LEGIOMIX®
Electronic mixing valve

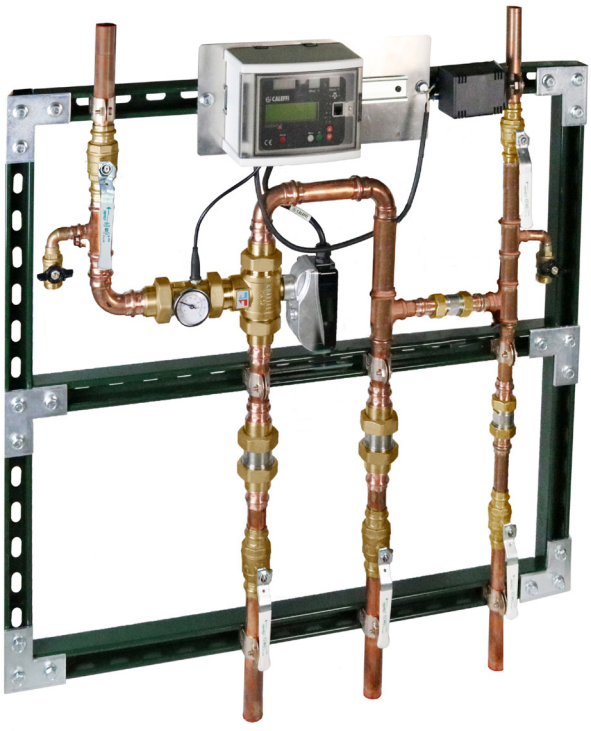
6000 series

01086/20 NA
Replaces 01086/19.1 NA

Function

The electronic mixing valve is used in centralized systems that produce and distribute domestic hot water. It maintains the temperature of the domestic hot water delivered to the user when there are variations in the temperature and pressure of the hot and cold water at the inlet or in the draw-off flow rate. The LEGIOMIX® electronic mixing valve provides precise temperature control over very low and very high flow rate demand, minimal pressure drop with a ball valve control element, automatic self-cleaning to prevent scale formation and easy-to-use digital interface with data logging, alarming and status indication. The LEGIOMIX electronic mixing valve is furnished with a controller with LCD user interface that provides a set of programs for circuit thermal disinfection to kill Legionella. The controller is configurable via keypad, or local or remote computer. Depending on the type of system and habits of the user, temperature levels and operation times can be programmed as desired. In addition, it comes standard with monitoring and remote control connections.

The LEGIOMIX Station is pre-piped with LEGIOMIX 3-way mixing valve with union connections, serviceable low-lead stainless steel check valves, a recirculation connection and isolation valves for fast and simple installation. The LEGIOMIX controller is pre-mounted and pre-wired and includes a return water temperature sensor, in a packaged wall mount configuration with steel uni-strut frame that can bolt to the wall through any of the perforations. The assembly also includes copper type L pipe, low lead ball valves and a 24 VAC transformer.



ASSE 1017

The LEGIOMIX 6000 series electronic mixing valves meet the requirements of ANSI/NSF 372-2011 and are certified to ASSE 1017, CSA B125.3, UPC, IPC, Low Lead Laws and listed by ICC-ES for use in accordance with the U.S. and Canadian plumbing codes.

Product Range

Code 6000 series Electronic mixing valve (ASSE 1017) with programmable thermal disinfection.....sizes ¾", 1", 1-1/4", 1-1/2", 2" male NPT union connections
Code 6000 series Electronic mixing valve (ASSE 1017) with programmable thermal disinfection.....sizes ¾", 1", 1-1/4", 1-1/2", 2" sweat union connections
Code 6000 series Electronic mixing valve (ASSE 1017) with programmable thermal disinfection.....sizes ¾", 1", 1-1/4", 1-1/2", 2" press union connections
Code 6000 series Electronic mixing valve (ASSE 1017) with programmable thermal disinfection
.....sizes 2-1/2" & 3" ANSI B16.5 150 CLASS RF flanged connections
Code 6000AS series:
Complete wall-mount assembly with pre-piped electronic mixing valve, code 6000 series.....sizes 1", 1-1/4", 1-1/2", 2"

Technical specification

Valve body

Materials:	- Body:	DZR low-lead brass
	- Ball:	sizes ¾" - 2": low-lead brass, chrome-plated sizes 2½" & 3": AISI 316 stainless steel
	- Slip-on flanges for sizes 2½" & 3":	galvanized carbon steel
	- Hydraulic seals:	peroxide-cured EPDM

Max. working pressure rating (static):	230 psi (16 bar)
Max. working pressure (dynamic):	150 psi (10 bar)
Max. inlet temperature:	212°F (100°C)
Temperature gauge scale:	30 - 210°F
Suitable fluids:	water
Max. water hardness:	10 grains

Main connections: -NPT male, sweat & press union: ¾", 1", 1¼", 1½" & 2"
-ANSI B16.5 150 CLASS RF: 2½" & 3"

Actuator, 3-wire floating fail-in-place

Electric supply:	24 VAC - 50/60 Hz
Power consumption:	6 VA
Protection cover:	self-extinguishing VO
Protection class:	IP 65 (NEMA 4/4X)
Ambient temperature range:	14 - 130°F (-10 - 55°C)
Electric supply cable length:	31½" (0.8 m)

Max. distance for control signal wire:
500 ft (150 m) cable 2 conductor x AWG 18
800 ft (250 m) cable 2 conductor x AWG 16

Station components

Frame:	steel uni-strut
Pipes:	copper type L
Ball valves:	low-lead brass
Check valves:	stainless steel
Main connections: -copper	1", 1¼", 1½" & 2"

Controller, LCD user interface/display

Materials:	- Housing:	self-extinguishing ABS, color white RAL 1467
	- Cover:	self-extinguising SAN, smoked transparent
Electric supply:		24 VAC (min 21.6, max 26.0 VAC)- 50/60 Hz (115/24 VAC transformer included in package)

Power consumption: 6.5 VA

Adjustment temperature range:	70 - 185°F (20 - 85°C)
Disinfection temperature range:	100 - 185°F (40 - 85°C)
Ambient temperature range:	32 - 120°F (0 - 50°C)
Protection class:	IP 54 (wall mounting) (Class II appliance)
Mounting bracket:	DIN rail

Contact rating (R1, R3, R4):	5 A resistance, 2 A inductance / 24 V
Mixing valve control:	5 A resistance, 2 A inductance / 24 V
Alarm relay (R2):	5 A resistance, 2 A inductance / 24 V

Fuses:	1 (main):	80 mA
Fuses:	2 (mixing valve):	1 A
Charge reserve:		15 days in the event of electric supply failure, with a 3 cell rechargeable 3.6 V 140 mAh buffer battery
Battery recharging time:		72 hours
Approvals:		CE, FCC part 15

Temperature sensors

Body material:	stainless steel
Type of sensitive element:	NTC
Working temperature range:	14 - 260°F (-10 - 125°C)
Resistance:	10,000 Ohms at 77° F (25° C)
Time constant:	2.5

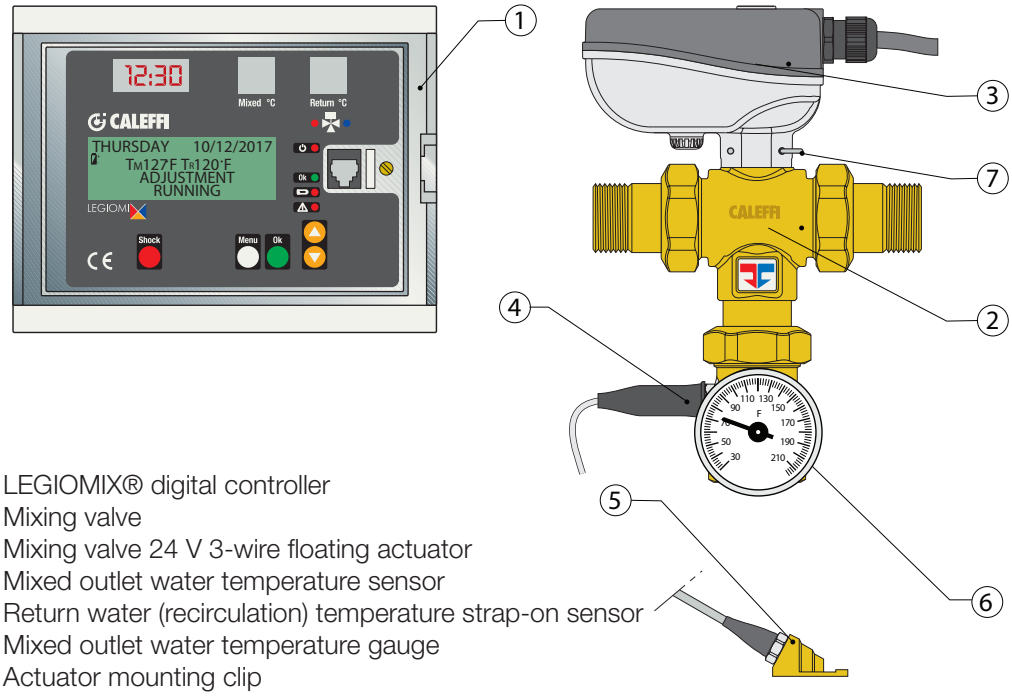
Max. distance for mixed outlet or return (recirculation) sensor:
500 ft (150 m) cable 2 conductor x AWG 18
800 ft (250 m) cable 2 conductor x AWG 16

