

Hybrid electronic mixing valve LEGIOMIX® 2.0



6000 EST series



Function

The electronic hybrid mixing valve combines the typical function of the mechanical thermostatic mixing valve and the management efficiency of an electronic mixing valve in a single device. The thermostatic mixing valve responds promptly to any variation in temperature, pressure and inlet flow rate to quickly restore the mixed water temperature value at the outlet. This standard mixing valve is effectively handled by a motorised actuator that, under the control of a specific regulator, changes the mixed water temperature set position.

The electronic regulator, directly on the actuator, allows the mixed water temperature control according to different functional programs, both for normal control and for the thermal disinfection for the prevention of Legionella. An optional memory system allows continuous recording of flow temperature, return temperature, alarm and functional statuses, useful for monitoring the operating status of the entire system.

Appropriate relays are used to manage the alarms and external appliances, for example for loading accumulation hot water and switching on/off the recirculation pump. The regulator is fitted for remote control with specific MODBUS transmission protocols, through optional board, for use in Building Management Systems (BMS).



Product range

6000 EST series Hybrid electronic mixing valve — Sizes DN 15 (1/2"), DN 20 (3/4"), DN 25 (1"), DN 32 (1 1/4"), DN 40 (1 1/2"), DN 50 (2") M with union

Technical specifications

Valve body

Materials:	
Body:	dezincification resistant alloy CR EN 1982 CC770S
Obturator:	PPSG40
Hydraulic seals:	EPDM
Spring:	stainless steel EN 10270-3 (AISI 302)
Temperature gauge scale:	0–120°C
Connections:	1/2"–2" M (ISO 10226-2) with union

Regulator-actuator

Material:	
Housing:	PA6G30 anti-UV black
Covers:	PA6G30 anti-UV black
Electric supply:	230 V (ac) 50/60 Hz
Power consumption:	6,5 VA
Adjustment temperature range:	35–65°C
Disinfection temperature range:	50–85°C

Ambient temperature range:

- Transportation:	-30–70°C EN 60721-3-2 Cl. 2K3 max. humidity 95%
- Operation:	0–50°C EN 60721-3-3 Cl. 3K3 max. humidity 85%
- Storage:	-20–70°C EN 60721-3-1 Cl. 1K3 max. humidity 95%
Protection class:	IP 54
Contact rating:	
- Relay OUT1, OUT2, OUT3:	5(2) A / 250 V
- Digital inputs:	without potential

Fuses:	self-resettable non-replaceable (only for control unit)
Battery:	CR2032 225 mAh - life approximately 1 year (for only keeping date and time in the absence of network)
Optional battery:	AA Lithium - duration about 10 years (for only keeping date and time in the absence of network)

Conforms to Directives:	CE
Insulation class:	Class II

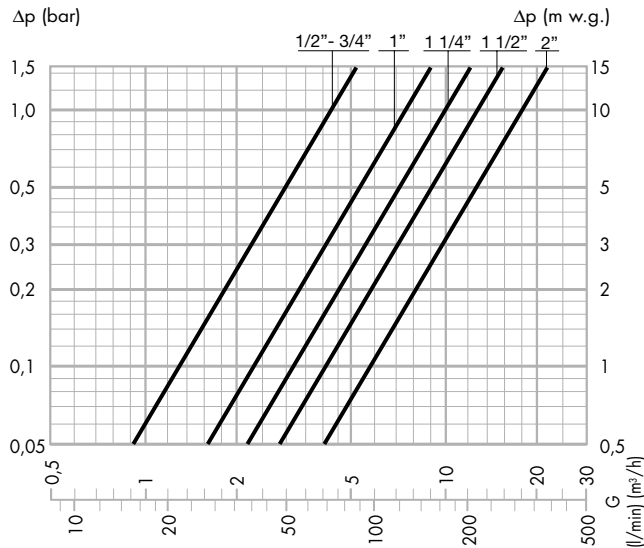
Temperature probes

Body material:	stainless steel
Type of sensitive element:	NTC
Working temperature range:	-10–125°C
Resistance:	10000 Ohm at 25°C
Time constant:	2,5
Max. distance for flow or recirculation probe:	150 m cable 2x1 250 m cable 2x1,5

Mixing valve performance

Accuracy:	± 2°C
Maximum working pressure (static):	10 bar
Max. working pressure (dynamic):	5 bar
Max. inlet pressure ratio (H/C or C/H):	2:1
Maximum inlet temperature:	90°C
Temperature gauge scale:	0–120°C

