.5	4.8	VB-7214-0-4-5
	7.5	6.5	VB-7214-0-4-6
1"	10	8.7	VB-7214-0-4-7
	14	12	VB-7214-0-4-8
1-1/4"	20	17	VB-7214-0-4-9
1-1/2"	28	24	VB-7214-0-4-10
2"	40	35	VB-7214-0-4-11

^a Do not apply above pressure rating to piping system.

^b Maximum recommended differential pressure. Do not exceed recommended differential pressure (pressure drop) or integrity of parts may be affected. Exceeding maximum recommended differential pressure voids product warranty.

^c $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $C_v = k_{vs} \times 1.156$

Close-off Pressure Rating

The close-off pressure rating is dependent on the size of the valve, valve linkage, and actuator. Consult the **Valve Products Catalog, F-27384**, for close-off ratings.

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Normal Position of Valve Assembly

For a valve assembly (valve, linkage, and actuator) to have a normal position, the actuator must be of the spring return type. See Table-2 for spring return position of valve assemblies.

Table-2 Required Compatible Actuators/Linkages.

Actuator Series	Required Valve Linkage	Normal Position
MA-318, MA-418, MA-419	AV-391	N.O. or N.C.
MA-5210, MA-5211, MA-5213	AV-7600 ^a	Normally Open
MC-351, MC-431, MC-4311, MC5-4311	AV-393	None
MF-5413, MF-5513	AV-7600 ^a	Normally Open
MF-22203, MF-22303, MF-22323	Included w/Actuator	None
MF-63103, MF-63123		
MK-2690	AV-7400	Normally Open
MK-4601, MK-4611, MK-4621	AV-401	
MK-6601, MK-6611, MK-6621	AV-430	
MM-400, MMR-400	AV-630 or AV-630-010	None
MM-500, MMR-500		N.O. or N.C.
MP-361, MP-367, MP-465, MP5-4651	AV-391	Normally Closed
MP-371, MP-377, MP-475, MP5-4751		Normally Open
MP-381, MP-382, MP-387, MP-485, MP-486, MP-4851, MP5-4851	AV-393	None
MP-5210, MP-5211, MP-5213	AV-7600 ^a	Normally Open
MP-5410, MP-5411, MP-5413	AV-7600 & AV-601	
MP-5511, MP-5513		
MPR-5610, MPR-5611, MPR-5613		
MPR-5713		
MS-22353	Included w/Actuator	

^a High ambient temperatures with high media temperatures in the valve may require the use of AV-601 in addition to AV-7600. See General Instructions for AV-7600 (F-26235) and AV-601 (F-19069) for details.

Flow Characteristics

All valves have modified equal percentage flow characteristics. That is, for equal increments of valve stem stroke, the change in flow rate with respect to valve stroke may be expressed as a constant percent of the flow rate at the time of the change. The change of flow rate with respect to valve stroke is relatively small when the valve plug is near the valve seat and relatively high when the valve plug is nearly wide open. See Figure-1 for typical modified equal percentage flow characteristics of VB-7214 series valve bodies.

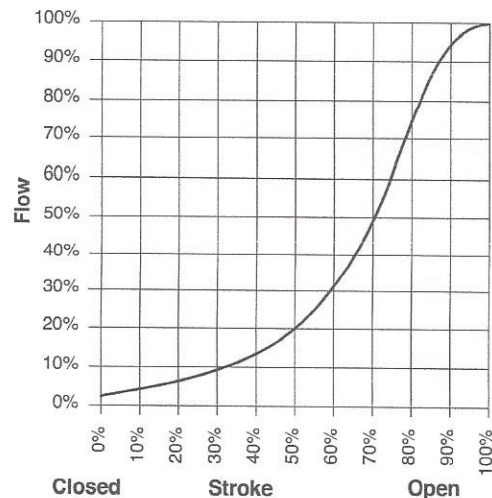


Figure-1 Typical Modified Equal Percentage Flow Characteristics.

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Rangeability

Rangeability is the ratio of rated flow to the minimum controllable flow through a valve. Table-3 lists the rangeability for VB-7214 series valves.

Table-3 Rangeability.

