VB-7332 Series



TAC 1354 Clifford Avenue P. O. Box 2940 Loves Park, IL 61132-2940 www.tac.com

5/8" O.D., 45° SAE Flared Three-Way Sequencing Valves General Instructions

Application

VB-7332 series three-way sequencing valves control hot or chilled water from 20 to 281°F (-7 to 138°C) in heating or air conditioning systems. With the stem in mid-stroke both inlet ports are closed, with the stem up there is flow "B" to "AB," and with the stem down there is flow "A" to "AB." These valves are used for 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-7332 series valve packings are not rated for combustible gas applications, and if used in these applications, gas leaks and explosions could result.



Features

- 250 psig pressure rating per ANSI Standards (B16.15–1985) for cast bronze bodies
- Spring-loaded TFE packing
- 5/8" O.D., 45° SAE flared end fittings

Applicable Literature

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

SPECIFICATIONS

	Specifications	Valve Body Series VB-7332-0-4-P			
Service		Chilled or Hot Water			
Flow Characteristics (Figure-1)			Sequencing		
Size			5/8" O.D.		
Type of End Fittin	g		45° SAE Flared		
	Body	y	Bronze		
Seat			Bronze		
Valve	Sten	า	Stainless Steel		
Materials	Plug		Brass		
	Pack	king	Spring-loaded TFE		
	Disc		None		
ANSI Pressure Cla	iss (Figure-2)		250 (up to 400 psig below 150°F) ^a		
Maximum Inlet Pre	essure, Water		35 psig (241 kPa)		
Allowable Control	Media Temperature	9	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 4)			
Valve Size	C _v Rating	k _{vs} Rating ^c	Complete Valve Body Part Number		
5/8" O D	2.2	1.9	VB-7332-0-4-3		
э/о U.D.	4.4	3.8	VB-7332-0-4-4		

Table-1 Specifications/Models.

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

^b 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.

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

Close-off Pressure Rating

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

Normal Position of Valve Assembly

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

Table-2 Required Compatible Actuators/Linkages.

Actuator Series	Required Valve Linkage	Normal Position
MF-22203, MF-22303, MF-22323	Included w/Actuator	
MK-2690	AV-400	
MK-4601, MK-4611, MK-4621	AV-401	
MK-4621-422	AV-401	
MP-5210, MP-5211, MP-5213	AV-7600 ^a	Flow Port "B"
MP-5410, MP-5411, MP-5413		to Port "AB"
MP-5511, MP-5513	AV-7600 & AV-601	
MPR-5713		
MS-22353	Included w/Actuator	

¹ 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

See Figure-1 for typical flow characteristics of VB-7332 series three-way sequencing valve bodies.



Figure-1 Typical Flow Characteristics.

Temperature/Pressure Ratings

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-7332-0-4-P (45° SAE Flared 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-7332 Series Valve Bodies.

VALVE SIZING AND SELECTION

Water

Proportional

Proportional valves are usually selected to take a pressure drop equal to at least 50% of the "available pressure" (that is, the pump pressure differential available between supply and return mains with design flow at the valve location). 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 ^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-4 for water capacity of VB-7332 series valves.

Note: For four-pipe application, refer to Table-6 for valves in series.

Table-4 Water Capacity in Gallons Per Minute for VB-7332 Series.

Valve Body	C _v		Differential Pressure (Δ P in psi)											
Part Number	Rating	1	2	3	4	5	6	7	8	9	10	15	20	35
VB-7332-0-4-3	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-7332-0-4-4	4.4	4	6	8	9	10	11	12	12	13	14	17	20	26

C_v Equation

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

Where:

Cv = 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 (psi)

P1 = Absolute inlet pressure (psia)

Pv = Absolute vapor pressure (psia) (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 psia.)

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.

Water Temp. (°F)	Vapor Pressure (psia)	Water Temp. (°F)	Vapor Pressure (psia)	Water Temp. (°F)	Vapor Pressure (psia)	Water Temp. (°F)	Vapor Pressure (psia)
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

Table-5	Vapor	Pressure of	Water	Table.
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	00	0.51	100	2.22	100	7.51	200	20.70
Additional Valve	For additio	nal valve si	zina informa	ition. see:				
Sizing Information		Control Vo		- 10755				
	• CA-28		uve Sizing, i North Motor	-13/33				
	 valve 	Selection C	nart water,					
	• valve	Sizing Silde	e Rule, TOC	JE-150				
INSTALLATION								
Inspection	Inspect the If undamaged p	e package fo ged, open th products.	or damage. ne package	If damaged	, notify the a the device	appropriate for obvious	carrier imm damage. F	nediately. Return
Requirements	 Trainir 	ng: Installer	must be a c	qualified, ex	perienced t	echnician		
-	 Appro 	priate acces	ssories					
	Caution:							
	 Install the inl Figure 	the valve w ets and "AB -3 and Figu	vith the flow 3" port is the ure-4.	in the direct outlet exce	tion of the fl pt when us	ow arrows ed as a retu	("A" and "B' ırn valve). F	' ports are Refer to
	 Do no 	t exceed the	e ratings of	the device.				
	Avoid	locations w	here excess	sive moistur	e, corrosive	fumes, or	vibration ar	e present.
Mounting	1. The va ambie linkage	alve should nt limits of tl e, actuator,	be mounted he actuator. and other ac	in a weathe When selec ccessories a	er protected sting a locat and for servi	area in a lo ion, allow su ce of the pre	cation that i ufficient roor oduct.	s within the m for valve
	2. The pr valve	referred mo body. Avoid	unting posit I mounting t	ion for the v he valve so	alve is with that the val	the valve s ve stem is l	stem vertica below horiz	l above the ontal.
	3. The V	B-7332 seri	ies of flared	valve bodie	s conform t	o SAE 45°.		

TYPICAL PIPING

All piping must comply with local codes and ordinances. Refer to Figure-3 and Figure-4 for typical piping.



Figure-3 Typical Piping for Three-Pipe Single Coil.



Figure-4 Typical Piping for Pneumatic Four-Pipe Single Coil.

	Supply	Return	Combined
Port Code	-3	-3	
C _v	2.2	2.2	1.5
Port Code	-3	-4	2.0
C _v	2.2	4.4	
Port Code	-4	-4	
C _v	4.4	4.4	3.1

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Figure-5 Sequencing Valve Operation with Pneumatic Actuator.

CHECKOUT

- 1. Make sure the valve stem operates smoothly before installing the valve linkage and the actuator.
- 2. If the stem does not operate smoothly, 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 & FIELD REPAIR

Regular maintenance of the total system is recommended to assure sustained performance. See Table-7 for maintenance kit part numbers.

Table-7 Maintenance Kits for VB-7332 Valves.

Valve Body Part Number	Replacement Packing Assembly	Packing Wrench	Valve Repair Kit ^a
VB-7332-0-4-3			RYB-733-3
VB-7332-0-4-4	TDA-022-1	100L-20-1	RYB-733-4

^a Kit includes replacement packing and stem & plug assembly.

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 TAC 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, Water System Guidelines Engineering Information, F-26080, for further details.

DIMENSIONAL DATA

Valvo Body	Valvo	Dimensions in Inches (mm)						
Part Number	Size	Α	В	С	D (Stem Down)	E (Stroke)		
VB-7332-0-4-3 VB-7332-0-4-4	5/8" O.D.	4 (102)	2-1/4 (57)	1-11/16 (43)	15/16 (24)	7/32 (6)		

Table-8 Dimensions for VB-7332 Series Valves (Figure-6).



Figure-6 Dimensions for VB-7332 Series Valve Bodies.

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