

High-flow thermostatic mixing valves

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5231 Series

INSTALLATION AND COMMISSIONING MANUAL



Function

The thermostatic mixing valve is used in systems producing domestic hot water or in radiant heating systems. Its function is to maintain the temperature of the mixed water supplied to the user at a constant set value when there are variations in the supply pressure and temperature of the incoming hot and cold water or in the flow rate.

The 5231 series thermostatic mixing valves are ASSE 1017 approved for point of distribution and are designed specifically for systems requiring high flow rates and precise, stable temperature control. Optional stainless steel inlet port check valves are available separately, for field installation only.



Product range

5231 series thermostatic mixing valve. NPT male and sweat union connections, sizes 1", 1-1/4", 1-1/2", 2". Inlet port check valves and outlet temperature gauge optional.



Technical characteristics

Materials:

- body: DZR low-lead brass (<0.25% lead content)
- shutter: PPSG40
- springs: stainless steel
- seals: peroxide-cured EPDM
- check valve extension (field installed): stainless steel

| | |
|--|--------------------------|
| Suitable fluids: | water, glycol solutions |
| Max. percentage of glycol: | 40% glycol solution |
| Mixed temperature adjustment range: | 95 – 150°F (32 – 66°C) |
| Temperature stability: | ± 3°F (± 2°C) |
| Max. operating differential pressure (static): | 200 psi (14 bar) |
| Max. operating differential pressure (dynamic): | 75 psi (5 bar) |
| Hot water inlet temperature range: | 120 – 195°F (49 – 91°C) |
| Cold water inlet temperature range: | 39 – 80°F (3.9 – 26.6°C) |
| Max. inlet pressure ratio (H/C or C/H) for optimum performance: | 2:1 |
| Min. temp. difference between hot inlet and mixed outlet for optimum perf: | 20°F (11°C) |
| Max. water hardness: | 10 grains |

Certified to:

- ASSE 1017/CSA B125.3, UPC, IRC, NPC and IPC, Low Lead Laws and listed by ICC-ES for use in accordance with the U.S. and Canadian plumbing codes. certified by ICC-ES, file PMG-1357.
- Complies with NSF/ANSI 372 –2016, Drinking Water System Components–Lead Content Reduction of Lead in Drinking Water Act, California Health and Safety Code 116875S.3874, Reduction of Lead in Drinking Water Act, Vermont Act 193, The Lead in plumbing Supplies Law, Maryland's Lead Free Law HB. 372 Law, as certified by ICC-ES, file PMG-1360.



SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.**

⚠ WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



CAUTION: All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of systems in accordance with all applicable codes and ordinances.



CAUTION: If the thermostatic mixing valve is not installed, commissioned and maintained properly, according to the instructions contained in this manual, it may not operate correctly and may endanger the user.



CAUTION: Make sure that all the connecting pipework is water tight.



CAUTION: When making the water connections, make sure that the pipework connecting the thermostatic mixing valve is not mechanically over-stressed. Over time this could cause breakages, with consequent water losses which, in turn, could cause harm to property and/or people.



CAUTION: Water temperatures higher than 100°F can be dangerous. During the installation, commissioning and maintenance of the thermostatic mixing valve, take the necessary precautions to ensure that such temperatures do not endanger people.



CAUTION: To prevent any damage which will cause the electronic mixing valve to not operate correctly, treat highly aggressive water before entering the thermostatic mixing valve.

Leave this manual for the user.

Caleffi shall not be liable for damages resulting from stress corrosion, misapplication or misuse of its products.



CONSIGNE DE SÉCURITÉ

Ce symbole d'avertissement servira dans ce manuel à attirer l'attention sur la sécurité concernant instructions. Lorsqu'il est utilisé, ce symbole signifie.

ATTENTION! DEVEZ ALERTE ! VOTRE SÉCURITÉ EST EN JEU ! NE PAS SUIVRE CES INSTRUCTIONS PEUT PROVOQUER UN RISQUE DE SECURITE.

⚠ AVERTISSEMENT: Ce produit peut vous exposer à des produits chimiques comme le plomb, qui est connu dans l'État de Californie pour causer le cancer, dommages à la naissance ou autre. Pour plus d'informations rendez-vous www.P65Warnings.ca.gov.



ATTENTION: Tous les travaux doivent être effectués par du personnel qualifié formé à la bonne application, installation et maintenance des systèmes conformément aux codes et règlements locaux.