Hydraulic characteristics

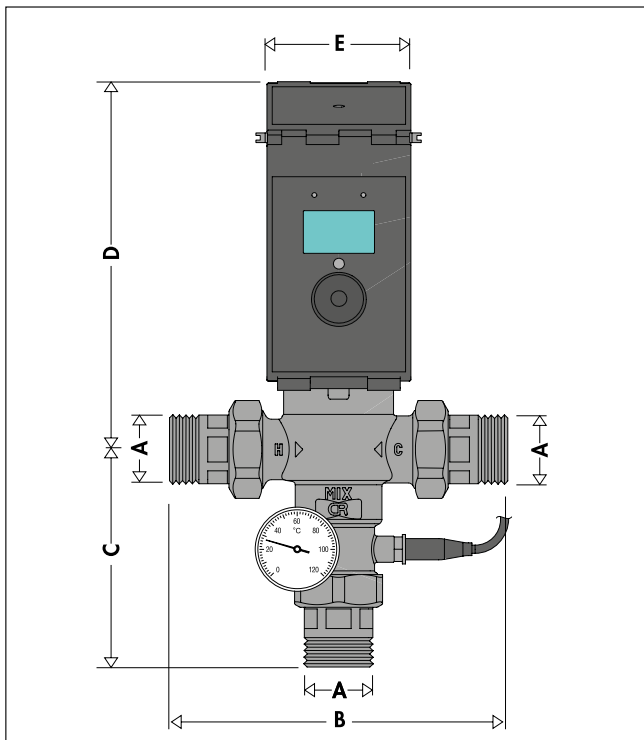


Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Kv (m³/h)	4,3	4,3	7,6	10,0	13,0	18,0

Recommended FLOW RATES to ensure stable operation and an accuracy of ± 2°C

Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Min (m³/h)	0,6	0,6	1,2	1,5	1,5	2,0
Max (m³/h)	5,3	5,3	9,3	12,5	16,0	22,1

Dimensions



Code	DN	A	B	C	D	E	Mass (kg)
600045	15	1/2"	157	130,5	217	88	3,0
600055	20	3/4"	157	130,5	217	88	3,0
600065	25	1"	209	134	220,5	88	4,1
600075	32	1 1/4"	209	134	220,5	88	4,7
600085	40	1 1/2"	242	159	224,5	88	5,5
600095	50	2"	262	179	229,5	88	6,2

Legionella - temperature of distribution

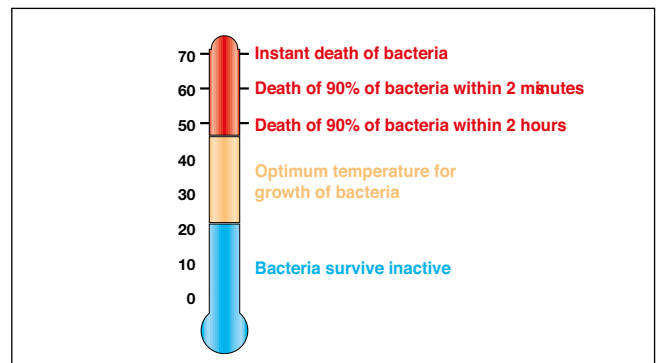
In central systems that produce hot water with storage for domestic purposes, in order to prevent the proliferation of dangerous Legionella bacteria, the hot water must be stored at a temperature of at least 60°C. At this temperature it is certain that the proliferation of the bacteria that cause Legionnaire's disease will be totally inhibited. These temperatures, however, are too high to be able to be used directly by the consumer. It is therefore necessary to reduce the temperature of the hot water distributed to the user to a lower value suitable for use. Moreover, not only the storage but also the entire distribution network requires thermal disinfection at regular intervals. Otherwise the bacteria would develop quickly in there too.

In view of the above, it is therefore necessary to use an electronic mixing valve able to:

- reduce the temperature of the distributed water to an adjustable value which is lower than the storage temperature
- keep the mixed water temperature constant despite any variation in inlet temperature and pressure, or in the drawn-off flow rate.
- allow programming thermal disinfection with a higher temperature than the adjustment value, in the necessary time and in periods with less frequent consumption (nighttime).
- it allows remote monitoring and management of the domestic hot water distribution system, ensuring its functional status with continuous recording of the temperature reached.

Thermal disinfection

The diagram below shows the behaviour of Legionella Pneumophila bacteria as the temperature conditions of the water containing the bacteria vary, in laboratory cultures.