Valve Body Part Number	Nominal Rangeability	Valve Body Part Number	Nominal Rangeability
VB-7214-0-4-1	5:1	VB-7214-0-4-7	60:1
VB-7214-0-4-2	15:1	VB-7214-0-4-8	75:1
VB-7214-0-4-3	25:1	VB-7214-0-4-9	75:1
VB-7214-0-4-4	40:1	VB-7214-0-4-10	75:1
VB-7214-0-4-5	50:1	VB-7214-0-4-11	75:1
VB-7214-0-4-6	60:1		

Temperature/Pressure Ratings of Valve

Caution: Do not apply at static pressures greater than the pressure rating of the piping system.

See Figure-2 for temperature and pressure ratings. Consult the appropriate valve linkage general instruction sheet for the effect of valve body ambient temperatures on specific actuators. Ratings conform with published values and disclaimer.

VB-7214-0-4-P (Union Sweat Cast Bronze Body)

Standards: Pressure to ANSI B16.15 Class 250 with 400 psig up to 150°F decreasing to 321 psig at 281°F

Materials: Bronze, ASTM B584

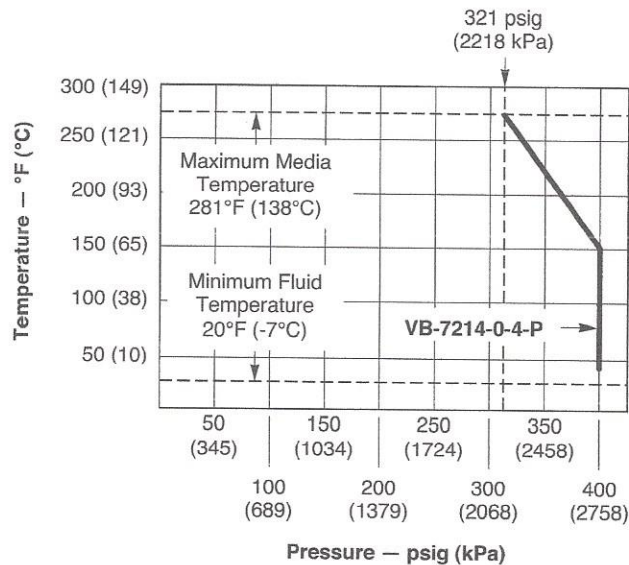


Figure-2 Temperature and Pressure Ratings for VB-7214 Series Valve Bodies.

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VALVE SIZING AND SELECTION

Water

Two-position

Two-position control valves are normally selected “line size” to keep pressure drop at a minimum. If it is desirable to reduce the valve below line size, then 10% of “available pressure” (that is, the pump pressure differential available between supply and return mains with design flow at the valve location) is normally used to select the valve.

Proportional

Proportional control valves are usually selected to take a pressure drop equal to at least 50% of the “available pressure.” As “available pressure” is often difficult to calculate, the normal procedure is to select the valve using a pressure drop at least equal to the drop in the coil or other load being controlled (except where small booster pumps are used) with a minimum recommended pressure drop of 5 psi (34 kPa). When the design temperature drop is less than 60°F (33°C) for conventional heating systems, higher pressure drops across the valve are needed for good results (Table-4).

Table-4 Conventional Heating System.

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop ^a (% of Available Pressure)	Multiplier on Load Drop
60 (33) or More	50%	1 x Load Drop
40 (22)	66%	2 x Load Drop
20 (11)	75%	3 x Load Drop

^a Recommended minimum pressure drop = 5 psi (34 kPa).

Secondary Circuits with Small Booster Pumps: 50% of available pressure difference (equal to the drop through load, or 50% of booster pump head).

Water Capacity

See Table-5 for water capacity of VB-7214 series valves.

Table-5 Water Capacity in Gallons Per Minute for VB-7214 Series.

Valve Body Part Number	C _v Rating	Differential Pressure (ΔP in psi)												
		1	2	3	4	5	6	7	8	9	10	15	20	35
VB-7214-0-4-1	0.4	0.40	0.57	0.69	0.80	0.89	0.98	1.06	1.13	1.20	1.26	1.55	1.79	2.37
VB-7214-0-4-2	1.3	1.30	1.84	2.3	2.6	2.9	3.2	3.4	3.7	3.9	4.1	5.0	5.8	7.7
VB-7214-0-4-3	2.2	2.2	3.1	3.8	4.4	4.9	5.4	5.8	6.2	6.6	7.0	8.5	9.8	13
VB-7214-0-4-4	4.4	4.4	6.2	7.6	8.8	9.8	11	12	12	13	14	17	20	26
VB-7214-0-4-5	5.5	5.5	7.8	9.5	11	12	13	15	16	17	17	21	25	33
VB-7214-0-4-6	7.5	7.5	11	13	15	17	18	20	21	23	24	29	34	44
VB-7214-0-4-7	10	10	14	17	20	22	24	26	28	30	32	39	45	59
VB-7214-0-4-8	14	14	20	24	28	31	34	37	40	42	44	54	63	83
VB-7214-0-4-9	20	20	28	35	40	45	49	53	57	60	63	77	89	118
VB-7214-0-4-10	28	28	40	48	56	63	69	74	79	84	89	108	125	166
VB-7214-0-4-11	40	40	57	69	80	89	98	106	113	120	126	155	179	237

