MixCal™ Adjustable three-way thermostatic mixing valve

521 series

Function

The Caleffi MixCal™ 521 series three-way thermostatic mixing valve is used in systems producing domestic hot water or in hydronic and radiant heating systems. It maintains the desired output temperature of the mixed water supplied at a constant set value compensating for both temperature and pressure fluctuations of the incoming hot and cold water.

The valve has been specifically certified to ASSE 1017 and Low Lead Plumbing Law by ICC-ES.

Product range

521_A series
Adjustable three-way thermostatic mixing valve.............connections ½", ¾", 1" NPT male union, sweat union and press union

521_AC series
Adjustable three-way thermostatic mixing valve with inlet port check valves .................................................connections ½", ¾", 1" NPT male union, sweat union

5215_6AC
Adjustable three-way thermostatic mixing valve with inlet port check valves .................................................connections ¾" press union

521101A
Adjustable three-way thermostatic mixing valve, (replacement body)........................................................ connections 1" male union thread with no fittings or union nuts

Technical specifications

Materials
- Body: low-lead brass (<0.25% Lead content)
- Shutter, seats and slide guides: PPO
- Springs: stainless steel
- Seals: Peroxide-cured EPDM

Performance
Suitable fluids: water, glycol solution
Max. percentage of glycol: 30%
Setting range: 85–150° F (30–65° C)
Tolerance: ±3° F (±2° C)
Max. working pressure: 200 psi (14 bar)
Max. operating differential pressure: 75 psi (5 bar)
Max. recommended differential pressure: 20 psi (1.5 bar)
Max. hot water inlet temperature: 200° F (93° C)
Max. inlet pressure ratio (H/C or C/H) for optimum performance: 2:1

Minimum temperature difference between hot water inlet and mixed water outlet for optimal performance: 27° F (15° C)
Minimum flow to ensure optimal performance: 1.0 gpm (3.8 L/min)
Minimum flow rate when recirculation flow rate is 1 gpm or greater: 0 gpm (0 L/min)

Certifications:
1. ASSE 1017/CSA B125.3, certified by ICC-ES, file PMG-1357.

Connections
- NPT male union: ½", ¾", 1"
- sweat union: ½", ¾", 1"
- press union: ½", ¾", 1"
- lay length-hot to cold inlet (press connections):
  size ½ inch: 3 3/8"
  size ¾ inch: 3 5/8"
  size 1 inch: 4 1/8"
### Dimensions

#### NPT & Press connections

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#### Laylength (press)

- sz 1/8 & 3/16 inch: 3 5/8”
- sz 1 inch: 4 1/8”

#### Sweat connections

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*At minimum temperature position on adjusting knob.
**Model with integral outlet temperature gauge.
**Temperature — exposure time**

- **Total burning**
- **Partial burning**
- **Safety condition. Maximum exposure time at a given temperature**

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**Thermal disinfection**

The diagram shows the behavior of the bacteria Legionella Pneumophila when the temperature conditions of the water in which it is contained vary. In order to ensure proper thermal “disinfection”, the values must not be below 140°F.

**Legionella-scalding risk**

In systems producing domestic hot water with storage, in order to avoid the dangerous infection known as Legionella, the hot water must be stored at a temperature of at least 140°F. At this temperature it is certain that the growth of the bacteria causing this infection will be totally eliminated. At this temperature, however, the water cannot be used directly.

As shown on the diagram opposite, temperatures of more than 120°F can cause burning very quickly. For example, at 130°F partial burning will occur in approximately 30 seconds, while at 140°F partial burning will occur in approximately 5 seconds. The time may be reduced by 50 percent or more for children and elderly people.

In view of the above, it is necessary to install a thermostatic mixing valve which can:

- reduce the temperature at the point of use to a value lower than that of storage and suitable for sanitary users. For safety reasons, it is advisable to limit the mixed water temperature to 120°F;
- maintain the temperature constant when the incoming pressure and temperature conditions vary.

**Construction details**

**Anti-scale materials**

The material used in the construction of the Caleffi MixCal™ 521 series thermostatic mixing valve reduces jamming caused by lime deposits. All the working parts such as shutter, seats and slide guides are made of a special anti-scale material, with a low friction coefficient, assuring long term performance.

**Temperature setting and locking**

The control knob permits temperature setting between minimum and maximum in one turn (360°). It also has a tamper-proof system to lock the temperature at the set value.

