**Differential pressure by-pass valve**

**519 series**

---

**Function**

The differential pressure by-pass valve is used in systems with a fixed speed circulating pump supplying several zones controlled by two way zone valves. This valve ensures that the head pressure of the pump is proportional to the number of two way valves being closed. It will by-pass the differential pressure created by the pump as the zone valves close, thus eliminating water hammer noise.

The 519 series is available with conventional NPT and sweat union connections. Also available for size 3/4", the Presscon™ copper tail-piece with union nut makes installation and maintenance fast, easy and efficient. Special slots in the EPDM O-ring allows fluid to leak during system testing if unpressed and provide a perfect leak proof seal when completely pressed.

---

**Product range**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Technical details</th>
</tr>
</thead>
<tbody>
<tr>
<td>519502A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 3/4&quot; MNPT union inlet x 3/4&quot; MNPT union outlet</td>
</tr>
<tr>
<td>519566A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 3/4&quot; press union inlet x 3/4&quot; press union outlet</td>
</tr>
<tr>
<td>519599A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 3/4&quot; sweat union inlet x 3/4&quot; sweat union outlet</td>
</tr>
<tr>
<td>519600A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 1&quot; FNPT inlet x 1&quot; MNPT union outlet</td>
</tr>
<tr>
<td>519609A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 1&quot; FNPT x 1&quot; sweat union outlet</td>
</tr>
<tr>
<td>519700A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 1-1/4&quot; FNPT inlet x 1-1/4&quot; MNPT union outlet</td>
</tr>
<tr>
<td>519709A</td>
<td>Adjustable differential pressure by-pass valve</td>
<td>Connections 1-1/4&quot; FNPT x 1-1/4&quot; sweat union outlet</td>
</tr>
</tbody>
</table>

**Technical specification**

**Materials**

- body: brass
- valve plug: brass
- valve plug gasket: EPDM
- O-Ring seals: EPDM
- union seals: asbestos free NBR
- control knob: ABS
- spring: stainless steel

**Performance**

- Suitable fluids: water, glycol solutions
- Max. percentage of glycol: 30%
- Temperature range: 32 to 230°F (0 to 110°C)
- Max. working pressure: 150 psi (10 bar)
- Flow rates: 3/4" flow up to 9 gpm, 1" flow up to 40 gpm, 1-1/4" flow up to 45 gpm
- Setting range: 1 to 6 m w.g. (2 to 10 psi)
Dimensions

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Wt. (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>519502A</td>
<td>¾&quot;</td>
<td>¾&quot;</td>
<td>2½&quot;</td>
<td>2½&quot;</td>
<td>5½&quot;</td>
<td>1</td>
</tr>
<tr>
<td>519566A</td>
<td>¾&quot; press</td>
<td>¾&quot; press</td>
<td>2½&quot;</td>
<td>2½&quot;</td>
<td>5½&quot;</td>
<td>1</td>
</tr>
<tr>
<td>519599A</td>
<td>¾&quot; SWT</td>
<td>¾&quot; SWT</td>
<td>2½&quot;</td>
<td>2½&quot;</td>
<td>5½&quot;</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Wt. (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>519600A</td>
<td>1&quot; FNPT</td>
<td>1&quot; MNPT</td>
<td>3 3⁄4&quot;</td>
<td>2 1⁄6&quot;</td>
<td>6 5⁄8&quot;</td>
<td>1.4</td>
</tr>
<tr>
<td>519609A</td>
<td>1&quot; FNPT</td>
<td>1&quot; SWT</td>
<td>3 3⁄4&quot;</td>
<td>2 1⁄6&quot;</td>
<td>6 5⁄8&quot;</td>
<td>1.4</td>
</tr>
<tr>
<td>519700A</td>
<td>1½&quot; FNPT</td>
<td>1½&quot; MNPT</td>
<td>3 3⁄4&quot;</td>
<td>2 1⁄6&quot;</td>
<td>7 3⁄4&quot;</td>
<td>1.5</td>
</tr>
<tr>
<td>519709A</td>
<td>1½&quot; FNPT</td>
<td>1½&quot; MNPT</td>
<td>3”</td>
<td>2 1⁄6&quot;</td>
<td>7 3⁄4&quot;</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Operating principal