C_v Equation

$$C_v = \frac{\text{GPM}}{\sqrt{\Delta P}} \quad \Delta P = \left(\frac{\text{GPM}}{C_v} \right)^2 \quad \text{GPM} = C_v \sqrt{\Delta P}$$

Where:

C_v = Coefficient of flow

GPM = U.S. gallons per minute (60°F, 15.6°C)

ΔP = Differential pressure in psi (pressure drop)

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Steam

Two-position

Two-position zone valves and direct radiation valves are normally sized using a minimum of 10% of inlet pressure (psig).

Proportional

Proportional control valves are normally sized using:

- For low pressure (15 psig or less), use ΔP of 80% of gauge inlet pressure.
- For steam pressures greater than 15 psig, use ΔP of 42% of absolute (gauge plus 14.7 psig) inlet pressure.
- When the C_v required is between two valve sizes, select the larger size. Do not size steam valves using a pressure drop greater than 42% of the absolute inlet pressure.

Steam Capacity

See Table-6 for steam capacity of VB-7214 series valves.

Table-6 Steam Capacity in Pounds Per Hour for VB-7214 Series.

Valve Body Part Number	C_v Rating	Differential Pressure (ΔP in psi) ^a															
		2 psig Inlet		5 psig Inlet		10 psig Inlet		15 psig Inlet		20 psig Inlet		25 psig Inlet		30 psig Inlet		35 psig Inlet	
		0.2	1.6	0.5	4	1	8	1.5	12	2	14	2.5	16	3	18	3.5	20
VB-7214-0-4-1	0.4	2.2	5.9	3.7	9.5	5.8	14	7.8	18	9.7	20	12	23	13	26	15	29
VB-7214-0-4-2	1.3	7.1	19	12	31	19	45	25	57	32	66	38	76	44	86	50	95
VB-7214-0-4-3	2.2	12	32	20	52	32	76	43	96	53	112	64	129	74	145	84	161
VB-7214-0-4-4	4.4	24	65	41	105	64	153	86	192	107	225	127	257	148	289	168	322
VB-7214-0-4-5	5.5	30	81	51	131	80	191	107	240	133	281	159	321	185	362	210	402
VB-7214-0-4-6	7.5	41	111	70	178	110	260	146	328	182	383	217	438	252	493	286	548
VB-7214-0-4-7	10	55	147	93	238	146	347	195	437	243	511	289	584	336	658	381	731
VB-7214-0-4-8	14	76	206	130	333	204	485	273	612	340	715	405	818	470	921	534	1024
VB-7214-0-4-9	20	109	295	186	475	292	694	390	874	485	1021	579	1168	671	1315	763	1462
VB-7214-0-4-10	28	153	413	260	665	409	972	546	1224	679	1429	811	1635	939	1841	1068	2047
VB-7214-0-4-11	40	218	590	372	951	584	1387	780	1749	970	2043	1157	2337	1342	2631	1526	2925

^a Values are for saturated steam ($K = 1$).

Left column under each inlet pressure is for two-position control, and right column is for proportional control.

C_v Equation

$$C_v = \frac{QK}{3\sqrt{\Delta P \cdot P2}} \quad Q = \frac{3C_v \sqrt{\Delta P \cdot P2}}{K}$$

Where:

C_v = Coefficient of flow

Q = Lbs. per hour of steam

ΔP = Differential pressure in psi (pressure drop)

P2 = Outlet pressure in psia (absolute) ($P2 = \text{Inlet pressure} + 14.7 - \Delta P$)

K = $1 + (0.0007 \times \text{°F superheat})$ ($K = 1$ for saturated steam)

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