Mixing valve performance

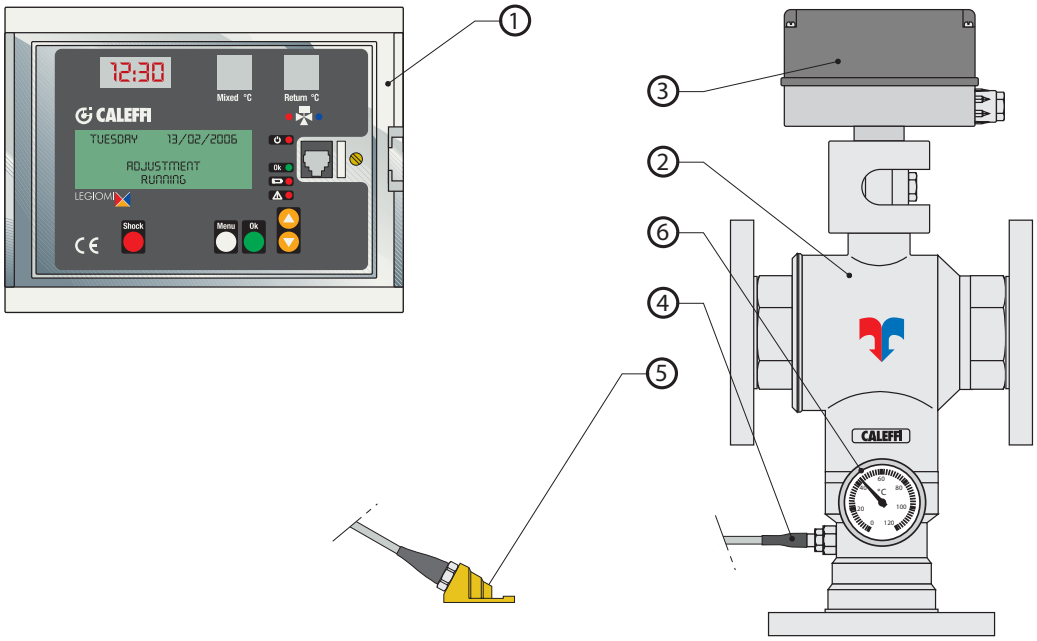
Accuracy:	± 3° F (± 2° C)
Max. operating differential pressure (dynamic):	20 psid (1.4 bar)
Max. ratio between inlet pressures (H/C or C/H):	2.1

Certifications

1. ASSE 1017/CSA B125.3, certified by ICC-ES, file PMG-1357.
2. NSF/ANSI 372, Drinking Water System Components-Lead Content Reduction of Lead in Drinking Water Act, California Health and Safety Code 116875 S.3874, Reduction in Drinking Water Act, Vermont Act 193 - The Lead in Plumbing Supplies Law and Maryland's Lead Free Law HB.372, certified by ICC-ES, file PMG-1360.



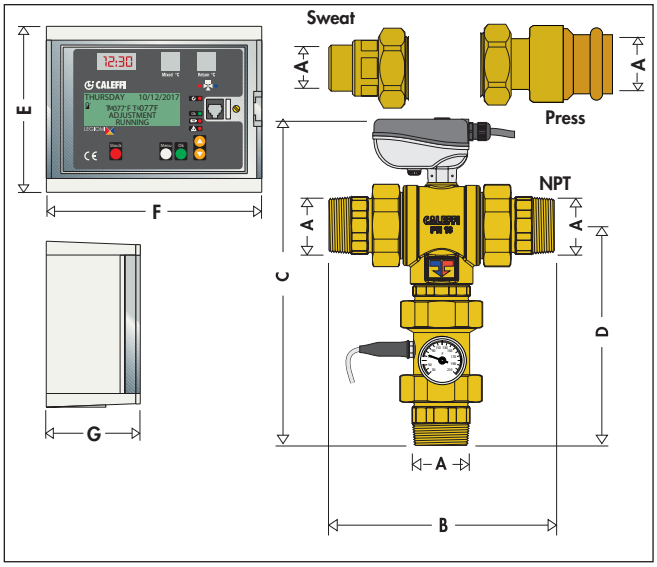
1) LEGIOMIX® digital controller
2) Mixing valve
3) Mixing valve 24 V 3-wire floating actuator
4) Mixed outlet water temperature sensor
5) Return water (recirculation) temperature strap-on sensor
6) Mixed outlet water temperature gauge
7) Actuator mounting clip

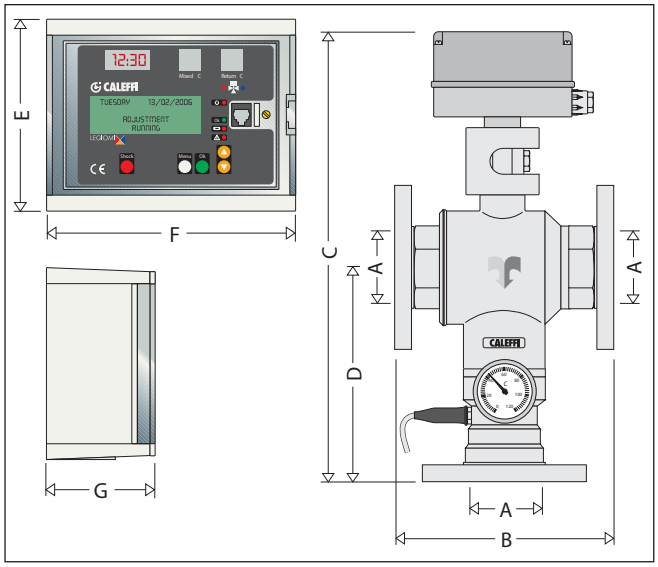


Package contents

- Digital controller, consisting of housing and base for electric connection
- DIN bar and mounting wall anchors
- Mixing valve with temperature gauge
- 24 VAC 3-wire floating Actuator
- Mixed outlet water temperature sensor
- Return water temperature strap-on sensor
- Spare fuses
- Installation and commissioning manual
- 115 / 24 VAC transformer

Dimensions

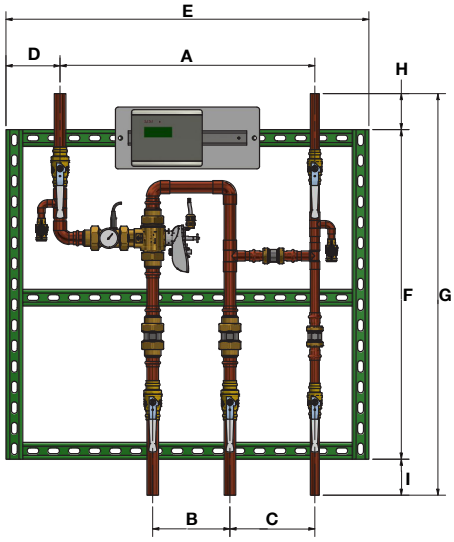




Code	A	B	C	D	E	F	G	Wt (lb)
600054A	¾" MNPT	5"	9 3/8"	5 3/8"	5 ½"	7"	4"	5.1
600059A	¾" sweat	4 ¾"	9 ¼"	5 ¼"				5.1
600056A	¾" press	5 3/8"	9 9/16"	5 9/16"				5.1
600064A	1" MNPT	6 ¼"	11"	6"				7.3
600069A	1" sweat	4 ¾"	10 ¼"	5 ¼"				7.3
600066A	1" press	7"	11 3/8"	6 3/8"				7.3
600074A	1 ¼" MNPT	7 ¼"	11 7/8"	6 ¼"				8.2
600079A	1 ¼" sweat	5 ¾"	11 1/8"	5 ½"				8.2
600076A	1 ¼" press	9 ¾"	13 1/8"	7 ½"				8.2
600084A	1 ½" MNPT	9 1/8"	14 3/8"	9 ½"				21.0
600089A	1 ½" sweat	7 7/8"	13 1/8"	8 ¼"				21.0
600086A	1 ½" press	10 1/8"	14 7/8"	10"				21.0

For press models,
Lay lengths: size ¾" - 5 9/16" ; 1"-5 ½"; size 1 ¼"- 7 ¾"; size 1 ½"- 7 3/8"; size 2"-10 ¾".

Code	A	B	C	D	E	F	G	Wt (lb)
600060A	2 ½" FLG	9 ¼"	23 11/16"	10 13/16"	5 ½"	7"	4"	30
600080A	3" FLG	9 ¼"	23 11/16"	10 13/16"	5 ½"			42



Code	connec-tions	A	B	C	D	E	F	G	H/I	Wt (lb)
600066AS	1" copper	24 ¾"	7 ½"	8 ¼"	5 ¼"	35 ¼"	32"	39"	3½"	27.3
600076AS	1 ¼" copper	27"	7 ½"	9"	6 ¼"	39 ¼"	36"	43"	3½"	28.2
600086AS	1 ½" copper	33 ¾"	8 ½"	13 ¼"	5"	43 ¼"	40"	48"	4"	41
600096AS	2" copper	36 ¾"	8 7/8"	14 ¼"	5 3/8"	47 ¼"	50"	60"	5"	42

“Legionella” - Scalding risk

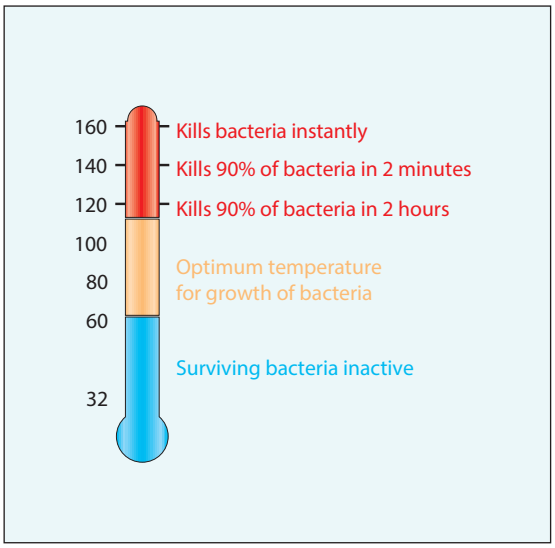
In systems producing domestic hot water with storage, in order to avoid the dangerous bacteria known as ”Legionella”, the hot water must be stored at a temperature of at least 140°F. At this temperature it is certain that the growth of the bacteria causing this infection will be totally eliminated. However, at this temperature the water cannot be used directly, as it may cause scalding. For example, at 130°F, partial burning takes place in 30 seconds and at 140°F total burning takes place in 5 seconds.
In view of the above, it is necessary to install an electronic mixing valve which can:

· reduce the temperature at the point of use to a value lower than that of storage;

· maintain this value when the incoming pressure and temperature conditions vary.