ATTENTION: Si le réducteur de pression, termostatico regolabile, n'est pas installé, mis en service et entretenu correctement, selon les instructions contenues dans ce manuel, il peut ne pas fonctionner correctement et peut mettre en danger l'utilisateur.



ATTENTION: S'assurer que tous les raccordements sont étanches.



ATTENTION: Lorsque vous effectuez les raccordements d'eau, assurez-vous que la tuyauterie reliant le termostatico regolabile n'est pas mécaniquement des overstressed. Au fil du temps, ceci pourrait causer des ruptures, avec pour conséquence des pertes en eau qui, à leur tour, peuvent causer des dommages à la propriété et/ou les gens.



ATTENTION: Les températures de l'eau supérieure à 100°F (38°C) peut être dangereux. Au cours de l'installation, mise en service et l'entretien de le réducteur de pression, le termostatico regolabile, prendre les précautions nécessaires afin de s'assurer que de tels températures ne compromettent pas les gens.



ATTENTION: Pour prévenir tout dommage qui provoque le mitigeur électronique à ne pas fonctionner correctement, le traitement de l'eau très agressive avant d'entrer dans la vanne de le termostatico regolabile.

LAISSEZ CE MANUEL AVEC L'UTILISATEUR

Caleffi ne pourra être tenue responsable des dommages résultant de la corrosion, d'une mauvaise utilisation ou une mauvaise utilisation des produits.

Operating principle

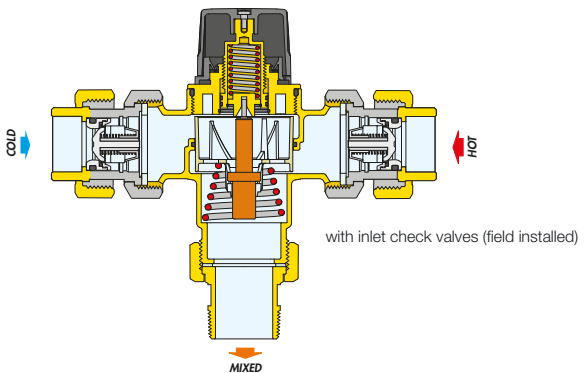
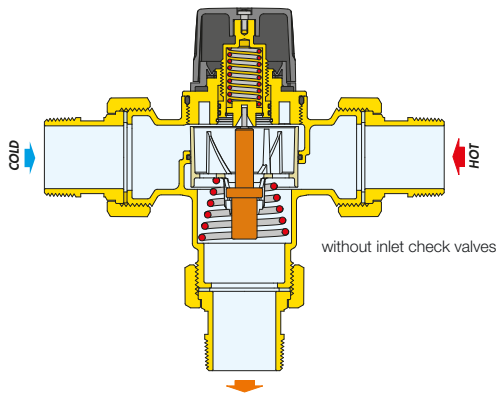
A thermostatic mixing valve mixes hot and cold water in such a way as to maintain a constant set temperature of the mixed water at the outlet.

A thermostatic element is fully immersed into the mixed water. It then contracts or expands causing movement of the piston, closing either the hot or cold inlets, regulating the flow rates entering the valve. If there are variations of temperature or pressure at the inlets, the internal element automatically reacts attempting to restore the original temperature setting.

The Caleffi 5231 series mixing valves require a minimum temperature differential from hot inlet to mixed water outlet of 20°F (11°C) to ensure the correct operation, and maximum pressure difference between the hot and cold inlet parts no greater than 2:1 ratio. Softened water use is highly recommended as the warranty is voided if used on water with hardness greater than 10 grains.

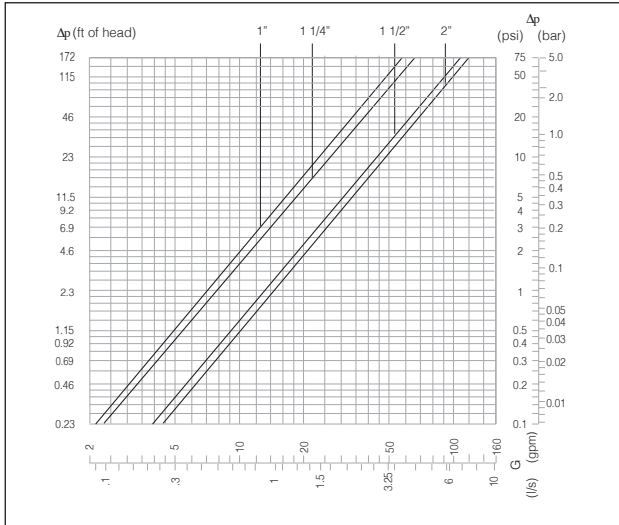
Control

The Caleffi 5231 series mixing valves require a minimum temperature differential from hot inlet to mixed water outlet of 20°F (11°C) to ensure the correct operation, and maximum pressure difference between the hot and cold inlet parts no greater than 2:1 ratio. Softened water use is highly recommended as the warranty is voided if used on water with hardness greater than 10 grains.



