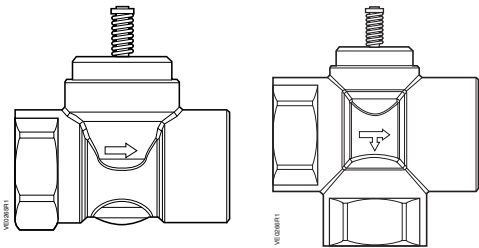


599 Series  
Zone Valve Bodies:

Two-Way and Three-Way



|                  |                                                                                                                                                                                                                                                                                                                                                      |  |                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|
| Description      | The 599 Series two-way and three-way Zone Valves with a 1/10-inch (2.5 mm) stroke.                                                                                                                                                                                                                                                                   |  |                    |
| Features         | Direct-coupled, universal bonnet                                                                                                                                                                                                                                                                                                                     |  |                    |
| Application      | Control of hot or chilled water for:<br>Zones with radiators<br>Floor heating by manifolds<br>Fan coil units<br>Induction units<br>Cooling ceilings (zone valves)<br>Wall-mounted boilers (zone valves)<br>VAV applications                                                                                                                          |  |                    |
| Ordering a Valve | To order a valve from the factory, use the product part numbers in Table 1.                                                                                                                                                                                                                                                                          |  |                    |
| Specifications   | Line size<br>Capacity<br>Body style<br>Seat style<br>Action<br>Two-way:<br>Three-way:<br>Valve body rating<br>Stem travel (Stroke)<br>1/2 to 1-inch (15 to 25 mm)<br>See Tables 2 and 3 and Figure 2<br>Globe<br>Metal-to-metal<br>NO/NC determined by actuator<br>Diverting<br>Mixing (limited application)<br>ANSI Class 125<br>1/10-inch (2.5 mm) |  |                    |
| Material         | Body<br>Body trim<br>Stem<br>Packing<br>Brass<br>Brass<br>Stainless steel ASTM A582 Type 303<br>Ethylene propylene O-ring                                                                                                                                                                                                                            |  |                    |
| Operating        | Controlled medium<br>Medium temperature range<br>Maximum inlet pressure<br>Close off pressure (AB-A)<br>Water, glycol solutions to 50%<br>34°F to 230°F (1°C to 110°C)<br>125 psig                                                                                                                                                                   |  |                    |
|                  | Valve Size Inch (mm)                                                                                                                                                                                                                                                                                                                                 |  | Pressure Psi (kPa) |
|                  | 1/2 (15)                                                                                                                                                                                                                                                                                                                                             |  | 44 (303)           |
|                  | 3/4 (20)                                                                                                                                                                                                                                                                                                                                             |  | 44 (303)           |
|                  | 1 (25)                                                                                                                                                                                                                                                                                                                                               |  | 22 (152)           |

|                             |                          |                                 |
|-----------------------------|--------------------------|---------------------------------|
| <b>Operating, continued</b> | Close-off ratings (AB-A) | According to ANSI/FCI 70-2      |
|                             | Leakage rate             | ANSI Class III (AB-A)           |
|                             | Flow characteristics     | Linear                          |
| <b>Miscellaneous</b>        | Mounting location        | NEMA 1 (interior only)          |
|                             | Dimensions               | See Table 4 and Figures 7 and 8 |
|                             | Valve weight             | See Table 4                     |

## Product Numbers

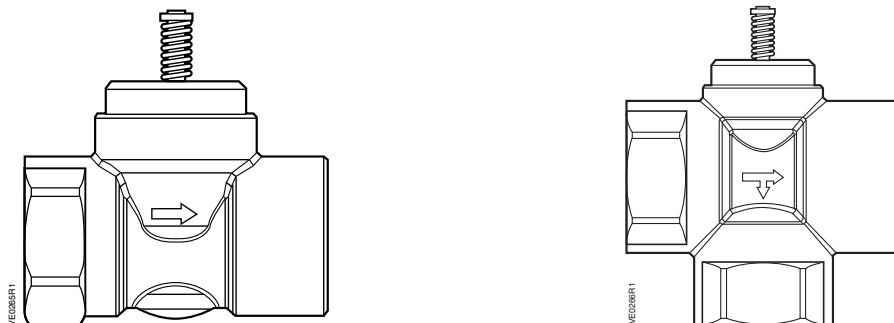


Figure 1. 2-Way and 3-Way Zone Valves.