Thermal disinfection

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



Reference documents

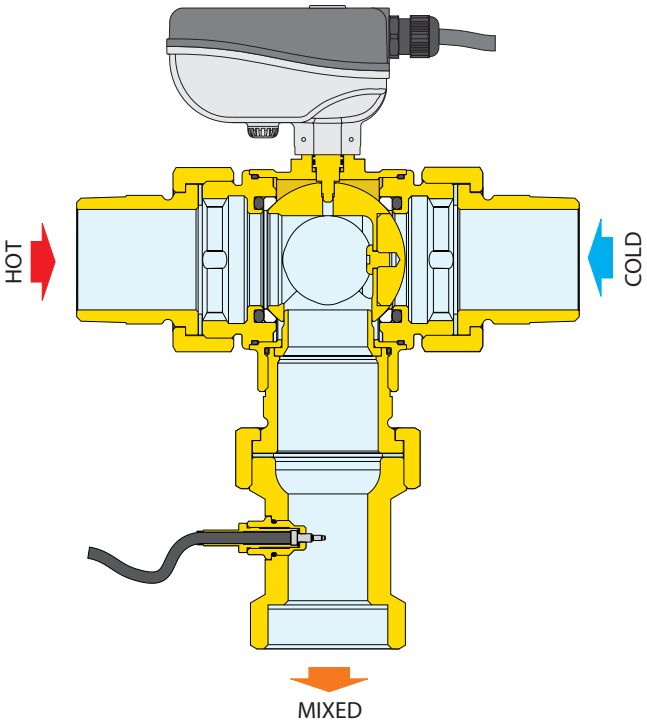
For the prevention and control of Legionella, see the ASHRAE Standard 12-2000 and 188-2015.

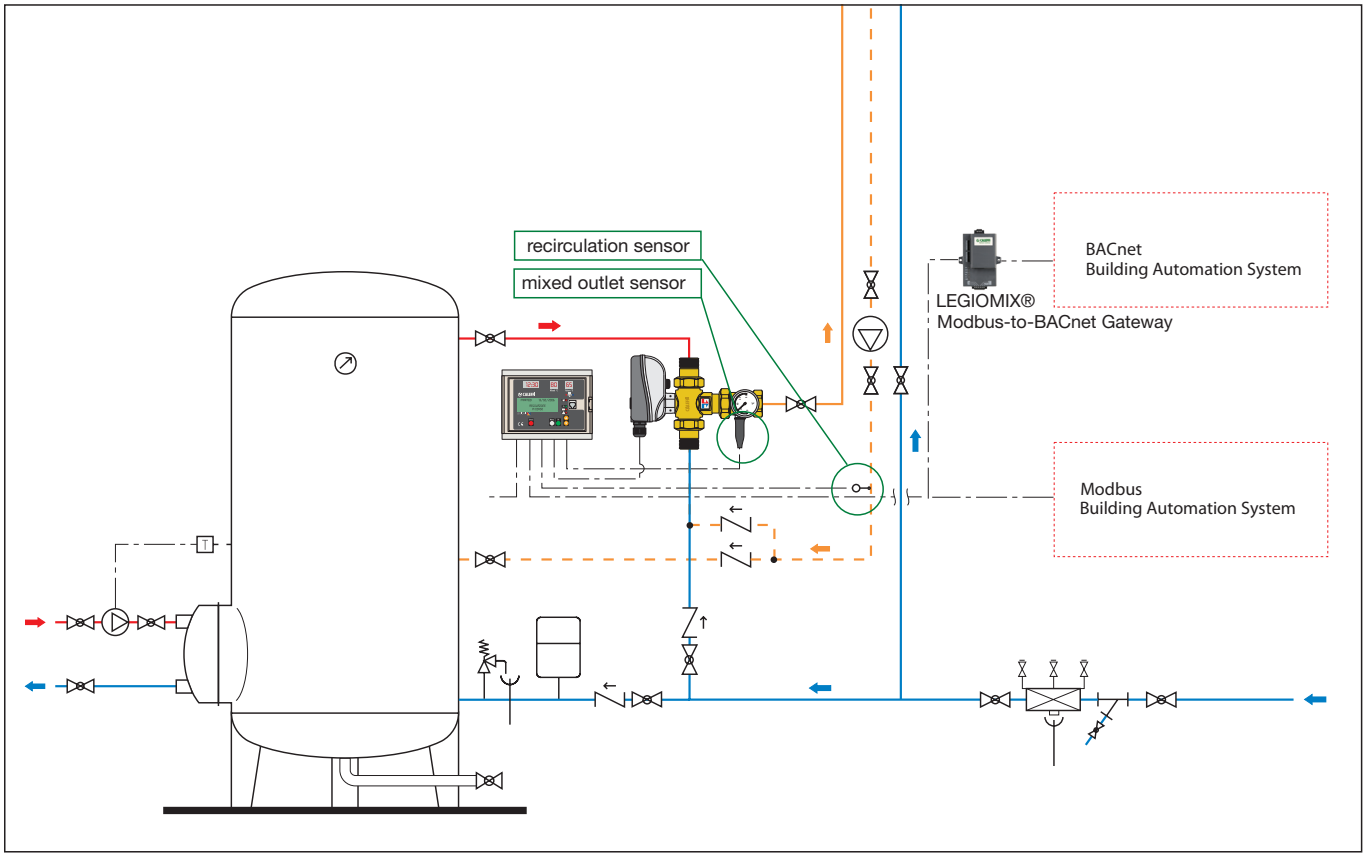
Operating principle

The electronic mixing valve mixes hot water from storage and cold water from the main supply to maintain a constant controlled set temperature of mixed water at the outlet. The controller measures the temperature of the mixed water at the valve outlet with temperature sensor and modulates the mixing valve position to maintain the desired set temperature. Despite variations in pressure drop or hot and cold water usage or variations in inlet temperature, the LEGIOMIX automatically controls the water temperature to meet the temperature setting.

A built-in clock is used to enable optional disinfection cycle programs. The system is disinfected by raising the water temperature to a specific value for a specific time duration. Using the recirculation temperature sensor, water returning from the distribution circuits can be measured for thermal distribution control. This measured temperature is used to check and control the temperature reached over all or part of the distribution network with this sensor placed at the end of the recirculation piping circuit.

The LEGIOMIX can be used to confirm that the correct temperature and time for thermal disinfection have been reached before taking the appropriate corrective action. All the parameters are updated every day and logged, with temperatures recorded every hour. There is an RS-485 connection for remote monitoring and configuration and, with specific relays, makes alarm signals and controls available to other interconnected system devices. A Modbus-to-BACnet gateway and inlet port check valves are available separately.