Check valves field installed only: code NA10366 for 1" & 1¼" sizes; code NA10367 for 1½" & 2" sizes.

Flow curves



Flow should never exceed standards for pipe size and material.

| Size | Connection | Model | Min. Flow* (GPM) | Max. Flow* (GPM) | CV |
|--------|---------------------|---------|------------------|------------------|------|
| 1" | NPT | 523160A | 4.4 | 40 | 7 |
| 1" | Sweat | 523168A | 4.4 | 40 | 7 |
| 1 1/4" | NPT | 523170A | 4.4 | 40 | 7.6 |
| 1 1/4" | Sweat w/ temp gauge | 523177A | 4.4 | 40 | 7.6 |
| 1 1/4" | Sweat | 523178A | 4.4 | 40 | 7.6 |
| 1 1/2" | NPT | 523180A | 8.8 | 70 | 13 |
| 1 1/2" | Sweat | 523188A | 8.8 | 70 | 13 |
| 2" | NPT | 523190A | 8.8 | 70 | 14.2 |
| 2" | Sweat | 523198A | 8.8 | 70 | 14.2 |

*Recommended flow rates for temperature stability: $\pm 3^{\circ}\text{F}$ ($\pm 2^{\circ}\text{C}$).

Use



Caleffi 5231 series thermostatic mixing valves are designed to be installed at the hot water heater and 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 and should not be used where ASSE 1070 devices are required. Wherever a scald protection feature is required, ASSE 1070 certified 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 5231 series thermostatic mixing valves are designed for use on domestic water heaters that have storage. The valve may deliver fluctuating mixed temperatures when used on instantaneous domestic water heaters.

Installation

Before installing a Caleffi 5231 series thermostatic mixing valve, the system must be inspected to ensure that its operating conditions are within the range of the mixing valve, checking, for example, the supply temperature, supply pressure, etc.



Systems where the Caleffi 5231 series thermostatic mixing valve is to be installed must be drained and cleaned out to remove any dirt or debris which may have accumulated during installation.

Failure to remove dirt or debris may affect performance and the manufacturer's product guarantee. Softened water use is highly recommended as the warranty is voided if used on water with hardness greater than 10 grains.

The installation of filters of appropriate capacity at the inlet of the water from the mains supply is always advisable.

In areas which are subject to highly aggressive water, arrangements must be made to treat the water before it enters the valve.

Caleffi 5231 series thermostatic mixing valves must be installed in accordance with the diagrams in this manual, taking into account all current applicable standards.

Caleffi 5231 series thermostatic mixing valves can be installed in any position, either vertical or horizontal.

The following are shown on the mixing valve body:

- Hot water inlet, "H".
- Cold water inlet, "C".
- Mixed water outlet, unmarked.

In systems with thermostatic mixing valves, check valves must be installed to prevent undesirable fluid backflow. The 5231 series valves, codes listed in this instruction sheet, do not contain integral check valves, so those must be sourced separately. Caleffi offers inlet port check valve assemblies separately, for field installation only to 5231 series valve.

It is essential that access to the valve is totally unobstructed for any maintenance which may be required to the valve or connections. The piping from/to the valve must not be used to support the weight of the valve itself.

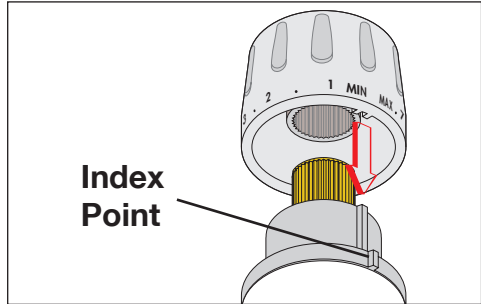


Locking the setting

Position the knob at the required value, unscrew the top screw, slide off the knob and put it back in such a way that the handle fits into the internal slot of the knob. Tighten the head screw.