Table 1. Part Numbers.

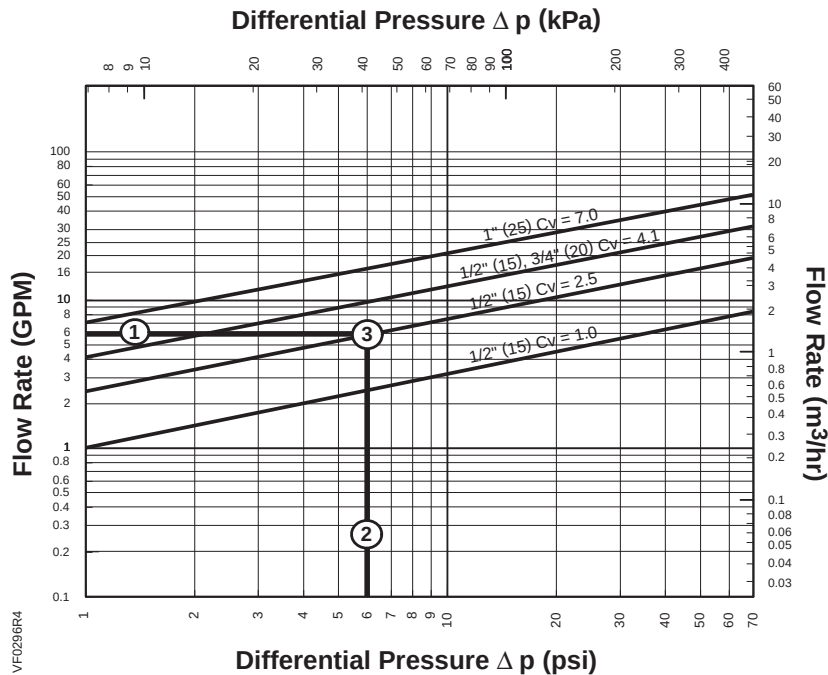
| Valve | Nominal Line Size |    | Flow Rate |        | Connection |           |
|-------|-------------------|----|-----------|--------|------------|-----------|
|       | Inch              | Mm | Cv        | (Kvs)  | NPT        | Sweat     |
| 2-Way | 0.5               | 15 | 1.0       | (0.85) | 599-00210  | 599-00510 |
|       | 0.5               | 15 | 2.5       | (2.15) | 599-00211  | 599-00511 |
|       | 0.5               | 15 | 4.0       | (3.4)  | 599-00214  | 599-00514 |
|       | 0.75              | 20 | 4.1       | (3.5)  | 599-00212  | 599-00512 |
|       | 1.00              | 25 | 7.0       | (6.0)  | 599-00213  | 599-00513 |
| 3-Way | 0.5               | 15 | 1.0       | (0.85) | 599-00230  | 599-00530 |
|       | 0.5               | 15 | 2.5       | (2.15) | 599-00231  | 599-00531 |
|       | 0.5               | 15 | 4.0       | (3.4)  | 599-00234  | 599-00534 |
|       | 0.75              | 20 | 4.1       | (3.5)  | 599-00232  | 599-00532 |
|       | 1.00              | 25 | 7.0       | (6.0)  | 599-00233  | 599-00533 |