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**Operating principle**

The controlling element of the three-way thermostatic mixing valve is a thermostatic sensor fully immersed in the mixed water outlet tube which, as it expands or contracts, continuously establishes the correct proportion of hot and cold water entering the valve. The regulation of these flows is by means of a piston sliding in a cylinder between the hot and cold water passages. Even when there are pressure drops due to the drawing off of hot or cold water for other uses, or variations in the incoming temperature, the thermostatic mixing valve automatically regulates the water flow to obtain the required temperature.
Caleffi MixCal™ 521 series thermostatic mixing valves must be installed at the hot water heater. The 521 series valve cannot be used for tempering water temperature at fixtures as a point-of-use valve. They are not designed to provide scald protection or chill protection service. They should not be used where ASSE 1070 devices are required.

Wherever a scald protection feature is required, Caleffi 5213 series high performance mixing valves need to be installed. For safety reasons, it is advisable to limit the maximum mixed water temperature to 120°F.

Instantaneous production of hot water

Caleffi MixCal™ 521 series thermostatic mixing valves should not be used in conjunction with boilers giving instantaneous production of domestic hot water. This could compromise the correct operation of the boiler itself.

Radiant heating systems

Caleffi MixCal™ 521 series thermostatic mixing valves can also be used for regulating the flow temperature in hydronic and radiant heating systems, to which it assures a constant and accurate control with ease of installation.

Temperature stability

The diagram shows the stability of the temperature of the mixed water on variation of the temperature of the stored water. Stable mixed temperature during water heater recovery.

Flow curve

Flow should never exceed standards for pipe size and materials.

Use

Caleffi MixCal™ 521 series thermostatic mixing valves are designed to be installed at the hot water heater. The 521 series valve cannot be used for tempering water temperature at fixtures as a point-of-use valve. They are not designed to provide scald protection or chill protection service. They should not be used where ASSE 1070 devices are required.

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## Replacement fittings

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*Tailpiece fitting with integral union nut. 1" NPT and Sweat models require only two separate 1" union nuts (F61008).

**NA10358 requires additional parts. Choose appropriate tailpiece, washers, and union nut to complete the adapter.

## Replacement parts

### Replacement body.


521101A........................................................................1" male union thread

### Point of distribution mixed temperature gauge adaptor fits MixCal™ 521 series mixing valves. Threaded union mounting replaces existing mixed outlet with ¾” or 1" sweat pipe connection. Removable gauge fits into temperature well. Gauge dial is 2" diameter and scale from 30—210°F. Low-lead brass body.

NA10328.................................................................½” sweat with gauge
NA10056.................................................................¾” sweat with gauge
NA10058.................................................................1” sweat with gauge
NA10358 ...........................................................1" union thread with gauge
688003A................................................................Replacement gauge
Recirculation with point-of-distribution thermostatic mixing valves

For domestic recirculating water systems that include a single ASSE 1017 point-of-distribution thermostatic mixing valve, such as the Caleffi MixCal™ 521 series, the piping installation below is recommended.

In any recirculating hot water distribution system there will be times when the circulator is operating, but no hot water is being drawn at the fixtures. Under this condition, heat continually dissipates from the piping forming the recirculation loop. If the loop is relatively short, and well insulated, the rate of heat loss should be very small. If the loop is long, and uninsulated, the rate of heat loss could be substantially greater.

To maintain the recirculating water at the desired delivery temperature the heat lost from the loop must be replaced. This requires some water flow between the loop and the hot water source. Ideally, this flow is adjusted so that the rate of heat transfer from the hot water source to the loop exactly balances the rate of heat loss from the loop’s piping.

The figure (below) shows a “bypass valve” (1), and “return valve” (2), which regulate how much warm water from the return side of the recirculating loop flows back to the storage tank. When there is no demand for hot water at the fixtures, the flow of return water to the tank will equal the rate of hot water flow from the tank to the inlet port of the mixing valve. Ideally, this flow should be adjusted so that the rate of heat transfer from the tank to the recirculating loop exactly balances the rate of heat loss from the recirculating loop. This allows the water temperature leaving the mixing valve to remain stable.

The bypass valve (1) and possibly the return valve (2) must be adjusted when there is no domestic water draw on the recirculating loop (when all the fixtures are off). Begin with the bypass valve (1) fully closed, and the return valve (2) fully open. Turn on the recirculating circulator and let it run for several minutes. The supply water temperature leaving the mixing valve will likely be lower than the setting of the valve, since there is no return flow to the tank thus, no hot water to the hot port of the mixing valve.

Slowly open the bypass valve (1) and monitor the temperature leaving the mixing valve. It will likely begin rising as some water returns to the tank, and an equal flow of hot water moves from the tank to the hot port of the mixing valve. When the temperature leaving the mixing valve remains stable, and is at or very close to the temperature set on the mixing valve, the bypass valve is correctly set.

