VB-9323 Series

SIEBE ENVIRONMENTAL CONTROLS

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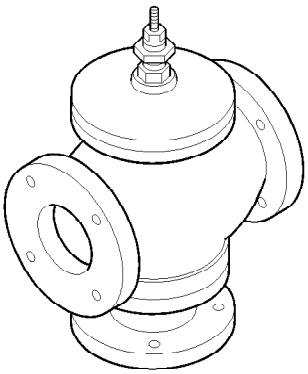
2-1/2" to 6" 125 Lb. Flanged Three-Way Diverting Valves

Application

VB-9323 series three-way diverting valves control hot or chilled water in heating or air conditioning systems. These valves must be piped with one inlet and two outlets. 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-9323 series valve packings are not rated for combustible gas applications, and if used in these applications, gas leaks and explosions will result.

Features

- Valve sizes 2-1/2" to 6".
- 125 psig pressure rating per ANSI Standards (B16.1–1993) for flanged cast iron bodies.

Applicable Literature

- Siebe Environmental Controls Catalog, F-25683
- Siebe Environmental Controls Cross-Reference Guide, F-23638
- Siebe Environmental Controls Reference Manual, F-21683
- Siebe Environmental Controls Application Manual, F-21335
- Siebe Environmental Controls Valve Selection Guide, F-26094
- Control Valve Sizing, F-13755
- 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-9323-0-5-P
Service		Chilled or Hot Water
Flow Characteristics		Diverting
Sizes		2-1/2" to 6"
Type of End Fitting		125 lb. Flanged
Valve Materials	**Body**	Iron
	Seat	Bronze
	Stem	Stainless Steel
	Plug	Stainless Steel
	Packing	Grafoil
	Disc	None
ANSI Pressure Class (Figure-1)		125 lb. Flanged (up to 200 psig below 150°F)
Maximum Inlet Pressure, Steam		35 psig (241 kPa)
Allowable Control Media Temperature		40 to 281°F (4 to 138°C)
Allowable Differential Pressure for Water*		35 psi (241 kPa) Max. for Normal Life (refer to "Cavitation Limitations on Valve Pressure Drop" on page 5)

Valve Size	C_v Rating		k_{vs} Rating**		Complete Valve Body Part Number
	"U"	"L"	"U"	"L"	
2-1/2"	68	75	59	65	**VB-9323-0-5-12**
3"	85	95	65	82	**VB-9323-0-5-13**
4"	160	180	138	156	**VB-9323-0-5-14**
5"	195	220	169	190	**VB-9323-0-5-15**
6"	250	275	216	238	**VB-9323-0-5-16**

*Maximum recommended differential pressure in open position. Do not exceed recommended differential pressure (pressure drop) or integrity of parts may be affected. Exceeding maximum recommended differential pressure voids product warranty.

**$k_{vs} = m^3/h$ (ΔP = 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 appropriate valve linkage general instruction sheet for the close-off ratings.

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 the normal position of valve assemblies.

Table-2 Required Compatible Actuators/Linkages.

Actuator Series	Required Valve Linkage		Normal Position*
	2-1/2" & 3" Valves	4" to 6" Valves	
MA-318, MA-418, MA-419	AV-329	—	Stem Up or Down
MC-351, MC-431, MC-4311, MC5-4311	AV-330	AV-352	None
MK-6801, MK-6811, MK-6821	AV-430	—	Stem Up
MK-6911	—	AV-430	
MM-400, MMR-400	AV-630	—	None
MM-500, MMR-500			Stem Up or Down
MP-361, MP-461-600, MP-465, MP5-4651	AV-329		Stem Down
MP-371, MP-471-600, MP-475, MP5-4751			Stem Up
MP-381, MP-382, MP-481-600, MP-485, MP-486, MP-4851, MP5-4851	AV-330	AV-352	None

*Stem Up = Flow port "B" ("C") to port "AB" ("L"). Stem Down = Flow port "B" ("C") to port "A" ("U").

