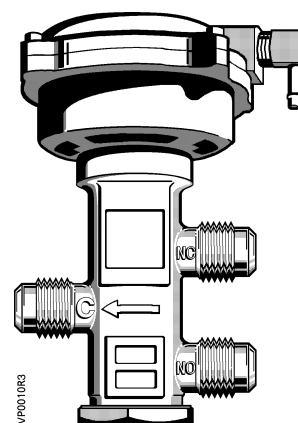


Powers™ Controls

VP 656 Powermite Three-way Mixing Valves (Flared Type)



Description	The VP 656 Powermite Three-way Mixing Valves are designed for water mixing applications. The valve body is a high grade bronze forging with connections for 1/2" O.D. SAE flare fittings.
Features	<ul style="list-style-type: none"> • Optimum flow/constant discharge capacity provided by use of a specially designed plug at the throttling port, Normally Open (NO), and a complementary plug at the bypass port, Normally Closed (NC). • Enclosed actuator housing to protect the diaphragm, spring, etc. • Small size allows installation in restricted space. • Actuator can be rotated to facilitate air connection. • Stainless steel valve stem to reduce friction and corrosion.

Product Numbers

Table 1.

Product Number	C _v	Spring Rating	Valve Size (Inches)
656-0009	2.5	10-15 lbs. (69-103 kPa)	1/2"
656-0010	2.5	3-8 lbs. (21 -55 kPa)	1/2"
656-0011	1.5	3-8 lbs. (21-55 kPa)	1/2"

Warning/Caution Notations

WARNING		Personal injury/loss of life may occur if a procedure is not performed as specified.
CAUTION		Equipment damage, or loss of data may occur if the user does not follow procedure as specified.

Specifications	Valve size/capacity	See <i>Table 2</i>
	Valve body style	Flared End
	Valve action	Upper seat normally closed Bottom seat normally open
	Valve stroke	3/8-inch (9.5 mm)
	Valve body rating	300 psig @ 350°F (2068 kPa @ 177°C)
	Flow characteristic (B port)	Modified equal percentage
Valve Actuator	Nominal spring span	5 psi (34.5 kPa)
	Effective diaphragm area	3.4 in ² (21.9 cm ²)
	Maximum air supply to diaphragm	30 psig (207 kPa)
	Air connection	1/8" N.P.T.
	Standard spring ranges	P=10 psi (68.9 kPa)
		3 to 8 psi (20.7 to 55.2 kPa) 10 to 15 psi (68.9 to 103.4 kPa)
Operating	Controlled medium	Water, Ethylene glycol solution
	Maximum fluid temperature	250°F (121°C)
	Maximum inlet pressure	300 psig (2068 kPa)
	Maximum recommended differential pressure for modulating service	
	Between inlets	25 psi (172 kPa)
	Between inlet and outlet	25 psi (172 kPa)
	Shipping weight	2.0 lb (0.9 kg)
	Dimensions	See <i>Figure 3</i>

Table 2. Maximum Water Capacity - US Gallons per Minute.

Valve Size (inches)	Pressure Differential - psi																
	C _v 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	25
1/2	1.5	2.1	2.6	3.0	3.4	3.7	4.0	4.2	4.5	4.7	5	5.2	5.4	5.6	5.8	6.7	7.5
1/2	2.5	3.5	4.3	5.0	5.6	6.1	6.6	7.1	7.5	7.9	8.3	8.7	9	9.3	9.7	11.2	12.5

Applications

VP 656 Three-way Mixing Valves are recommended for mixing hot or chilled water for convectors, fan coil units, unit conditioners, radiation, reheat coils, and similar terminal units requiring water mixing. The dual sealing packed construction allows applications for higher pressure system encountered in high rise buildings.

Applications requiring a modified equal percentage flow characteristic must be piped so the NO port controls the flow to the coil.

Typical uses are schools, office buildings, hotels, hospitals, factories, and other sites where efficient, economical water mixing is desired. The small, overall size lends itself to installation within cabinet enclosures, etc., where available space is limited.

Operation

The control pressure from the controller is connected to the upper housing, above the valve diaphragm. With no air pressure in the upper housing, the internal compression spring exerts force against the piston plate which holds the stem assembly tight against the upper seat permitting the flow from NO port to Common (C) port. An increase in control pressure will overcome this spring force and the differential pressure of the controlled medium to gradually move the stem assembly downward.

Full stem travel will bring the throttling plug in contact with the bottom seat for a metal-to-metal close-off permitting the flow from the NC port to the C port.