To ensure correct thermal disinfection, it is necessary to go up to values of at least 60°C.

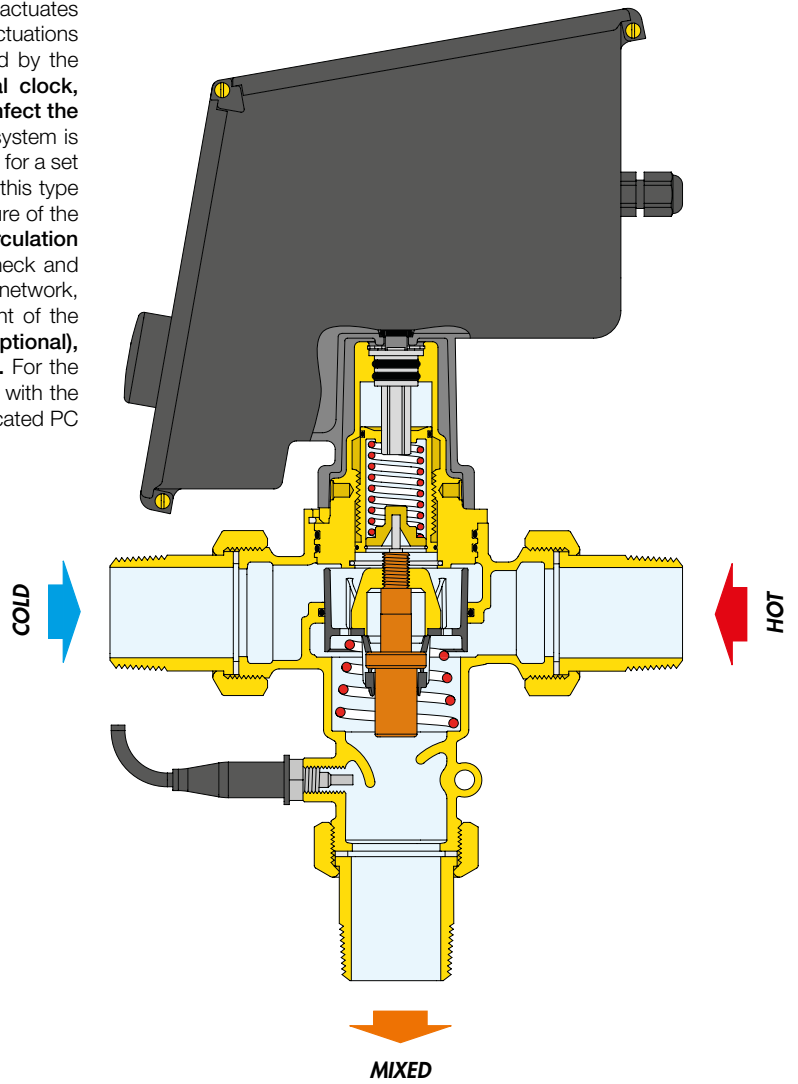
Applications

The electronic mixing valve is typically used in central systems serving hospitals, nursing homes, sports centres, shopping centres, hotels, campsites and boarding schools. In these structures with their collective use, it is more than ever necessary to control and prevent legionnaire's disease in a programmed manner, managing the disinfection times in the best possible way.