Temperature/Pressure Ratings

See Figure-1 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-9323-0-5-P (Flanged Cast Iron Body)
Standards: ANSI B16.1–1993
Materials: ASTM A126-93 Class B

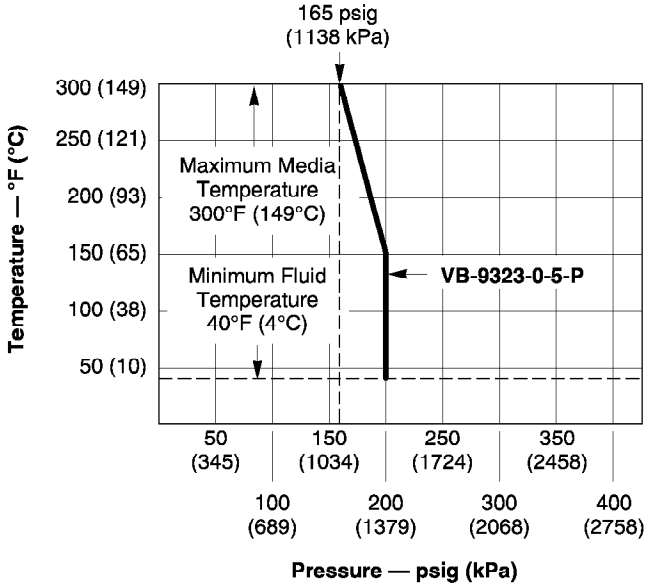

Figure-1 Temperature and Pressure Ratings for VB-9323 Series Valve Bodies.

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.

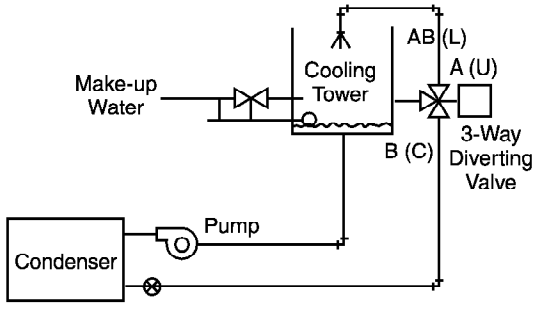

Figure-2 Piping for Proportional Diverting Valves.

Proportional to Bypass Flow

Proportional diverting valves used to bypass flow are piped on the inlet side of the load to throttle the water flow through the load and therefore control heat output of the load (Figure-2).These 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-3).

Table-3 Conventional Heating System.

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop* (% 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

*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).

Proportional to Blend Water Flows

Proportional valves used to blend two water flows control the heat output by varying the water temperature to the load at constant flow. These valves do not require high pressure drops for good control results. They can be sized for a pressure drop of 20% of the "available pressure" or equal to 25% of the pressure drop through the load at full flow.

Water Table

See Table-4 for water capacity of VB-9323 series valves.

Table-4 Water Capacity in Gallons Per Minute for VB-9323 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	25	30	35
VB-9323-0-5-12 (Port "U")	68	68	96	118	136	152	167	180	192	204	215	263	304	340	372	402
VB-9323-0-5-12 (Port "L")	75	75	106	130	150	168	184	198	212	225	237	290	335	375	411	444
VB-9323-0-5-13 (Port "U")	85	85	120	147	170	190	208	225	240	255	269	329	380	425	466	503
VB-9323-0-5-13 (Port "L")	95	95	134	165	190	212	233	251	269	285	300	368	425	475	520	562
VB-9323-0-5-14 (Port "U")	160	160	226	277	320	358	392	423	453	480	506	620	716	800	876	947
VB-9323-0-5-14 (Port "L")	180	180	255	312	360	402	441	476	509	540	569	697	805	900	986	1065
VB-9323-0-5-15 (Port "U")	195	195	276	338	390	436	478	516	552	585	617	755	872	975	1068	1154
VB-9323-0-5-15 (Port "L")	220	220	311	381	440	492	539	582	622	660	696	852	984	1100	1205	1302
VB-9323-0-5-16 (Port "U")	250	250	354	433	500	559	612	661	707	750	791	968	1118	1250	1369	1479
VB-9323-0-5-16 (Port "L")	275	275	389	476	550	615	674	728	778	825	870	1065	1230	1375	1506	1627

C_v Equation

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

Where:

C_v = Coefficient of flow

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

ΔP = Differential pressure in psi (pressure drop)

Cavitation Limitations on Valve Pressure Drop

A valve selected with too high a pressure drop can cause erosion of discs and/or wire drawing of the seat. In addition, cavitation can cause noise, damage to the valve trim (and possibly the body), and choke the flow through the valve.

Do not exceed the maximum differential pressure (pressure drop) for the valve selected.