**Table 2. Maximum Water Capacity - U.S. Gallons per Minute.**

| Valve Size inches | Pressure Differential - psi |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-------------------|-----------------------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                   | Cv1                         | 2   | 3    | 4    | 5    | 6    | 8    | 10   | 15   | 20   | 25   | 30   | 40   | 50   | 60   | 75   |
| 0.5               | 1.0                         | 1.4 | 1.7  | 2.0  | 2.2  | 2.4  | 2.8  | 3.2  | 3.9  | 4.4  | 5.0  | 5.5  | 6.3  | 4.1  | 7.7  | 8.7  |
| 0.5               | 2.5                         | 3.5 | 4.3  | 5.0  | 5.6  | 6.1  | 7.1  | 7.9  | 9.7  | 11.2 | 12.5 | 13.7 | 15.8 | 17.7 | 19.4 | 21.7 |
| 0.5/0.75          | 4.1                         | 5.8 | 7.1  | 8.2  | 9.2  | 10.0 | 11.6 | 13.0 | 15.9 | 18.3 | 20.5 | 22.5 | 25.9 | 29.0 | 31.8 | 35.5 |
| 1.00              | 7.0                         | 9.9 | 12.1 | 14.0 | 15.7 | 17.1 | 19.8 | 22.1 | 27.1 | 31.3 | 35.0 | 38.3 | 44.3 | 49.5 | 54.2 | 60.6 |

**Table 3. Maximum Water Capacity - Cubic Meters per Hour (m<sup>3</sup>/hr).**

| Valve Size<br>mm | Pressure Differential - kPa |      |      |      |      |      |      |      |          |      |      |       |       |       |  |
|------------------|-----------------------------|------|------|------|------|------|------|------|----------|------|------|-------|-------|-------|--|
|                  | 1                           | 10   | 20   | 30   | 40   | 50   | 60   | 80   | Kvs/ 100 | 150  | 200  | 300   | 400   | 500   |  |
| 15               | 0.9                         | 0.27 | 0.38 | 0.47 | 0.54 | 0.60 | 0.66 | 0.76 | 0.85     | 1.04 | 1.20 | 1.47  | 1.70  | 1.90  |  |
| 15               | 0.21                        | 0.68 | 0.96 | 1.17 | 1.35 | 1.51 | 1.66 | 1.91 | 2.15     | 2.60 | 3.00 | 3.70  | 4.30  | 4.80  |  |
| 15/20            | 0.35                        | 1.12 | 1.59 | 1.94 | 2.24 | 2.51 | 2.75 | 3.17 | 3.50     | 4.34 | 5.01 | 6.14  | 7.09  | 7.93  |  |
| 25               | 0.60                        | 1.91 | 2.71 | 3.32 | 3.83 | 4.28 | 4.69 | 5.41 | 6.00     | 7.41 | 8.56 | 10.48 | 12.11 | 13.54 |  |

**Figure 2. Water Capacity Graph.****Selection Example**

Select a valve given:

See Figure 2.

- ① Required flow = 6 gpm
- ② Desired pressure drop = 6 psi
- ③ Choose a 1/2-inch (15-mm) valve, Cv 2.5

## Operation

### 2-Way

Figure 3 shows the zone valve in the open or full flow position. The valve spring provides the necessary force to hold the stem in the raised or NO position.

In the event of power failure, the actuator returns to its normal position; the actuator determines whether the valve will fail open or closed. See the actuator Technical Instructions for additional information.

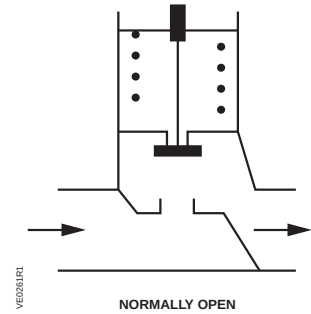


Figure 3.

### 3-Way

#### Diverting

As the valve stem moves downward, the flow through the NO port (AB-A) decreases and the flow through the NC port (AB-B) increases. As the valve stem moves upward, the flow through the NO port (AB-A) increases and the flow through the NC (AB-B) port decreases.

In the event of power failure, the actuator returns the valve to its normal position; the actuator determines whether the valve fails with flow to port A or port B. See the actuator Technical Instructions for additional information.