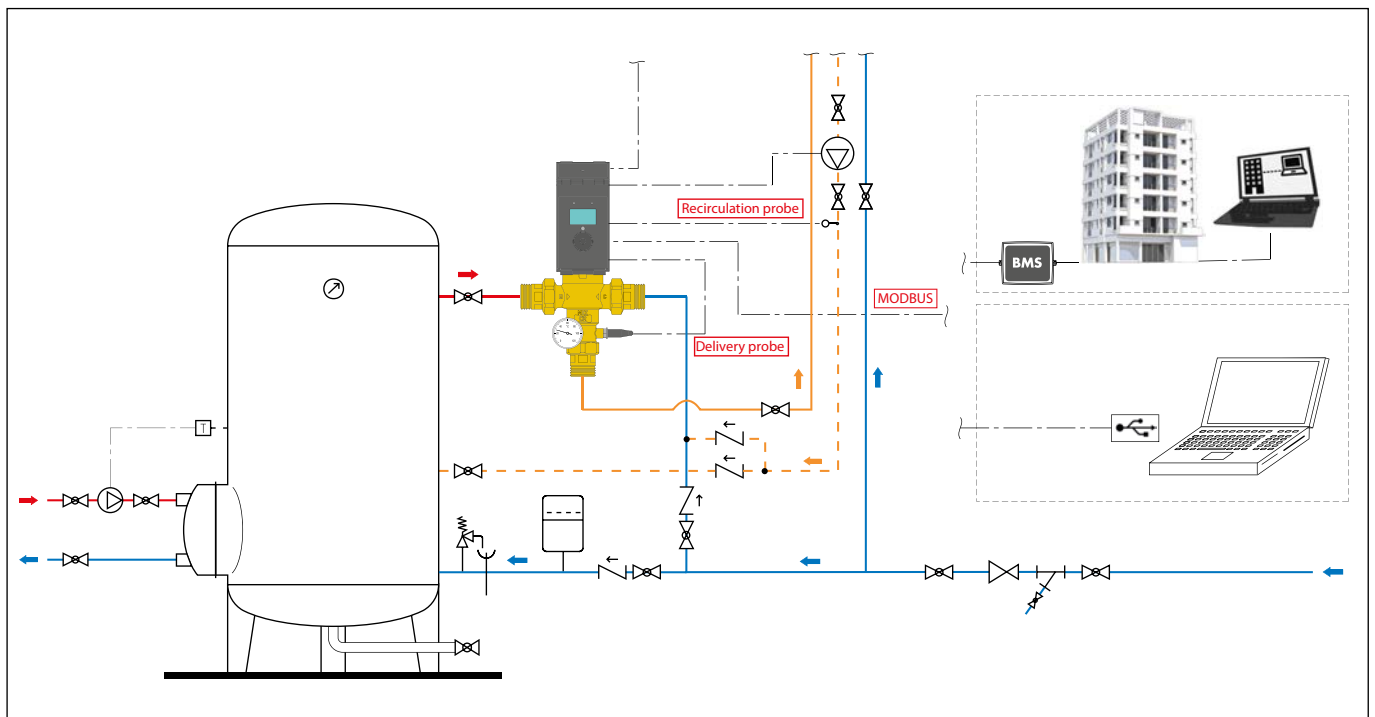
These systems increasingly require remote control and continuous temperature adjustment for the best guarantee of effective functionality.

Operating principle

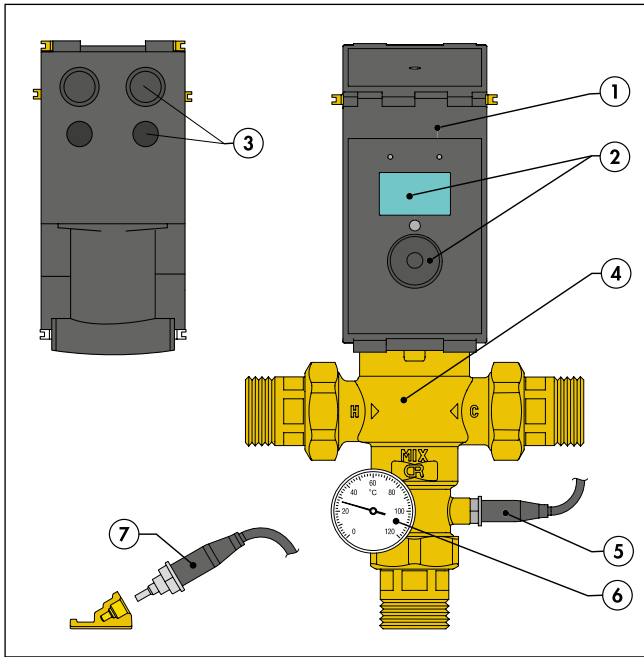
At the inlets the mixing valve has the hot water from the storage and the cold water from the water mains. At the outlet there is the flow mixed water. By means of a specific probe, the regulator measures the temperature of the mixed water at the valve outlet and actuates an obturator in order to maintain the setting. Temperature fluctuations caused by flow rate or pressure variations are compensated by the thermostat in the valve. **The device has a built-in digital clock, which can be used to set anti-legionella programs to disinfect the water system and to manage a recirculation pump.** The system is disinfected by raising the water temperature to a specific value for a set time duration. For **the best thermal disinfection control**, in this type of system it may also be necessary to measure the temperature of the water returning from the distribution network, **using the recirculation probe.** When this measurement is available, it is used to check and **control the temperature reached over all or part of the network**, since the probe may be located at a significant remote point of the system. The device is equipped with **RS-485 interface (optional), with MODBUS protocol, for readouts and remote setting.** For the device use, it is necessary to configure the MODBUS system with the addresses of the registers used by the device of use the dedicated PC software available.