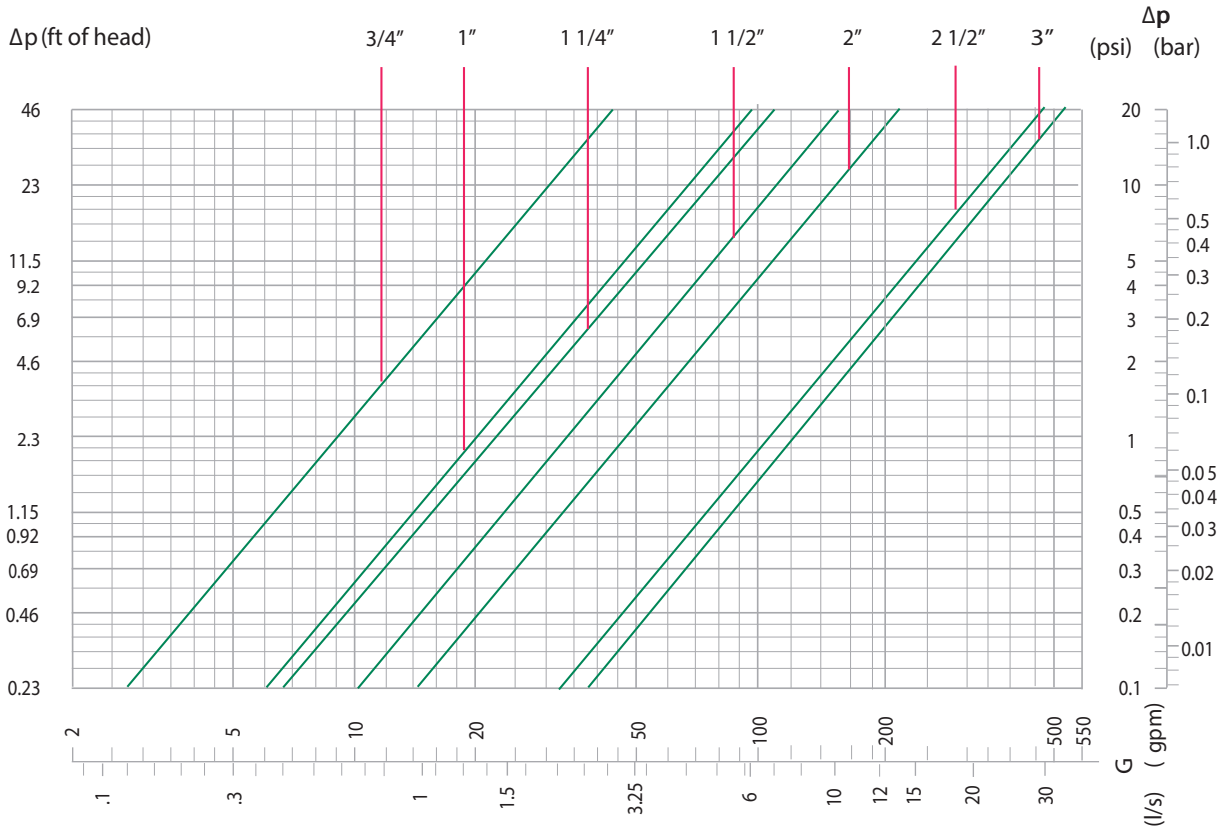




Modbus-to-BACnet gateway for remote control

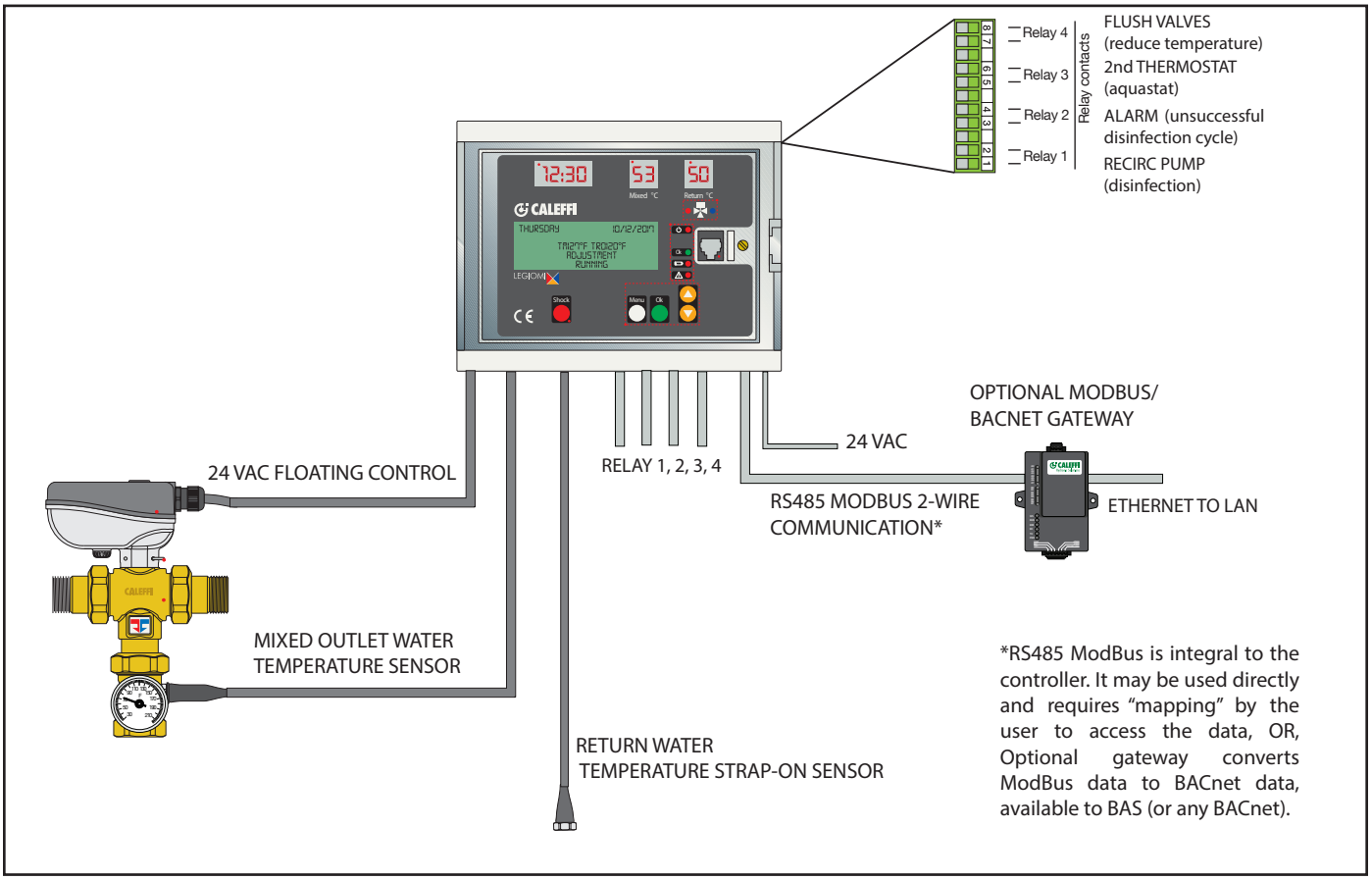
The LEGIOMIX Modbus-to-BACnet gateway, code NA10520, allows the transfer of data to a Building Automation System using BACnet communication protocol.

Hydraulic Characteristics

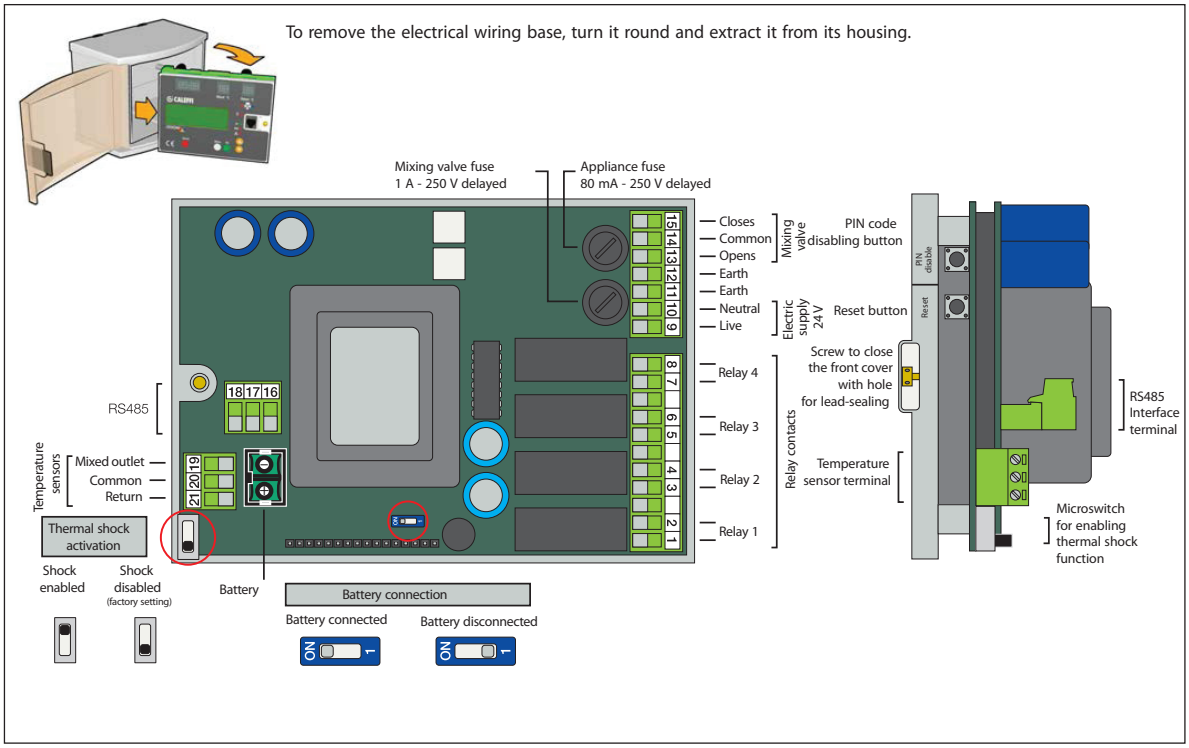


	Recommended Flow Rates (gpm/lpm)						
Size	¾"	1"	1¼"	1½"	2"	2½"	3"
Minimum (1)	2.2 / 8.3	3.1 / 11.7	4.4 / 16.6	6.6 / 25	8.8 / 33.3	17.0 / 64	22.0 / 83.3
Design Flow (2)	27 / 102	58 / 220	66 / 250	93 / 352	131 / 495	288 / 1,090	329 / 1,245
Maximum (3)	43 / 172	94 / 356	107 / 405	152 / 575	215 / 814	470 / 1,780	537 / 2,033
Cv	9.7	21	24	34	47	105	120