When the spring (1) compression is adjusted using the control knob (2), the force balance acting on the valve plug (3) changes, modifying the threshold pressure value of the valve. The valve plug opens, activating the by-pass circuit, only when it is subjected to a differential pressure sufficient to generate a thrust greater than the thrust exerted by the spring. This allows the flow discharge through the outlet (4), limiting the difference in pressure between the two points in the system where the valve is installed.

System operation

The purpose of the differential pressure by-pass valve is to maintain the pump operating point as close as possible to its nominal value (point A on the graph shown below). If the by-pass valve is not used, when the flow rate in the circuit decreases due to partial closure of the two-way zone valves, the head loss in the circuit increases, point B.

The by-pass valve, set to the nominal head value of the pump, limits the increase in pressure, by-passing the flow rate ∆G. This occurs at any closing condition of the system two-way zone valves. In fact, once the position of the valve control knob has been determined, the threshold pressure value is more or less constant as the discharge flow rate varies (see hydraulic characteristic diagrams).

The valve must provide a sufficient flow rate by-pass to keep the pump at its nominal operating point in all system operating conditions, for example when the first zone valves are closed.
Setting

To adjust the valve, turn the knob to the required differential pressure on the graduated scale: the values correspond to the differential pressure in psi or meters w.g. to open the by-pass.

For a quick setup adjustment of the differential pressure by-pass valve, use the following manual method. As an example, a hydronic system with several zone valves: the system must be operating, the zone valves must be fully open and the by-pass valve must be set to the maximum value (a) (clockwise). Gradually open the differential pressure by-pass valve using the control knob (counterclockwise). Use a thermometer, or simply your hand, to check that the hot water is flowing into the by-pass circuit (b). As soon as a rise in the temperature is noted, turn control knob (clockwise) one half turn closed so hot water stops flowing into the by-pass (c). Lock the knob in this position (d) with the locking screw.

Installation

The differential pressure by-pass valve can be installed in any position, following the flow direction indicated by the arrow on the valve body.

For small to medium size systems:

Differential pressure by-pass valves are connected between the supply and return headers of a zoned system. The differential pressure by-pass valve can be connected at the beginning of the headers, between the pump discharge and first zone circuit. Alternately, the ends of the headers often provide a convenient installation location.

For medium to large size systems:

If the system flow rate is greater than the capacity of a single differential pressure bypass valve, install the valve between the supply and return ends of each zone circuit, rather than installing a number of valves in parallel at the central boiler.
Application diagrams

Small-medium size system
by-pass in mechanical room.

Medium-large size system
by-pass at end of zone circuits.
**SPECIFICATION SUMMARIES**

**519 series**
Differential pressure by-pass valve. Union connections: 3/4" MNPT union inlet x 3/4" MNPT union outlet, 3/4" union press inlet x 3/4" union press outlet, 3/4" sweat union inlet x 3/4" sweat union outlet, 1" FNPT inlet x 1" MNPT union outlet, 1" FNPT inlet x 1" sweat union outlet, 1-1/4" FNPT inlet x 1-1/4" MNPT union outlet and 1-1/4" FNPT inlet x 1-1/4" sweat union outlet. Brass body, Brass valve plug, EPDM valve plug gasket, EPDM O-Ring seals. Asbestos free NBR union seals, ABS control knob, Stainless steel spring. Suitable fluids: water, or 30% glycol solution. Temperature range 32 to 230°F (0 to 110°C). Maximum working pressure 150 psi (10 bar). Setting range is 1 to 6 m w.g. (2 to 10 psi) and flow rates 3/4" flow up to 9 gpm, 1" flow up to 40 gpm and 1-1/4" flow up to 45 gpm.