Application diagram



Characteristic components



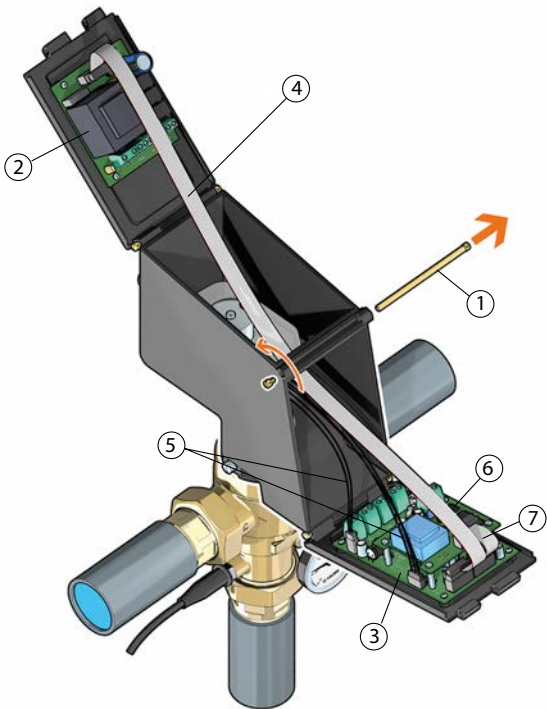
- 1 Digital regulator with actuator in single casing
- 2 Control knob and LCD display
- 3 Fitted for cable seals and cable glands, with holes
- 4 Valve body
- 5 Mixed water temperature probe
- 6 Mixed water temperature gauge
- 7 System return temperature probe and probe holder

Electronic boards description

There are two circuit boards on the device. On the CS176 board there are the electric supply and relay contacts, but in the second board (CS180) there are the contacts for the probe connections and the disinfection start/end or thermal shock inputs. There is a CS179 board (optional) for data transmission, with which is used to manage the device remotely.

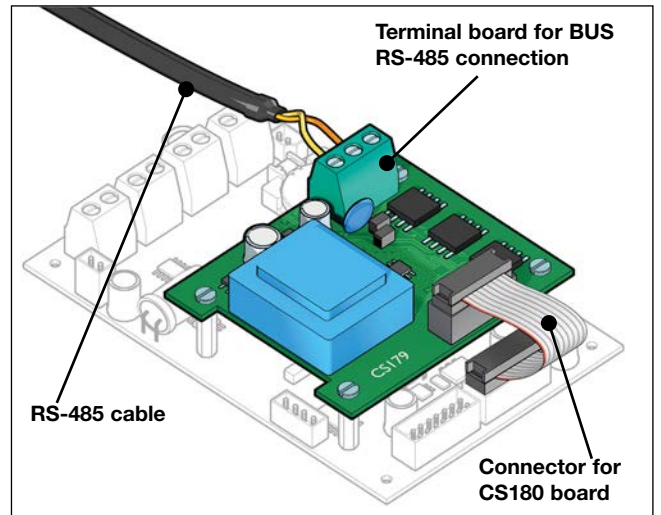
Log

The device, through the data transmission board CS179 (optional) allows recording the flow temperature, return temperature, alarms and functional statuses, useful for monitoring the operation status of the device. It will then be possible to export the data from the device through a PC interface. In addition, there is a failed disinfection menu on the device (the last 10 disinfections that have not been completed correctly are stored). The device is fitted for remote control with specific MODBUS transmission protocols, for use in Building Management Systems (BMS).



- 1 Actuator-regulator opening/closing pin
- 2 Power supply board (CS176)
- 3 Control board (CS180)
- 4 Multi-pole cable for board connection*
- 5 Motor connection cables*
- 6 RS-485 Interface board (CS179) (OPTIONAL)
- 7 RS-485 Interface connection cable (OPTIONAL)

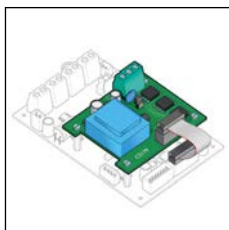
* already assembled in factory



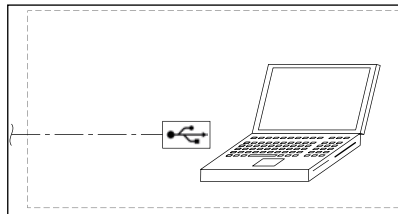


Code 60001 - Optional board CS179 and logs

By installing the CS179 board on the device, it will be possible to manage the device through a specific MODBUS transmission protocol for use in Building Management Systems (BMS). The package includes the optional CS179 board, CS180 board connection cable and logs.