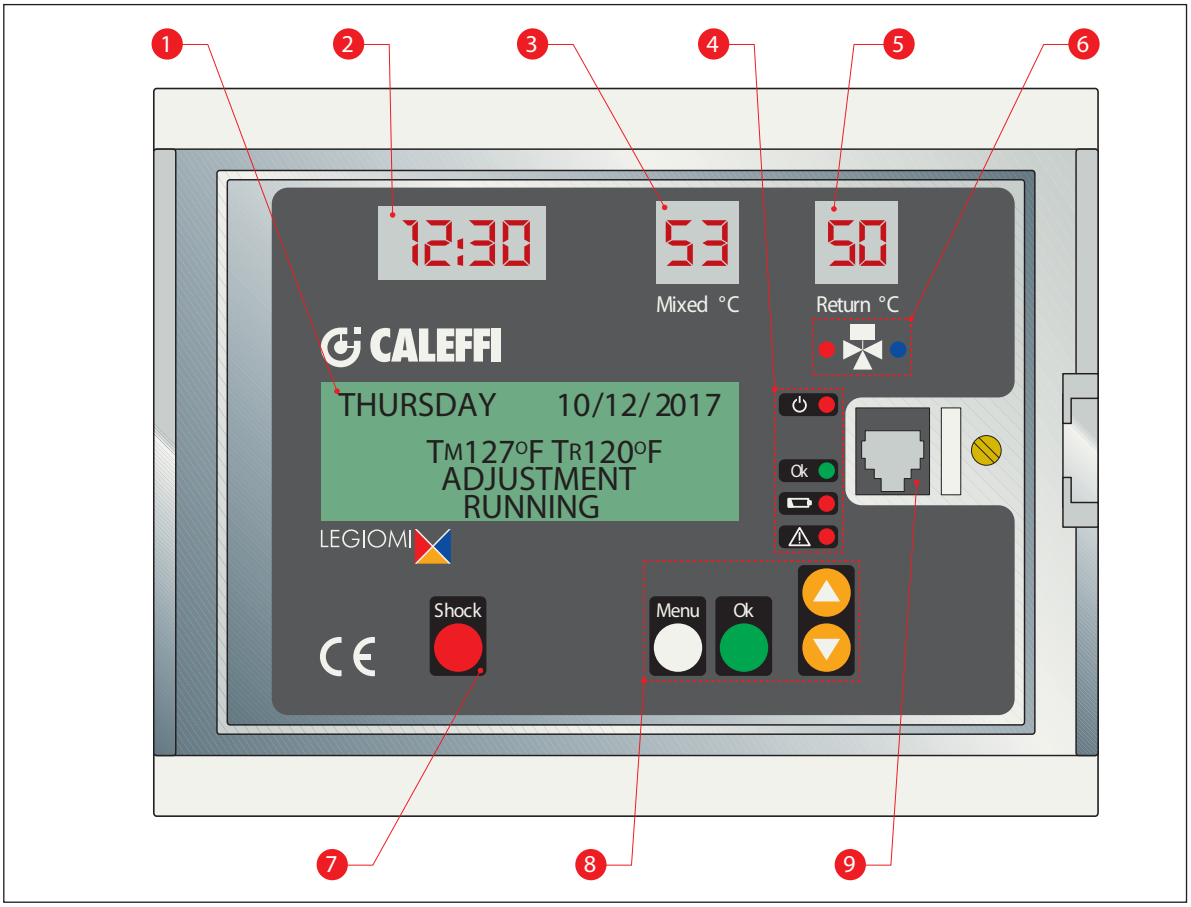
(1) To ensure stable operation and a ± 3° F accurate temperature control. Minimum flow rate is 0 gpm when recirculation flow rate is greater than or equal to the valve size minimum flow rating.
(2) Suggested maximum flow rate for optimum modulating control (at 7.5 psid pressure drop).
(3) Maximum recommended differential pressure is 20 psid to ensure stable operation and accurate temperature control.


Relay 4
Relay 3
Relay 2
Relay 1
Relay contacts
FLUSH VALVES (reduce temperature)
2nd THERMOSTAT (aquastat)
ALARM (unsuccessful disinfection cycle)
RECIRC PUMP (disinfection)
12:30
53
50
Mixed °C
Return °C
CALEFFI
THURSDAY
10/12/2011
TA20°F TR020°F
ADJUSTMENT
RUNNING
LEGIONX
Shock
Menu
Ok
OPTIONAL MODBUS/ BACNET GATEWAY
24 VAC
RELAY 1, 2, 3, 4
24 VAC FLOATING CONTROL
RS485 MODBUS 2-WIRE COMMUNICATION*
ETHERNET TO LAN
MIXED OUTLET WATER TEMPERATURE SENSOR
RETURN WATER TEMPERATURE STRAP-ON SENSOR
*RS485 ModBus is integral to the controller. It may be used directly and requires "mapping" by the user to access the data, OR, Optional gateway converts ModBus data to BACnet data, available to BAS (or any BACnet).

Back panel


To remove the electrical wiring base, turn it round and extract it from its housing.
Mixing valve fuse 1 A - 250 V delayed
Appliance fuse 80 mA - 250 V delayed
Closes
Common
Opens
Earth
Earth
Neutral
Live
Mixing valve
Electric supply 24 V
Relay 4
Relay 3
Relay 2
Relay 1
Relay contacts
PIN code disabling button
Reset button
Screw to close the front cover with hole for lead-sealing
Temperature sensor terminal
RS485 Interface terminal
Microswitch for enabling thermal shock function
RS485
Temperature sensors
Mixed outlet
Common
Return
Thermal shock activation
Shock enabled
Shock disabled (factory setting)
Battery
Battery connection
Battery connected
Battery disconnected
ON

Front panel



1. LCD display*
2. LED display: Time
3. LED display: Tmixed- Mixed Outlet water temperature (°C only)**
4. LED indicator

- ON

- Status OK
- Battery
- Alarm

5. LED display: Treturn - return water (recirculation) temperature (°C only)**
6. Mixing valve open/close LED
7. Thermal shock button
8. Navigation buttons
- Menu
- OK
- UP

- DOWN

9. RS 485 front connection

*Tmixed and Treturn is displayed, default °F. Can be changed to °C in settings (Cels.-Fahr.)
**Can be turned off in settings (LED Display).

Indication description

Indications on LED display

3 LED displays on the front of the controller show the clock time and termperature of the mixed outlet water temperature and return temperature sensors at all times.

Time (24 hr clock) | Mixed Outlet (°C) | Return (Recirc) (°C)

The default setting for the temperatures is OFF because the default engineering unit for temperature is ºF. Go to SETTINGS to change the units to ºC and turn on these displays. Also, if the recirculation sensor has been set as “not present” in SETTINGS, or is faulty in program 0, the related display remains OFF. Temperatures are in ºC only, and can not be changed to ºF.

Hour and minutes display (24 hour system)

Sensor temperature display (in ºC) Resolution 1 ºC

Sensor warning display “out of range” at top. (blinking)

Sensor warning display “out of range” at bottom. (blinking)

Sensor warning display “open”. (blinking)

Sensor warning display “short circuit”. (blinking)

LED indicators

The following LED indicators are located on the front of the controller:

Electric power supply LED: red LED: steadily ON when voltage is present.

Mixing valve LED:
-red LED: on when opening hot water.
-blue LED: on when opening cold water.

Controller OK status LED: green LED: steady ON when there are no faults or active alarms.

Faulty battery LED: red LED: on steady there is a battery fault; otherwise it is Off.

Generic Alarm LED: red LED: steadily ON when there is an alarm (sensor fault, thermal shock in progress, reset).

LCD indicators

Green backlit alphanumeric displays with 4 rows of 20 characters each, for setting parameters, scheduling operations, displaying error messages and machine status are on the front of the controller. Buttons on the front panel (“MENU”, “UP”. “DOWN”, and “OK”) can be used to scroll through the menu items to configure the controller, set various parameters and view the temperature log.

Operating status

Depending on the times and the programs that have been set, the controller may be in one of the following operating modes:

- **Adjustment;**
- **Disinfection;**
- **Flushing;**
- **Thermal shock** (this function has #1 priority over other modes)

In the event of trouble due to the LEGIOMIX or the system, the device manages and reports the alarm and, depending on the situation, may or may not maintain operation. Accordingly, a distinction is made between the following:

- Active with alarm
- Inactive with alarm

The LEGIOMIX is equipped with a rechargeable battery that keeps the clock working and maintains selected programmed settings during loss of power. In the event of blackout, to ensure the longest battery life, the controller assumes the status:

- Inactive on Low Power

Adjustment (modulation)- default mode

LEGIOMIX measures the temperature of the mixed water at the valve outlet with temperature sensor and adjusts (modulates) the mixing valve position to maintain the desired set temperature.

Disinfection

LEGIOMIX® runs the disinfection phase, which consists of raising the water temperature to a pre-set value for a specific time duration, by operating the mixing valve as required.

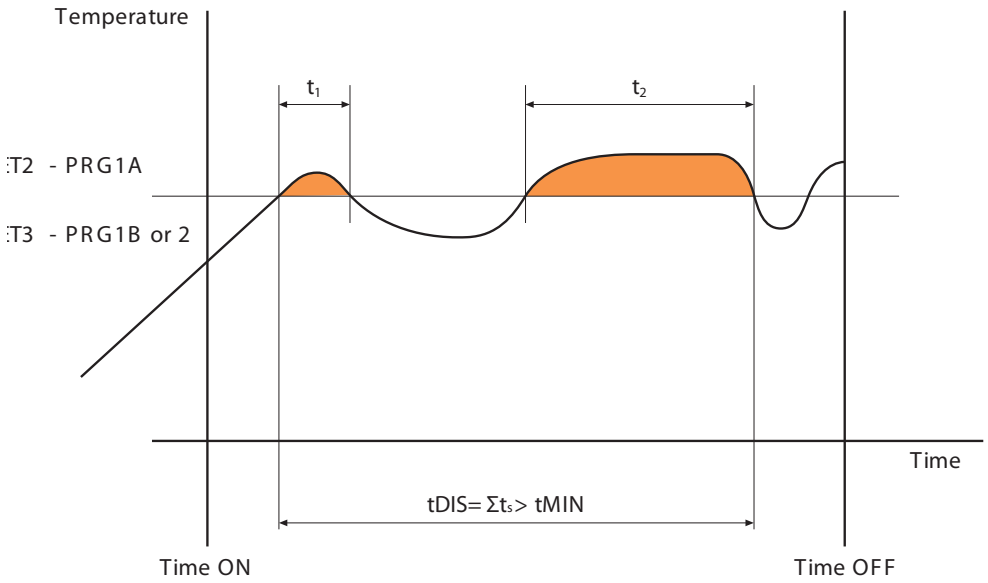
Using the menu, set the days of the week for the disinfection phase to run.