Setting the temperature

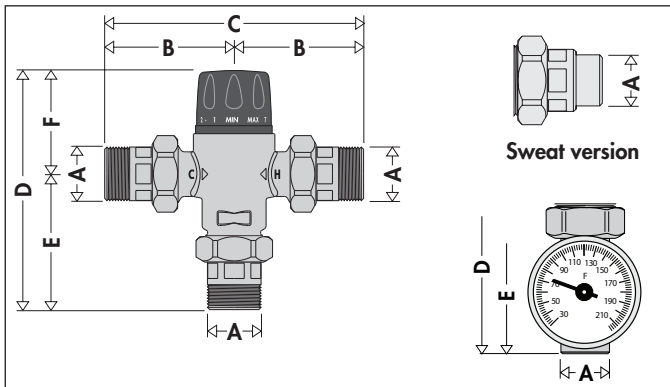
The temperature is set to the required value by means of the adjusting knob with the graduated scale on the top of the valve.



| Pos. | Min | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Max |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T (°F) | 95 | 104 | 109 | 117 | 122 | 129 | 136 | 142 | 150 |
| T (°C) | 35 | 40 | 43 | 47 | 50 | 54 | 58 | 61 | 66 |

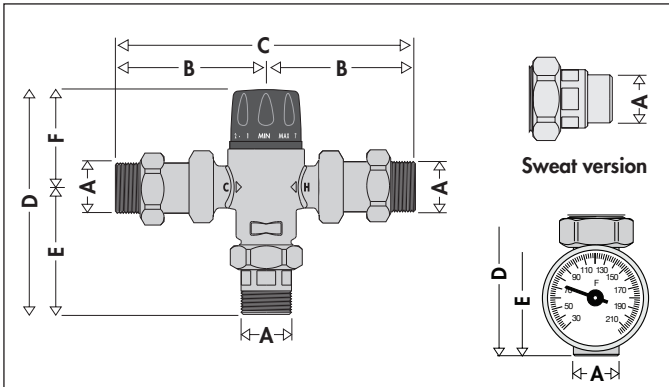
with: $T_{HOT} = 155^{\circ}F (68^{\circ}C)$ · $T_{COLD} = 55^{\circ}F (13^{\circ}C)$ · $P_{INLETS} = 43 \text{ psi (3 bar)}$

Dimensions



| Code | A | B | C | D | E | F | Wt (lb) |
|---------|------------|---------|---------|---------|---------|--------|---------|
| 523160A | 1" NPT | 4" | 8" | 7 5/8" | 4 3/16" | 3 3/8" | 7.0 |
| 523168A | 1" SWT | 3 5/16" | 6 5/8" | 7" | 3 1/2" | 3 3/8" | 7.0 |
| 523170A | 1 1/4" NPT | 4 1/8" | 8 1/4" | 7 3/4" | 4 5/16" | 3 3/8" | 7.0 |
| 523177A | 1 1/4" SWT | 3 3/8" | 6 3/4" | 7 5/8" | 4 1/8" | 3 3/8" | 9.0 |
| 523178A | 1 1/4" SWT | 3 3/8" | 6 3/4" | 7" | 3 1/2" | 3 3/8" | 7.0 |
| 523180A | 1 1/2" NPT | 5 1/8" | 10 1/4" | 9 3/16" | 5 7/16" | 3 3/4" | 17 |
| 523188A | 1 1/2" SWT | 4 1/16" | 8 1/8" | 8 1/8" | 4 3/8" | 3 3/4" | 17 |
| 523190A | 2" NPT | 5 1/8" | 10 1/4" | 9 1/2" | 5 3/4" | 3 3/4" | 18 |
| 523198A | 2" SWT | 4 5/16" | 8 5/8" | 8 5/8" | 4 7/8" | 3 3/4" | 18 |