The following formula can be used on higher temperature water systems, where cavitation could be a problem, to estimate the maximum allowable pressure drop across the valve:

$Pm = 0.5 (P_1 - Pv)$

Where:
Pm = Maximum allowable pressure drop
P_1 = Absolute inlet pressure (psia)
Pv = Absolute vapor pressure (refer to Table-5)

NOTE

Add 14.7 psi to gauge supply pressure to obtain absolute pressure value.

For example, if a valve is controlling 200°F water at an inlet pressure of 18 psig, the maximum pressure drop allowable would be:

Pm = 0.5 [(18 + 14.7) – 11.53] = 10.6 psi
(Vapor pressure of 200°F water is 11.53 psi.)

If the pressure drop for this valve is less than 10.6 psi, cavitation should not be a problem.

Systems where cavitation is shown to be a problem can sometimes be redesigned to provide lower inlet velocities. Valves having harder seat materials should be furnished if inlet velocities cannot be lowered.

Table-5 Vapor Pressure of Water Table.

Water Temp. (°F)	Vapor Pressure (psig)	Water Temp. (°F)	Vapor Pressure (psig)	Water Temp. (°F)	Vapor Pressure (psig)	Water Temp. (°F)	Vapor Pressure (psig)
40	0.12	90	0.70	140	2.89	190	9.34
50	0.18	100	0.95	150	3.72	200	11.53
60	0.26	110	1.28	160	4.74	210	14.12
70	0.36	120	1.69	170	5.99	220	17.19
80	0.51	130	2.22	180	7.51	230	20.78

Additional Valve Sizing Information

For additional valve sizing information, see:

- CA-28 Control Valve Sizing, F-13755
- Valve Selection Chart Water, F-11080
- Valve Sizing Slide Rule, TOOL-150

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Tools (not provided): Pipe wrenches
- Training: Installer must be a qualified, experienced technician
- Appropriate accessories

▼CAUTION

- Install the valves with the "C" port as the inlet and ports "L" and "U" as the outlets.
- Do not exceed the ratings of the device.
- Avoid locations where excessive moisture, corrosive fumes, or vibration are present.

Mounting

1. The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. When selecting a location, allow sufficient room for valve linkage, actuator, and other accessories and for service of the product.
2. The preferred mounting position for the valve is with the valve stem vertical above the valve body. Avoid mounting the valve so that the valve stem is below horizontal.

Flanged Valve Bodies

The VB-9323-0-5-P series flanged valve bodies conform to American Standard 125 Lb. Cast Iron Pipe Flanges. The companion flanges (not provided) should be the same specification as the valve. The 125 lb. flanges have plain flat faces and should not be bolted to a raised faced flange. The valves must be piped with one inlet ("C" port) and two outlets ("L" and "U" ports),

1. All parts should be clean to assure the best results.
2. The pipe with the companion flanges installed should be properly supported and aligned. Be sure the companion flange is flush with the face of the valve body flange and lined up squarely.
3. Use a gasket material (not provided) that is recommended for the medium being handled.

▼CAUTION

Do not apply pipe dope to the valve flange, gasket, or companion flange.

4. See Figure-3 for flange and flange bolt details. Figure-3 also shows the proper way a flanged valve should be mounted.

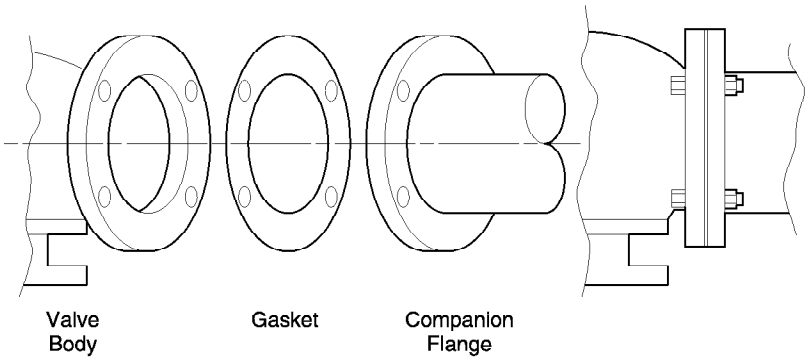

Figure-3 Installation of Flanged End Valves.

CHECKOUT

1. Make sure the valve stem operates freely before installing the valve linkage and the actuator.
2. If the stem does not operate freely, it may indicate that the valve was twisted or crushed during installation or that the stem was bent by rough handling. These conditions may require that the valve be replaced.
3. After the piping is under pressure, check the valve body and the connections for leaks.
4. After the valve linkage and the actuator are installed, check their operation.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained performance.