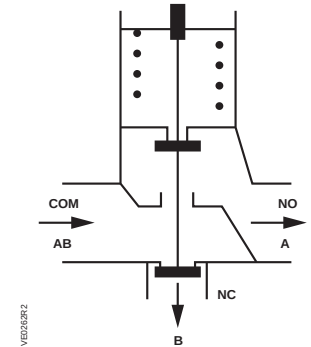


Figure 4.

#### Mixing

The 3-way zone valves are diverting valves. However, they may be used as mixing valves under the conditions shown in Figures 5 and 6.

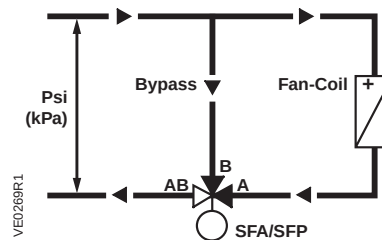


Figure 5. Mounting in the Return Flow.

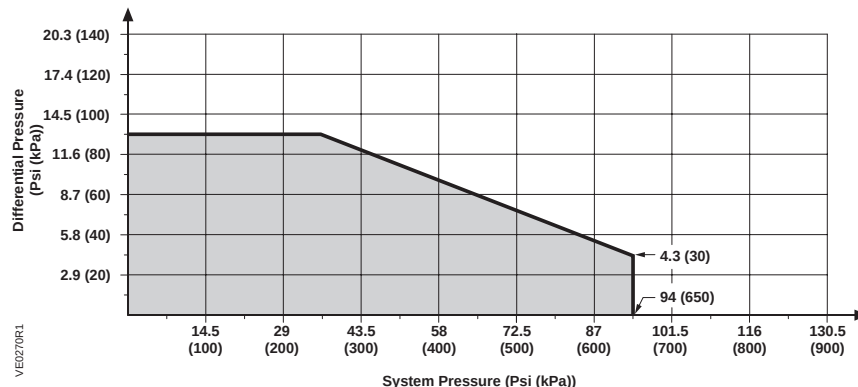


Figure 6. Allowable Differential Pressure in Relation to the System Pressure.

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**Sizing**

The sizing of a valve is important for correct system operation. An undersized valve will not have sufficient capacity at maximum load. An oversized valve can initiate cycling and can damage the seat and throttling plug because of the restricted opening. Correct sizing of the control valve for actual expected conditions is considered essential for good control.

The following variables must be determined:

The medium to be controlled: hot or chilled water.

The maximum inlet temperature and pressure of the medium at the valve.

The pressure differential that will exist across the valve under maximum load demand.

The maximum capacity the valve must deliver.

The maximum line pressure differential the valve actuator must close against.

See the Application Bulletin entitled *Control Valve Selection and Sizing* (140-0038) for further recommendations.

See Tables 2 and 3 for valve capacities.

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**Mounting and  
Installation**

Install the valve so that the flow follows the direction of the arrow indicated on the valve body.

For best performance, install the valve assembly with the actuator above the valve body. The valve and actuator can be installed in any position between vertical and horizontal.

**NOTE:** It is not recommended to install the valve assembly so that the actuator is below horizontal or upside down.

Allow sufficient space for servicing the valve and actuator. See Table 4 for valve body dimensions.

**NOTE:** Instructions for field mounting an actuator, wiring diagrams, and start-up are covered in the Technical Instructions for each actuator.

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**Service Kit**

599-00599 AL50 - Zone valve support rings – 10 pack

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## Dimensions

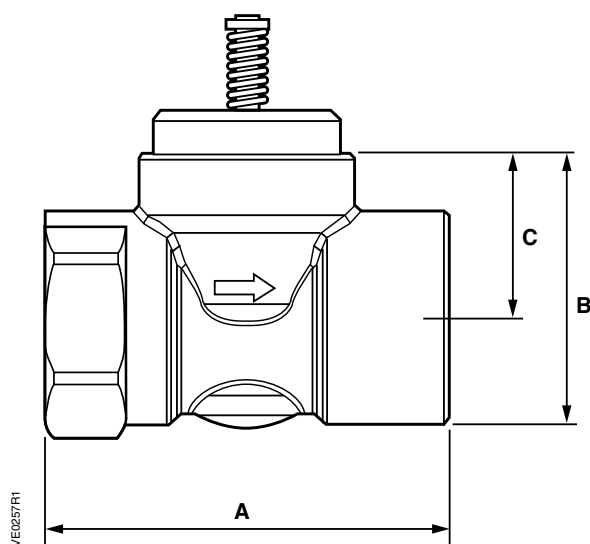


Figure 7. 2-Way Valve Body.