The nominal spring span is identified as the change in air pressure required to operate the valve from the opening of the upper port to the closing of the bottom port.

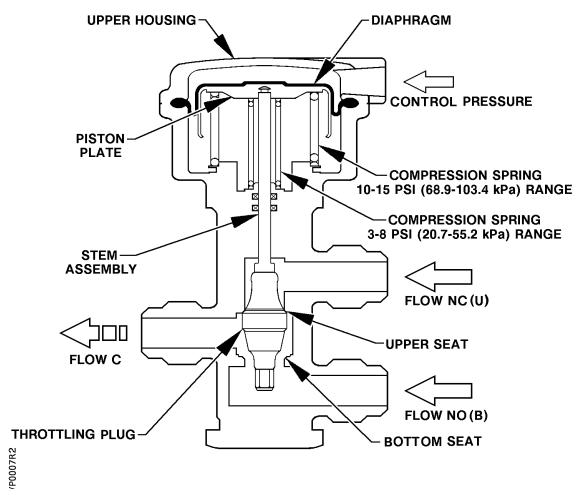


Figure 1. Operation.

Sizing

Correct sizing of the control valve for actual expected condition is essential for good control. An undersized valve will not have sufficient capacity at maximum load. An oversized valve may initiate cycling and the seat and disc may be damaged because of the restricted opening.

Some variables that must be determined are:

1. The medium to be controlled; water, etc.
2. The maximum inlet temperature and pressure of medium at the valve.
3. The pressure differential that will exist across the valve under maximum load demand.
4. The maximum capacity the valve must deliver.
5. The maximum medium pressure differential the valve actuator must close against.
6. As the medium pressure differential across the valve increases, the spring span also increases. This must be considered when sequencing valves.
7. Typical valve capacities are shown for water in *Table 2*. See AB-1 "Valve Selection and Sizing" for further recommendations.

Table 3. Part Numbers (See Figure 2).

No.	Name	C _v 1.5	C _v 2.5 3-8 psi	C _v 2.5 10-15 psi	No. Req'd	Material
1	E-ring	See Items 29 & 30 Kits			1	Phos. Bronze
2	Piston Plate	-	-	-	1	Brass
3	#8-32 x 7/16 Lg. Filister Hd. Scr.	See Items 28 & 30 Kits			4	Steel
4	Diaphragm	See Item 28 Kit			1	Rubber
5	Spring (3-8 psi only)	-	-	-	1	Music Wire
6	Spring (10-15 psi only)	-	-	-	1	Music Wire
7	Washer (10-15 psi only)	-	-	-	1	Steel
8	Quad Ring Retainer	See Items 29 & 30 Kits			1	Brass
9	Stem & Collar Assembly	See Item 30 Kit			1	St. Steel
10	Lower Quad Ring Retainer	-	-	-	1	Brass
11	Throttle Plug	656-345	656-346	656-346	1	Brass
12	Lower Seat	See Item 30 Kit			1	Brass
13	Lower Seat Retainer	See Item 30 Kit			1	Brass
14	Upper Housing	-	-	-	1	Aluminum
15	Washer	See Items 29 & 30 Kit			1	Brass
16	90° Elbow	-	-	-	1	Brass
17	Piston Cup	-	-	-	1	Brass
18	Lower Housing	-	-	-	1	Aluminum
19	Retaining Ring	See Items 29 & 30 Kit			1	Steel
20	Retaining Ring	See Items 29 & 30 Kit			1	St. Steel
21	Quad Ring	See Items 29 & 30 Kit			2	E.P. Rubber
22	Spring	-	-	-	1	Phos. Bronze
23	Stem Bearing	-	-	-	1	Oilite
24	Valve Body	-	-	-	1	Brass
25	Gasket	See Item 30 Kit			1	Copper
26	Lock Nut	See Item 30 Kit			1	Brass
27	Cap	-	-	-	1	Brass
28	Diaphragm Kit	656-763	656-763	656-753	1	-
29	Stem Packing Items 1, 8, 15, 19, 20, 21	656-601	656-601	656-601	1	-
30	Rebuild/Repair Kit Items 1, 3, 8, 9, 12, 13, 15, 19, 20, 21, 25, 26	656-764	656-765	656-765	1	-