At the end of disinfection, statistical data relating to the just concluded disinfection are logged.

This mode begins and ends automatically at a start time (Time ON) and end time (Time OFF) that can be selected by the user in SETTINGS.

Safety measures must be in place before engaging disinfection mode. Anti-scald protection devices, certified to ASSE 1016 or ASSE 1070, at all downstream fixtures, must be installed.

CONFIRMING DISINFECTION



NOTE: Graph is for reference only, not shown on display or logged data.

If, within the time span (Time OFF - Time ON), the actual disinfection time reaches tDIS is greater than the set tMIN, the disinfection is concluded with a positive outcome. It automatically exits this status and returns to the adjustment (modulating) mode.

If the sufficient time tDIS is not reached, the disinfection phase ends at Time OFF.

Programs

The operation of the controller during disinfection can be set according to different programs, selected depending on the type of system and management of the system. Set the program, and the day and time to turn on and turn off disinfection, in parameters in SETTINGS.

Program 0

Features continuous mixed outlet water temperature modulation with automatic disinfection in a time band that can be set. Disinfection will run only when the Program Day (ProgDay) parameter has days selected (default is no days) and the TimeOn and TimeOff parameters are filled in (default is 00:00 for both). The return water temperature sensor is not used, but if present, it is used as a monitor only. During the disinfection phase, the mixed outlet water temperature must remain above SET2 for a time tDIS at least equal to tMIN, and if this occurs then disinfection has been successful. When this happens, disinfection then stops. If disinfection is not successful, there is no alarm signal. If alarm indication for unsuccessful disinfection is desired, use other programs.

Program 1A

Features continuous mixed outlet water temperature modulation with automatic disinfection in a time band that can be set. Disinfection will run only when the Program Day (ProgDay) parameter has days selected (default is no days) and the TimeOn and TimeOff parameters are filled in (default is 00:00 for both). The return water temperature sensor is not used, but if present, it is used as a monitor only. During the disinfection phase, the mixed outlet water temperature must remain above SET2 for a time tDIS at least equal to tMIN, and if this occurs then disinfection has been successful. When this happens, disinfection then stops. If the disinfection temperature is not reached or it cannot be maintained for a sufficient period of time, the alarm for unsuccessful disinfection is generated. The alarm is recorded in the log. The first time a button is pressed, the relay opens again. The other alarm indications are cleared at the next successful disinfection.

Program 1B

This program can only be set if the return water temperature sensor is set at present. Identical to the previous program (1A), the only difference is the successful outcome of the disinfection phase is checked via the return water temperature sensor in relation to SET3 instead of via the mixed outlet water temperature sensor in relation to SET2. As soon as conditions indicate successful disinfection, disinfection then stops. If the disinfection temperature is not reached or it cannot be maintained for a sufficient period of time, the alarm for unsuccessful disinfection is generated. The alarm is recorded in the log. The first time a button is pressed, the relay opens again. The other alarm indications are cleared at the next successful disinfection.

Program 2 (factory settings - default)

This program can only be set if the return water temperature sensor is used. By default, the disinfection is not enabled (no days are selected). If days are selected during commissioning, it is identical to the previous program (1B). The only difference is, if the return water temperature does not reach SET3 after a wait period (tWAIT) since the start of disinfection, the mixed outlet water temperature SET2 is increased by a value equal to (SET3 - TR reached), considering that SET2 can not in any case exceed the limit of SETMAX. This correction procedure (increasing only) of the disinfection SET is iterative: if necessary, it is repeated in the time span defined by the TimeOn and TimeOff at each time interval equal to tWAIT. As soon as conditions indicate successful disinfection, disinfection then stops. If the disinfection temperature is not reached or it cannot be maintained for a sufficient period of time, the alarm for unsuccessful disinfection is generated. The alarm is recorded in the log. The first time a button is pressed, the relay opens again. The other alarm indications are cleared at the next successful disinfection.

Thermal disinfection

The temperatures and corresponding disinfection times for the network must be chosen according to the type of system and the related intended use. The following criteria is generally followed, guided by.....

T = 160º F (70º C) for 10 minutes

T = 150º F (65º C) for 15 minutes

T = 140º F (60º C) for 30 minutes

Thermal disinfection is generally performed during times of reduced system usage, ie: nighttime. This minimizes the potential for scald conditions to occur. Thermal disinfection is recommended to be run every day and at least once per week.

Safety measures must be in place before engaging disinfection mode. Anti-scald protection devices, certified to ASSE 1016 or ASSE 1070, at all downstream fixtures, must be installed.

Interupting disinfection

Disinfection can be interupted while it is still in progress. On the working screen (showing the message “disinfection in progress”), press the OK button once. The display shows the message “Cancel disinfection?”; and at this point, the OK button can be pressed to stop the disinfection phase and return to the adjustment function (without going through the flush phase). If the OK button is not pressed, after a timeout of about 3 seconds, the display goes back to displaying the message “disinfection running”.

Table of thermal disinfection programs

Program # >	0	1A	1B	1B	2
type of confirmation	Adjustment and simple disinfection without confirming	Adjustment and disinfection confirming on the mixed outlet water temperature	Adjustment and disinfection check on return temperature to the central heating system	Continuous disinfection (max. 4 hours)	Adjustment only (default). If scheduled, disinfection confirming.
Use of return sensor	NO	NO	YES	YES	YES
Return sensor shown on LED display	As monitor only	As monitor only	YES	YES	YES
Adjustment temperature	Flow*: (SET1) 68 - 185º F	Flow*: (SET1) 68 - 185º F	Flow*: (SET1) 68 - 185º F	--	Flow*: (SET1) 68 - 1850º F
Disinfection temperature	Flow*: (SET2) 104 - 185º F	Flow*: (SET2) 104 - 185º F	Recirculation: (SET3) 104 - 185º F	Recirculation: (SET3) 104 - 185º F - 24 hours	Recirculation: (SET3) 104 - 1850º F - with adjustment of flow* up to the max value
Alarm if disinfection unsuccessful	NONE	YES	YES	YES	YES
Recording in log if disinfection unsuccessful	NONE	YES	YES	YES	YES

*mixed outlet water temperature

Flushing

LEGIOMIX automatically enters this mode at the end of the disinfection phase, and is used to make the water temperature return to the adjustment value (SET1 value) quicker, or to periodically clear (or flush) the storage of impurities. This phase is ended after a time selected with the tFLUX parameter. When flushing time has ended, relay 1, relay 4, and the controller returns to the “adjustment” mode.

Thermal shock

LEGIOMIX adjusts the mixed outlet water temperature at the set shock value (SETSH) for a selected time duration (tSH). The Shock button on the front of the controller can be used then to initiate thermal disinfection, the manual mode. This function is associated with activation of alarm 4 (AL4), and illumination of the alarm LED. Thermal shock can be started by pressing the specific button on the front panel (press and hold for at least 5 seconds) while the operating screen is displayed, or to program it with the menu item for a delayed execution (countdown in minutes), or by remote control.

Thermal shock operation can be stopped, if needed, by pressing the shock button and confirming with the “OK” button, or by remote control.

This is a potentially dangerous function so a jumper is provided on the printed circuit board to enable it. If the jumper is closed, the Shock function can be used; if it is open, it is not available (see Back Panel section).

At the end of the Thermal shock phase, the controller reverts to the “adjustment” (modulating) mode.

Low power

LEGIOMIX goes into low power mode with loss of power, and continues to run the internal date clock. NOTE: in this condition there is no power for switching relays, so the controller does not perform the adjustment or disinfection functions, sensor temperatures can not be acquired, and no communication functionality is available. The mixing valve remains in the last state when power went out. LCD and LED displays are off, all LEDs are off, except the “alarm” LED, which will be flashing.

When the power comes back on, the blackout is recorded in the log (alarm AL5) and the controller returns to operating mode as programmed, unless the power failure lasts long enough to completely run down the battery. In this case, LEGIOMIX will be reset to default values when the power is restored.

In the event of a reset or extended power failure, factory settings are restored. If modifying the factory settings, make a copy of the new settings.

ANTI-CLOG function

The LEGIOMIX controller is configured to execute a daily ball rotation cycle, to ensure efficient ball operation and cleaning. This occurs after the disinfection program concludes, if active, or in any case after 24 hours has elapsed when disinfection is not active. The ANTI-CLOG function can be deactivated through the ANTI-CLOG step in the “SETTINGS” menu by entering the release code 5566 and confirming with ON-OFF. Eliminating this function increases the risk of deposits forming on the moving parts of the valve.

If it is necessary to also eliminate the disinfection function, proceed in the following order: 1. eliminate the ANTI-CLOG function, then 2. eliminate the disinfection function.

Reset

On the back panel, there is a specific reset button, in case it is necessary to restore the initial settings.

If the date and time are not set after the reset, the controller will operate according to the factory default settings.

Actuation relays

The circuit board and terminals show the relay contacts used to manage auxiliary equipment and to report alarms.