Dimensions with check valves



| Code | A | B | C | D | E | F | Wt (lb) |
|---------|------------|--------|---------|---------|---------|--------|---------|
| NA10366 | 1" NPT | 5 1/2" | 10 7/8" | 7 5/8" | 4 3/16" | 3 3/8" | 9.0 |
| | 1" SWT | 4 3/4" | 9 1/2" | 7" | 3 1/2" | 3 3/8" | 9.0 |
| | 1 1/4" NPT | 5 5/8" | 11 1/8" | 7 3/4" | 4 5/16" | 3 3/8" | 9.0 |
| | 1 1/4" SWT | 4 3/4" | 9 5/8" | 7 5/8" | 4 1/8" | 3 3/8" | 11.0 |
| | 1 1/4" SWT | 4 3/4" | 9 5/8" | 7" | 3 1/2" | 3 3/8" | 9.0 |
| NA10367 | 1 1/2" NPT | 7 3/8" | 14 3/4" | 9 3/16" | 5 7/16" | 3 3/4" | 19 |
| | 1 1/2" SWT | 6 1/4" | 12 5/8" | 8 1/8" | 4 3/8" | 3 3/4" | 19 |
| | 2" NPT | 7 3/8" | 14 3/4" | 9 1/2" | 5 3/4" | 3 3/4" | 20 |
| | 2" SWT | 6 1/2" | 13 1/8" | 8 5/8" | 4 7/8" | 3 3/4" | 20 |

Dimensions for 5231 models with field installed inlet check valve assemblies, code numbers listed in first column.

Replacement fittings

| Code | Description | Tailpiece all ports (3) | Inlet Check Valve Assembly (2)** | Outlet adapter with Temperature Gauge** | Union nuts (3) | Union washers (3) | | |
|---------|---|-------------------------|----------------------------------|---|------------------------|------------------------|--------|--------|
| 523160A | 1" MNPT union | NA10009 | NA10366 | NA10476 | R31589 | R50057 | | |
| 523168A | 1" Sweat union | 31554 FD | | | | | | |
| 523170A | 1-1/4" MNPT union | R41660 | | | | | | |
| 523178A | 1-1/4" Sweat union | 41787 CST | | | | | | |
| 523177A | 1-1/4" Sweat union with outlet temp. gauge* | 41787 CST (2 only) | | | R31589 (2 only - 177A) | R50057 (2 only - 177A) | | |
| 523180A | 1-1/2" MNPT union | 41371A | | | NA10367 | NA10461 | R51838 | R50060 |
| 523188A | 1-1/2" Sweat union | 41788 CST | | | | | | |
| 523190A | 2" MNPT union | 41372A | | | | | | |
| 523198A | 2" Sweat union | F0000496 | | | | | | |

*Replacement outlet mixed temperature gauge adaptor complete with outlet tailpiece, union nut and gasket, and temperature gauge (30-210°F), code NA10315.

**Field installed only

Replacement parts



Point of distribution mixed temperature gauge adaptor fits high flow 5231 series mixing valves. Removable gauge fits into temperature well. Gauge dial is 2" diameter and scale from 30–210° F. Low-lead brass body.



| Code | Description | Lbs |
|----------------|------------------------------------|-----|
| NA10315 | 1¼" sweat with gauge | 0.5 |
| NA10476 | For 1" & 1 ¼" * | 3.0 |
| NA10476 | For 1 ½" & 2" * | 4.0 |
| 688003A | Replacement gauge with pocket well | 0.2 |
| R39591 | Replacement temperature gauge | 0.2 |

* Requires separately ordered union nut, tailpiece and union washer. See replacement fittings table above.



5231

Replacement body. Meets requirements of ANSI/NSF 372-2011. Certified to: ICC-ES listed to ASSE 1017/CSA B125.3, Low lead.

ASSE 1017



| Code | Description | Min. Flow (gpm) | Cv | Lbs |
|----------------|------------------|-----------------|------|------|
| 523179A | 1½" union thread | 4.4 | 7.6 | 5.0 |
| 523199A | 2½" union thread | 8.8 | 14.2 | 15.0 |

Includes no fittings or union nuts.



Inlet check valve assembly for mounting on inlet union tail pieces of 5231 mixing valves. Stainless steel body, acetal plastic check valve insert with NBR o-ring.

| Code | Description | Open Pressure | Lbs |
|----------------|-------------------------------|---------------|-----|
| NA10366 | Check valve assembly 1" & 1¼" | 0.23 psi | 1.0 |
| NA10367 | Check valve assembly 1½" & 2" | 0.20 psi | 1.5 |

Commissioning

After installation, the valve must be tested and commissioned in accordance with the instructions given below, taking into account current applicable standards.

- 1) Ensure that the system is clean and free from any dirt or debris before commissioning the thermostatic mixing valve. Be sure water hardness is less than 10 grains.
- 2) It is recommended that the temperature is set using a suitable calibrated digital thermometer. The valve must be commissioned by measuring the temperature of the mixed water at the outlet.
- 3) The maximum outlet temperature from the valve must be set taking account of the fluctuations due to simultaneous use. It is essential for these conditions to be stabilized before commissioning.
- 4) Adjust the temperature using the adjusting knob on the valve. For safety reasons, it is advisable to limit the maximum mixed water temperature to 120°F in domestic hot water systems.