The return valve (2) can remain fully open unless a situation occurs where the bypass valve (1) is fully open, but the temperature leaving the mixing valve is still too low. If this occurs, partially close the return valve (2) to add flow resistance. This forces more flow through the bypass valve (1). Repeat the previously described procedure of slowly opening the bypass valve (1) until the water temperature leaving the mixing valve is stable.

![Domestic hot water system with recirculation](image-url)
**Application diagrams**

- **Radiant heating system**
- **Domestic hot water system without recirculation**

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**SPECIFICATION SUMMARIES**

**MixCal™ 521 series - threaded union connections**

Adjustable thermostatic and pressure balanced mixing valve, certified by ICC-ES to ASSE 1017-2009 and CSA B125.3, approved for point of distribution domestic water systems and radiant hydronic heating systems. Threaded connections ½", ¾" or 1" NPT male with union tailpieces. Low-lead brass body (<0.25% Lead content) certified by ICC-ES file 1360. Meets requirements of NSF/ANSI 372-2011. Shutter, regulating seats and sliding surfaces in anti-scale plastic, PPO. Seals peroxide-cured EPDM. Stainless steel spring. Maximum working temperature 200 degrees F (93 degrees C). Setting range 85 degrees F to 150 degrees F (30 degrees C to 65 degrees C). Maximum working pressure 200 psi (14 bar). Maximum operating differential pressure 75 psi (5 bar). Tolerance ±3 degrees F (±2 degrees C). Flow rating: Cv 3.0. Minimum flow to ensure optimal performance: 1.0 gpm (3.8 L/min). Minimum flow rate when recirculation flow rate is 1 gpm or greater: 0 gpm. Provided with tamper-proof setting lock. Provide with optional inlet port check valves. Provide with optional mixed outlet temperature gauge, 30 to 210 degrees F scale, 2 inch diameter for 1/2", 3/4" and 1" models.

**MixCal™ 521 series - sweat union connections**

Adjustable thermostatic and pressure balanced mixing valve, certified by ICC-ES to ASSE 1017-2009 and CSA B125.3, approved for point of distribution domestic water systems and radiant hydronic heating systems. Sweat connections ½", ¾" or 1" with union tailpieces. Low-lead brass body (<0.25% Lead content) certified by ICC-ES file 1360. Meets requirements of NSF/ANSI 372-2011. Shutter, regulating seats and sliding surfaces in anti-scale plastic, PPO. Seals peroxide-cured EPDM. Stainless steel spring. Maximum working temperature 200 degrees F (93 degrees C). Setting range 85 degrees F to 150 degrees F (30 degrees C to 65 degrees C). Maximum working pressure 200 psi (14 bar). Maximum operating differential pressure 75 psi (5 bar). Tolerance ±3 degrees F (±2 degrees C). Flow rating: Cv 3.0. Minimum flow to ensure optimal performance: 1.0 gpm (3.8 L/min). Minimum flow rate when recirculation flow rate is 1 gpm or greater: 0 gpm. Provided with tamper-proof setting lock. Provide with optional mixed outlet temperature gauge, 30 to 210 degrees F scale, 2 inch diameter for 1/2", 3/4" and 1" models.

**MixCal™ 521 series - press union connections**

Adjustable thermostatic and pressure balanced mixing valve, certified by ICC-ES to ASSE 1017-2009 and CSA B125.3, approved for point of distribution domestic water systems and radiant hydronic heating systems. Press connections ½", ¾" or 1" with union tailpieces. Low-lead brass body (<0.25% Lead content) certified by ICC-ES file 1360. Meets requirements of NSF/ANSI 372-2011. Shutter, regulating seats and sliding surfaces in anti-scale plastic, PPO. Seals peroxide-cured EPDM. Stainless steel spring. Maximum working temperature 200 degrees F (93 degrees C). Setting range 85 degrees F to 150 degrees F (30 degrees C to 65 degrees C). Maximum working pressure 200 psi (14 bar). Maximum operating differential pressure 75 psi (5 bar). Tolerance ±3 degrees F (±2 degrees C). Flow rating: Cv 3.0. Minimum flow to ensure optimal performance: 1.0 gpm (3.8 L/min). Minimum flow rate when recirculation flow rate is 1 gpm or greater: 0 gpm. Provided with tamper-proof setting lock. Provide with optional mixed outlet temperature gauge, 30 to 210 degrees F scale, 2 inch diameter for 1/2", 3/4" and 1" models.

*We reserve the right to change our products and their relevant technical data, contained in this publication, at any time and without prior notice.*