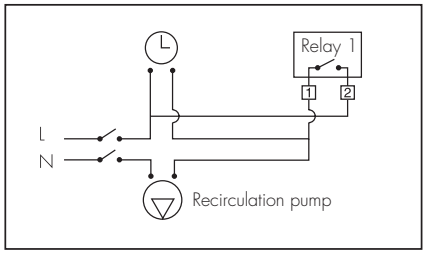
- Relay 1: Circulation pump (**active during disinfection**) connect Relay 1 in parallel to time clock or aquastat contacts (whatever switch is controlling recirculation pump).
- Relay 2: Generic alarm (sensor fault, battery fault, blackout or clock failure).
- Relay 3: Second thermostat. Wire in parallel to high temperature thermostat. Use to increase hot water supply temperature for thermal disinfection.
- Relay 4: Flushing valves

Summary of actuation relay status

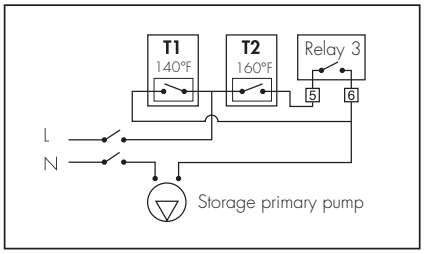
Operating Status	Adjustment	Disinfection	Flushing	Thermal shock
Relay	**Contact status**	**Contact status**	**Contact status**	**Contact status**
Relay 1: recirc pump	Open	Closed	Closed	Closed
Relay 2: generic alarm	Open	Open	Open	Closed
Relay 3: second thermostat	Open	Closed	Open	Closed
Relay 4: flush valves	Open	Open	Closed	Open

Relay contact for recirculation pump and second storage thermostat

Wiring diagram of relay 1 with a clock for managing the recirculation pump times.

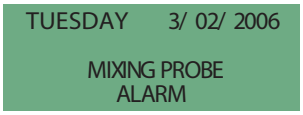


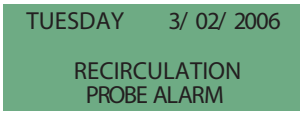
Wiring diagram of relay 3 for connecting the second thermostat on hot water storage.

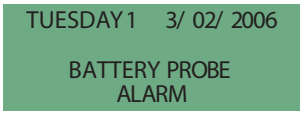


Alarm management

To make it easier to resolve any functional faults that occur after installation and commissioning, the controller is configured so that faults are indicated by special alarms and the appropriate action is taken. The cause of the alarm is shown on the LCD display. If the alarm does not inhibit all the functions, the alarm screen will alternate with controller status screen.







Alarm description

Alarm indicator	Description
AL1	Mixed outlet water temperature sensor fault
AL2	Return water temperature sensor fault
AL3	Disinfection failed
AL4	Thermal shock in progress
AL5	Main power failure
AL6	Controller reset
AL7	Battery default

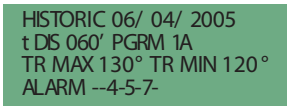
Depending on the alarm type, certain actions occur, relay statuses modified and information shown on the LED display, LCD display and LEDs on the front panel.

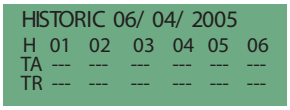
Log

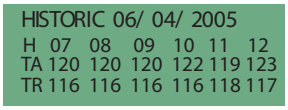
The “log” is a FIFO (First In - First Out) loop buffer that is continually updated and records parameters relating to adjustment and disinfection phases that occurred during the day. Data is stored for the last 40 days, after which the data for the first day is overwritten, etc.
The hourly average mixed outlet and return water temperatures are saved to Eeprom every hour, and alarms are saved at the time they occur. The average hourly values of the current day can be viewed at any time. The disinfection data is saved when disinfection ends. The log (via specific menu item) can be viewed on the display or remotely via the RS485 serial interface.

The parameters saved in the log are:
-Date (day, month, year)
-Set program. This is saved when disinfection starts.
-tDIS: actual disinfection time (in steps of minutes).
When the set program is 0 or 1A, this parameter is the time when the temperature of the mixed outlet water was above SET2.
When the set program is 1B or 2, this parameter is the time when the temperature of the return water was above SET3.
This is helpful when it is less than tMIN, to understand how much greater the span of TIME ON: TIME OFF should be to complete the disinfection.
-TRMAX: Max. temperature of the return water sensor during disinfection (if a disinfection was completed that day).
-TRMIN: Min. temperature of the return water sensor duriong disinfection (if a disinfection was completed that day). It is calculated from the time when the return water sensor measured a value greater than SET3, beginning from the time when the disinfection starts being effective.
-ALARMS AL1, AL2, AL3, AL4, AL5, AL6, AL7 if they were activated on the day in question.
-24 hourly average values of the mixed outlet water temperature.
-24 hourly average values of the return water temperature.

If no disinfection was completed on that day, then the related fields will contain a default value.
If there have been any faults in one or both sensors, the hourly average data will be represented by dashes. If there are any gaps or unavailable data due to a change of date, time, etc., the cells will contain a default value and will be represented on the display by dashes.







Remote control

The controller can be controlled from a remote computer with the RS485 serial output connection, which can be accessed by hard-wired terminals and through the connector on the front panel. Since the interface is the multipoint bus type it is necessary for each controller connected on the bus to be identified by an appropriate address to avoid identification conflicts. For a detailed description of the operations and controls that are available from a remote location using this interface, refer to the relevant documentation.

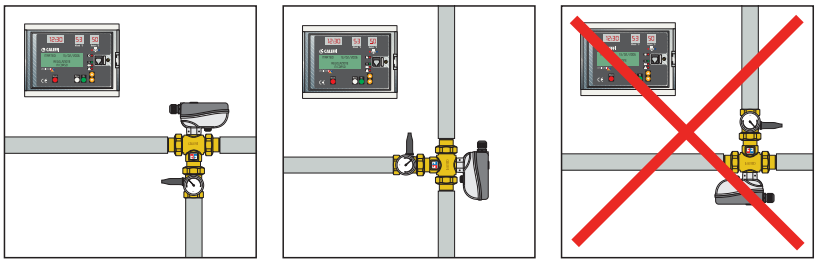
Contact Caleffi for list of registers (points) for mapping LEGIOMIX information to ModBus. Configuation, mapping, hardware (routers, modem, etc.), and software are customer/user responsibility. Code NA10520 Modbus-to-BACnet gateway is available separately for translating ModBus to BACnet.

Plumbing installation

Before installing the LEGIOMIX electronic mixing valve, pipes must be flushed to prevent impurities in the water from affecting performance. Always install strainers of appropriately sized capacity at the inlet from the water main supply. Caleffi LEGIOMIX electronic mixing valves must be installed as shown below, conforming to applicable codes, and installed either vertically or horizontally, but the actuator must never be oriented upside down.

To assure accurate mixed temperature control it is required to have constant flow through the valve, with similar pressures at each inlet, and a flow rate equal to or greater than the valve minimum flow requirement, see table on page 4.

The mixing valve body indicates with arrows, hot water inlet- red, cold water inlet - blue.



Check valve

To prevent backflow, check valves should be installed on the valve inlets if cold and hot inlet pressures are not the same at all times. Check valves, code NA10366 (for 1" and 1¼" LEGIOMIX) and NA10367 (for 1½" and 2" LEGIOMIX) may be used.

Commissioning

Due to the special purpose for electronic mixing valves, commissioning in accordance with current regulations and by qualified personnel using suitable instruments is required. Check that the hot and cold water supply pressures are within operating limits of the mixing valve, see technical specifications. Check the temperature of the hot water coming from storage, greater than or equal to 140°F (60°C). Record all parameters settings and measurements taken in the installation log book.

Maintenance

During service, regularly monitor the performance of the LEGIOMIX electronic mixing valve since any loss of performance may indicate maintenance is needed for the valve or the system. If the temperature of the mixed water is found to have changed significantly compared to previous recordings, refer to installation and commissioning sections. The following check points are recommended periodically, at least every 12 months or more frequently, to ensure that the valve continues to deliver optimum levels of performance:

1) Check and clean the filters installed in the system.

2) Check that any check valve installed at the inlet of the LEGIOMIX electronic mixing valve is functioning correctly, and there are no leaks caused by dirt.

3) The internal components of the valve can be descaled by immersing in a suitable descaling fluid.

4) Follow commissioning procedure again after maintainable components have been checked.

5) Record all operations conducted on system log book.

Accessories and replacement parts

Modbus-to BACnet gateway. Converts LEGIOMIX controller Modbus (RS-485 serial) output communication to BACnet IP (Ethernet) communication.

Code	Description	Lbs
755052	Modbus-to-BACnet gateway	1.2

Replacement actuator for LEGIOMIX valve body, ¾" to 2" sizes.

Code	Description	Lbs
645114	Replacement actuator	1.0

LEGIOMIX Body

Replacement body for LEGIOMIX valve body. Source fittings separately, see Caleffi catalog, fitting selection table.

Code	Description	Lbs
NA10615	Replacement body (1", 1¼")	1.0
NA10616	Replacement body (1½", 2")	1.5

Replacement temperature gauge.

Code	Description	Lbs
F69807	Fits all sizes	1.0

Inlet check valve assembly for installing on inlet union tail pieces of LEGIOMIX mixing valves, if required. Stainless steel body (no lead), acetal plastic check valve insert with NBR o-ring. Order separately, field installed. 2 required per valve.

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

Replacement controller for LEGIOMIX assembly.

Code	Description	Lbs
F0000962	Replacement controller	1.5

Replacement mixed outlet temperature sensor.

Code	Description	Lbs
F69807	Fits 1" and 1¼" valve	1.0

Replacement mixed outlet temperature sensor.