Water System Maintenance

All heating and cooling systems are susceptible to valve and system problems caused by improper water treatment and system storage procedures. These guidelines are provided to help avoid valve and water system problems resulting from improperly treated water or storage procedures in cooling and hot water systems, and to obtain maximum life from Siebe Environmental Controls valves.

Durability of valve stems and packings is dependent on maintaining non-damaging water conditions. Inadequate water treatment or filtration, not in accordance with chemical supplier/ASHRAE handbook recommendations, can result in corrosion, scale, and abrasive particle formation. Scale and particulates can result in stem and packing scratches and can adversely affect packing life and other parts of the hydronic system.

To maintain non-damaging conditions, follow these guidelines:

- Clean the system prior to start up. Use a nitrite or molybdate-based treatment program.
- Use filtration equipment where needed.
- Properly store off-line systems and monitor water treatment results using corrosion test coupons.
- Follow the advice of a water treatment professional.
- Consult EN-205 for further details.

DIMENSIONAL DATA

Table-6 Dimensions for VB-9323 Series Valves (Figure-4).

Part Number	Valve Size	Dimensions in Inches (mm)				
		A	B	C	D (Stem Down)	E (Stroke)
VB-9323-0-5-12	2-1/2"	9 (229)	7 (178)	5-1/8 (130)	3-1/4 (83)	3/4 (19)
VB-9323-0-5-13	3"	10 (254)	8 (203)	5-7/8 (149)		
VB-9323-0-5-14	4"	13 (330)	10 (254)	6-3/4 (171)		1 (25)
VB-9323-0-5-15	5"	12 (305)	10-1/2 (267)	7-3/8 (187)		1-1/8 (29)
VB-9323-0-5-16	6"	14-1/8 (359)	11-1/8 (283)	8 (203)		1-1/2 (38)

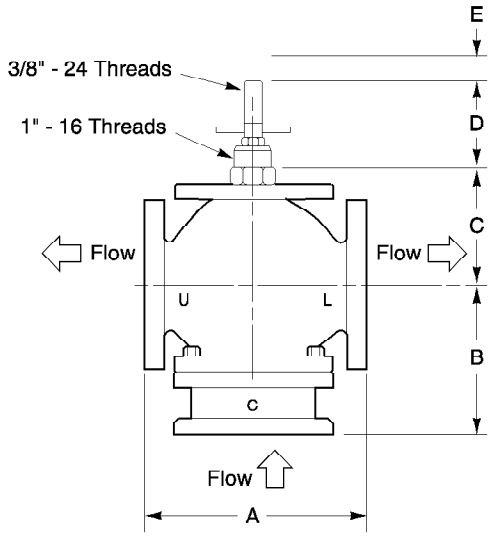

Figure-4 Typical of VB-9323-0-5-P Valve Bodies.

Table-7 Flange Detail for American Standard 125 lb. Cast Iron Pipe Flanges (Figure-5).

Nominal Pipe Size	Flanges		Drilling		Bolting		Length of Machine Bolts
	Flange Diameter A	Flange Thickness B	Diameter of Bolt Circle C	Diameter of Bolt Holes D	Number of Bolts	Diameter of Bolts	E
2-1/2"	7"	11/16"	5-1/2"	3/4"	4	5/8"	2-1/2"
3"	7-1/2"	3/4"	6"				
4"	9"	15/16"	7-1/2"		8	3/4"	3"
5"	10"		8-1/2"	7/8"			
6"	11"	1"	9-1/2"				3-1/4"

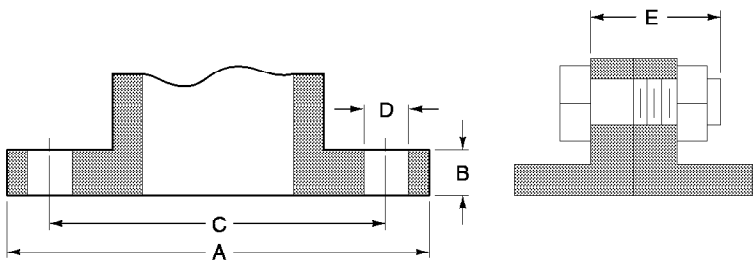

Figure-5 Flange Dimensions.