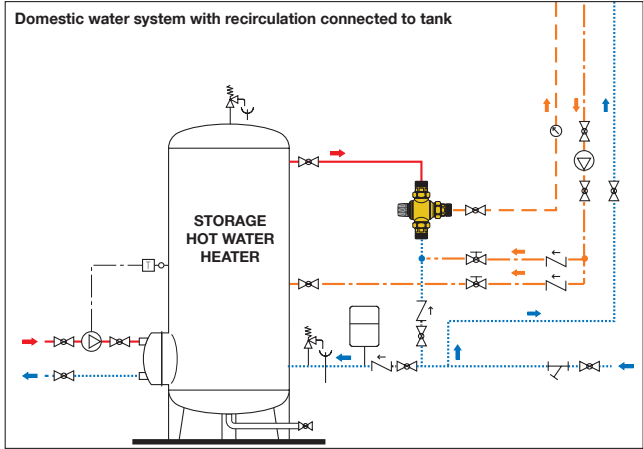
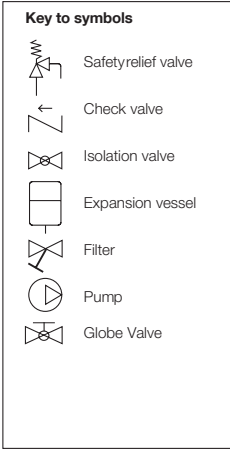
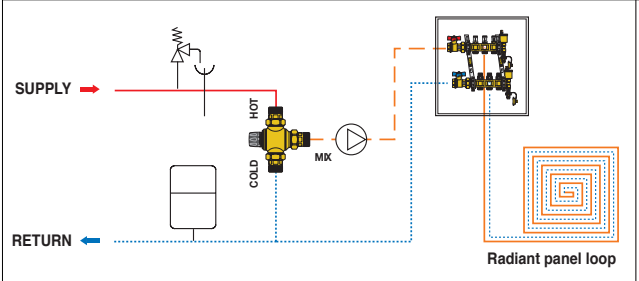
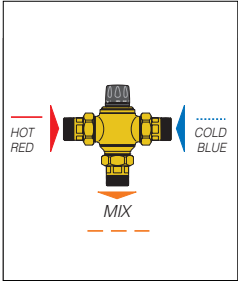
Maintenance

Service tests should be carried out regularly to monitor the mixing valve performance, as deterioration of performance could indicate that the valve and/or the system require maintenance. If, during these tests, the temperature of the mixed water has changed significantly in comparison with the previous test, the details given in the installation and commissioning sections should be checked and maintenance carried out.

The following aspects should be checked regularly to ensure that the optimum performance levels of the valve are maintained. Every 12 months at least, or more often if necessary.

- 1) Check and clean the system filters.
- 2) Check that any non-return valves positioned upstream of the Caleffi valve are operating correctly, without problems caused by impurities.
- 3) Limescale can be removed from internal components by immersion in a suitable de-scaling fluid.
- 4) When the components which can be maintained have been checked, commissioning should be carried out again.

Application diagrams



Troubleshooting

Under normal operating conditions the Caleffi 5231 series thermostatic mixing valve will provide a very high level of performance. However, in some circumstances, where our maintenance plan is not followed, the following problems may arise.

| Symptom | Cause | Corrective action |
|--------------------------------------|--|---|
| Hot water at the cold taps | a) Operation of check valve is hindered; check valve is not sealing correctly b) Check valves not fitted | <ul style="list-style-type: none"> • Replace faulty check valves |
| Fluctuating mixer water temperature | a) Erratic supply temperatures at the inlets of the valve b) Starvation of the water supplies at the inlets of the valve c) Incorrect commissioning of the valve | <ul style="list-style-type: none"> • Restore inlet conditions within the limits of the valve |
| Erratic flow of water from the valve | a) Insufficient water supplies b) Fluctuations in supply pressures/temperatures c) Adverse effect created by other draw off points on the system | <ul style="list-style-type: none"> • Stabilize inlet supply conditions |
| No flow of water from the valve | a) In-line filters blocked b) Insufficient supply pressures c) Debris obstructing valve operation | <ul style="list-style-type: none"> • Clean filters • Restore inlet supplies • Clean debris or scale from valve |



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