Code	Description	Lbs
F69804	Fits 1½" and 2" valve	1.0

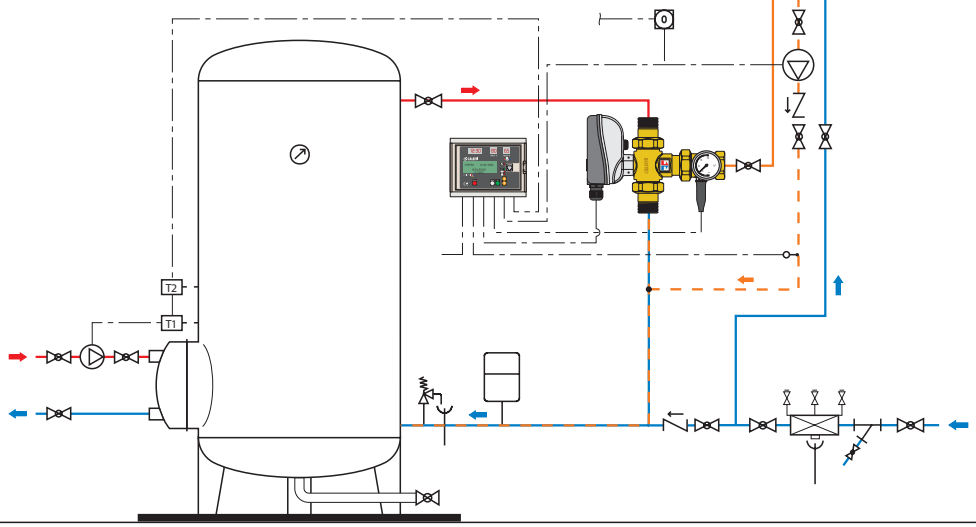
Replacement recirculation sensor.

Code	Description	Lbs
F69591	Fits all sizes	1.0

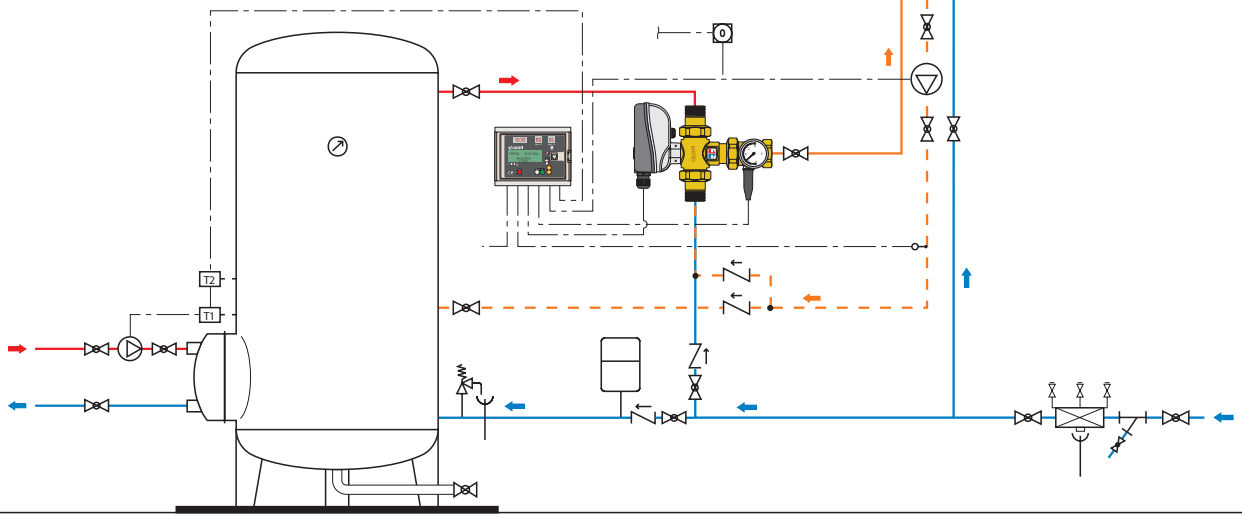
Application diagrams

- Check valve
- Ball valve
- Temperature gauge
- Backflow preventer
- Pump
- Expansion tank
- Thermostat
- Safety relief valve
- Strainer
- Clock

Domestic hot water system with no recirculation connection at storage tank



Domestic hot water system with recirculation connection at storage tank



Make sure there is sufficient constant recirculation flow to meet the valve minimum flow requirement, see table on page 7 (2.2 gpm for ¾"; 3.1 gpm for 1"; 4.4 gpm for 1¼"; 6.6 gpm for 1½"; 8.8 gpm for 2"; 17.0 gpm for 2½"; and 22.0 gpm for 3"). Flow less than minimum may cause valve hunting and fluctuating mixed temperatures.

NOTES

THE LEGIOMIX® 6000 SERIES POINT-OF-DISTRIBUTION (ASSE 1017) ELECTRONIC MIXING VALVE IS INTENDED TO BE BUT ONE COMPONENT IN AN OVERALL RISK MANAGEMENT PLAN AS DESCRIBED IN ANSI/ASHRAE STANDARD 188 “LEGIONELLOSIS: RISK MANAGEMENT FOR BUILDING WATER SYSTEMS”. WHEN INSTALLED AND USED AS DESIGNED AND INTENDED, THE LEGIOMIX® CAN HELP REDUCE BACTERIA IN DOMESTIC HOT WATER RECIRCULATION SYSTEMS, HOWEVER DUE TO SYSTEM-DEPENDENT VARIABLES, 100% ERADICATION CAN NOT BE GUARANTEED. CALEFFI IS NOT RESPONSIBLE FOR ANY DAMAGES, CONSEQUENTIAL OR OTHER, THAT MAY ARISE FROM LEGIONELLA ILLNESS WHEN USING THE LEGIOMIX® ELECTRONIC MIXING VALVE.

SPECIFICATION SUMMARIES

6000 series

Electronic mixing valve. ASSE 1017/CSA B125.3 certified by ICC-ES. **Valve body, union connections:** Threaded NPT male, sweat or press connections from ¾” to 2” with unions and tailpieces. DZR low-lead brass body (<0.25% lead content), meets requirements of IPC, IRC, UPC, NPC and ANSI/NSF 372-2011 certified by ICC-ES. Low-lead brass, chrome-plated ball, and peroxide-cured EPDM hydraulic seals. Maximum body pressure rating (static) 230 psi (16 bar). Maximum working pressure (dynamic) 150 psi (10 bar). Maximum inlet temperature 212°F (100°C). Complete with mixed outlet temperature gauge, 30°F to 210°F scale, 2 inch diameter. Flow ranges: ¾ inch: Cv 9.7, 2.2 to 43 gpm (8.3 to 172 lpm); 1 inch: Cv 21, 3.1 to 94 gpm (11.7 to 356 lpm); 1 ¼ inch: Cv 24, 4.4 to 107 gpm (16.6 to 405 lpm); 1 ½ inch: Cv 34, 6.6 to 152 gpm (25 to 575 lpm); 2 inch: Cv 48, 8.8 to 215 gpm (33.3 to 814 lpm). **Valve body, flanged connections:** ANSI B16.5 150 CLASS RF flange connections from 2½” to 3” sizes. DZR low-lead brass body (<0.25% lead content), meets requirements of IPC, IRC, UPC, NPC and ANSI/NSF 372-2011 certified by ICC-ES. 316 stainless steel ball, galvanized carbon steel slip-on flanges and peroxide-cured EPDM hydraulic seals. Maximum body pressure rating (static) 230 psi (16 bar). Maximum working pressure (dynamic) 150 psi (10 bar). Maximum inlet temperature 212°F (100°C). Complete with mixed outlet temperature gauge, 30°F to 210°F scale, 2 inch diameter. Flow ranges: 2½ inch: Cv 105, 17 to 470 gpm (64 to 1,780 lpm); 3 inch: Cv 120, 22 to 537 gpm (83.3 to 2,033 lpm). **Actuator:** 3-wire floating fail-in-place with intergral position indicator, electric supply 24 VAC - 50/60 Hz direct from controller. Power consumption 6 VA. Self-extinguishing VO cover, protection class IP65 (NEMA 4/4X). Ambient temperature range 14°F to 130°F (-10°C to 55°C). Supply cable length 31½" (0.8 m). **Mixing valve:** Maximum recommended operating differential pressure (dynamic) 20 psi (1.4 bar). Maximum inlet pressure ratio (H/C or C/H) 2.1. Temperature stability ± 3°F (± 2°C). Maximum water hardness: 10 grains. **Controller:** Electric supply 24 VAC - 50/60 Hz. Power consumption 6.5 VA. Adjustment temperature setting range 70°F to 185°F (20°C to 85°C), Disinfection temperature range 100 to 185°F (40 to 85°C). Ambient temperature range 32°F to 120°F (0°C to 50°C). Self-extinguishing ABS, color white RAL 1467 housing, self-extinguising SAN, smoked transparent cover, protection class IP 54 (wall mounting) Class II appliance. CE and FCC part 15 approvals. Choice of 11 languages with set of programs for selectable automatic scheduling circuit thermal disinfection to kill Legionella, configurable via keypad, or local or remote controller; with additional functions of daily ball rotation cycle to flush debris, flush valve relay output, data logging (40 day FIFO loop buffer), alarming, and status indication. Provided with two NTC element 10,000 ohm stainless steel temperature sensors for mixed outlet water temperature and return water temperature, strap-on style, for recirculation; and 115 / 24 VAC transformer.

Provide with optional stainless steel inlet port check valve assembly with a acetal plastic check valve insert and NBR o-ring, field installed, code NA10366 (1 inch and 1¼ inch), NA10367 (1½ inch and 2 inch). Provide with Modbus-to-BACnet gateway for BAS integration, code NA10520.

6000AS Series

Electronic mixing station. Pre-piped Caleffi 6000 series 3-way mixing valve with union connections, serviceable low-lead stainless steel check valves, a recirculation connection and low-lead brass isolation valves. The controller is pre-mounted and pre-wired with return water temperature sensor, in a packaged wall mount configuration with steel uni-strut frame to bolt to wall through any of the perforations. Includes copper type L pipe and a 24 VAC transformer. Copper connections for mixed water outlet, recirculation return, hot water inlet, cold water inlet and return to storage, 1" to 2".

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

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