Valve Components

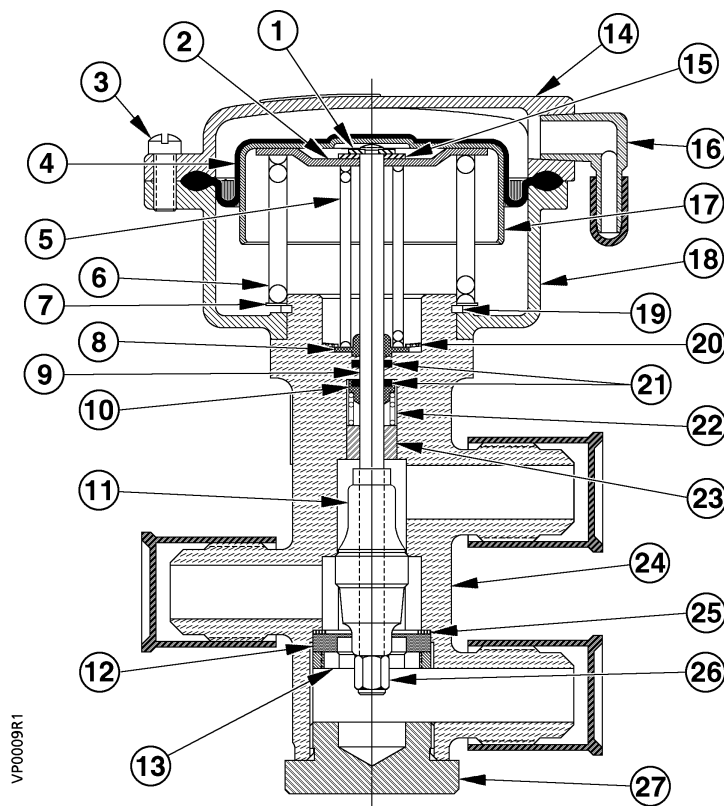


Figure 2. Valve Construction (See Table 3)

Installation

- It is not necessary to remove the valve top for normal installation.
- In concealed installations, sufficient room should be allowed so that the upper housing can be removed for valve servicing. A distance of two inches (51 mm) from top of the housing is sufficient.
- Flow should be into ports NC and NO and out of port C for the valve to operate properly. Flow direction arrows are cast in the valve body.
- The valve housing should never be used as a lever arm to tighten the body when taking up on a thread.
- The valve should be installed in a vertical, upright position.
- The valve top can be rotated to allow piping the control air from a convenient direction.

Service



WARNING:

Before doing any service work, shut off the medium (water, etc.) to the valve and remove and cap the air line to the valve actuator to prevent personal injury and equipment damage.

Throttling Plug
Replacement

See 155-240P25 (TB 233) for recommended procedure.

Valve Rebuilding/
Repacking

See 155-240P25 (TB 233) for recommended procedure.

Diaphragm Replacement

See 155-240P25 (TB 233) for recommended procedure. Installation instructions are packaged with the replacement kit.

Dimensions

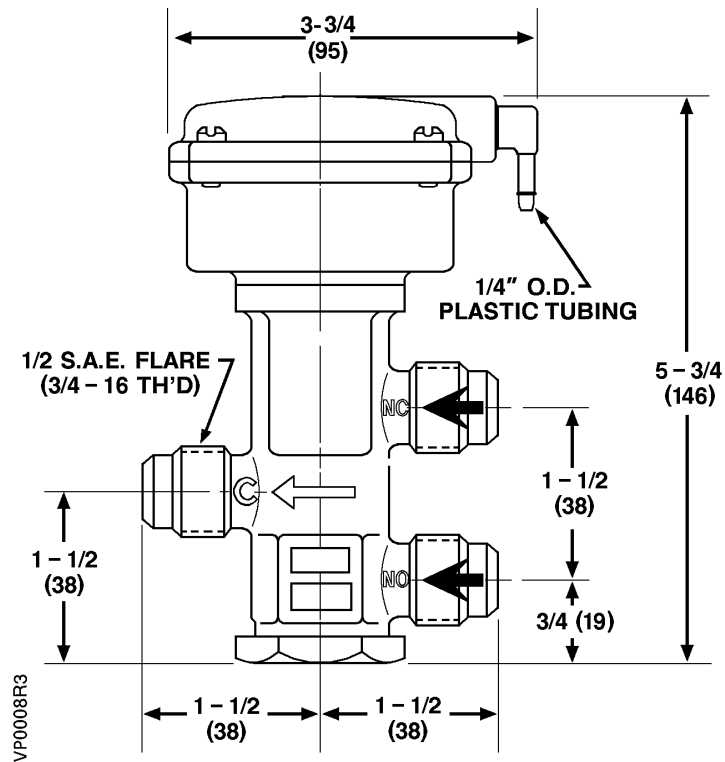


Figure 3. Dimensions in Inches (Millimeters).

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