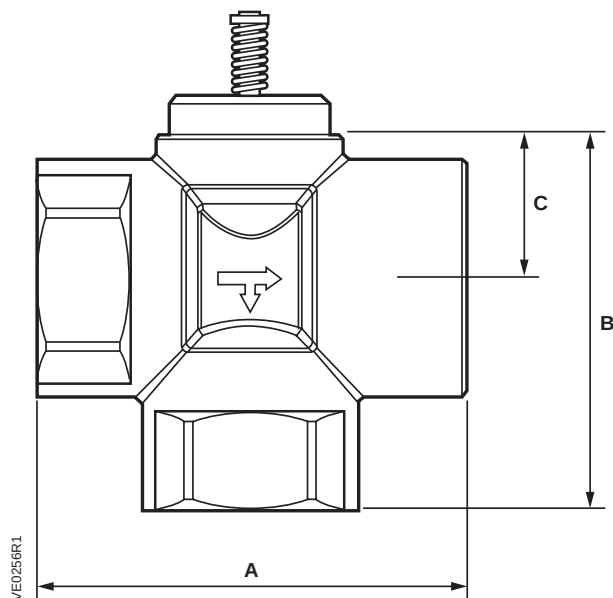


Figure 8. 3-Way Valve Body.

Table 4. Valve Dimensions.

| Connection Type | Valve Size<br>Inch<br>(mm) | 2-Way Valve  |                |                |                   | 3-Way Valve  |                |                |                   |
|-----------------|----------------------------|--------------|----------------|----------------|-------------------|--------------|----------------|----------------|-------------------|
|                 |                            | A            | B              | C              | Weight<br>lb (kg) | A            | B              | C              | Weight<br>lb (kg) |
| NPT             | 0.5<br>(15)                | 2.76<br>(70) | 1.63<br>(41,5) | 1.00<br>(25,4) | 0.82<br>(0,37)    | 2.76<br>(70) | 2.34<br>(59,5) | 1.00<br>(25,4) | 1.08<br>(0,49)    |
|                 | 0.75<br>(20)               | 2.76<br>(70) | 1.77<br>(45)   | 1.00<br>(25,4) | .99<br>(0,45)     | 2.76<br>(70) | 2.34<br>(59,5) | 1.00<br>(25,4) | 1.26<br>(0,57)    |
|                 | 1.0<br>(25)                | 3.50<br>(89) | 2.10<br>(54)   | 1.00<br>(25,4) | 1.68<br>(0,76)    | 3.50<br>(89) | 2.85<br>(67,3) | 1.00<br>(25,4) | 2.14<br>(0,97)    |
| Sweat           | 0.5<br>(15)                | 2.66<br>(66) | 1.48<br>(38)   | 1.00<br>(25,4) | 0.60<br>(0,27)    | 2.66<br>(68) | 2.26<br>(57,5) | 1.00<br>(25,4) | 0.71<br>(0,32)    |
|                 | 0.75<br>(20)               | 2.76<br>(70) | 1.63<br>(41,5) | 1.00<br>(25,4) | 0.71<br>(0,32)    | 2.76<br>(70) | 2.34<br>(59,5) | 1.00<br>(25,4) | 0.86<br>(0,39)    |
|                 | 1.00<br>(25)               | 3.50<br>(89) | 1.77<br>(45)   | 1.00<br>(25,4) | 1.06<br>(0,48)    | 3.50<br>(89) | 2.65<br>(67)   | 1.00<br>(25,4) | 1.24<br>(0,56)    |

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