REGISTRI IN LETTURA	DESCRIZIONE
0000	...
0001	...
0002	...
0003	...
0004	...
0005	...
0006	...
0007	...
0008	...
0009	...
0010	...
0011	...
0012	...
0013	...
0014	...
0015	...
0016	...
0017	...
0018	...
0019	...
0020	...
0021	...
0022	...
0023	...
0024	...
0025	...
0026	...
0027	...
0028	...
0029	...
0030	...
0031	...
0032	...
0033	...
0034	...
0035	...
0036	...
0037	...
0038	...
0039	...
0040	...
0041	...
0042	...
0043	...
0044	...
0045	...
0046	...
0047	...
0048	...
0049	...
0050	...
0051	...
0052	...
0053	...
0054	...
0055	...
0056	...
0057	...
0058	...
0059	...
0060	...
0061	...
0062	...
0063	...
0064	...
0065	...
0066	...
0067	...
0068	...
0069	...
0070	...
0071	...
0072	...
0073	...
0074	...
0075	...
0076	...
0077	...
0078	...
0079	...
0080	...
0081	...
0082	...
0083	...
0084	...
0085	...
0086	...
0087	...
0088	...
0089	...
0090	...
0091	...
0092	...
0093	...
0094	...
0095	...
0096	...
0097	...
0098	...
0099	...



Code 60002 - RS485 USB Cable and Caleffi Software

Using the cable with RS485 USB interface and the Caleffi Software included in the package, it is possible to manage the device from PC.



Operating status

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

- Regulation
- Disinfection
- Thermal shock*
- Zero and full scale acquisition

*(this function has priority over the disinfection/regulation).

In the event of anomalies, the device manages and signals an alarm trying to set into a safety condition for the user. The device is equipped with a non-rechargeable battery that keeps the clock working in the event of electric supply failure.

Regulation

The electronics must adjust the flow temperature through the actuator in order to reach the working set-point. The electronic actuator adjusts the flow so as to have a temperature centered in a suitable working range, within which the fine and dynamic adjustment is made by the thermostat. The water mixing temperature is set through the regulator. The management system always checks in real time the flow temperature detected by the probe: if the flow temperature deviates excessively from the set value, a correction is made through the electric motor. In the case of installation with a return probe present, it is not used for the water mixing temperature adjustment.

Disinfection

In this mode, the device performs thermal disinfection, which consists in raising the mixed water temperature for a defined period of time.

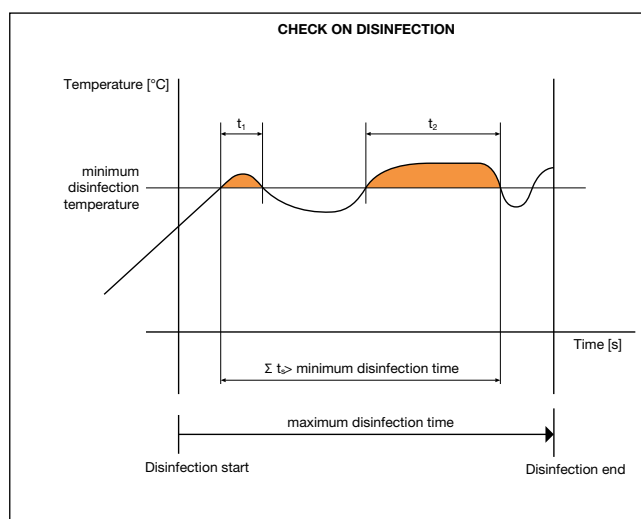
The following can be set:

- Days of the week for performing the disinfection
- Minimum disinfection temperature
- Disinfection start time
- Minimum stay time above the minimum disinfection temperature in order to evaluate the successful outcome of the disinfection
- Maximum time within which it is possible to perform the disinfection

The disinfection can be:

- Programmed: it starts in the days and hours set
- Activated through the control: it can be controlled by the device from the "Controls submenu" or remotely through optional board
- Activated by IN1 inlet

The disinfection in progress OUT3 relay and the recirculation pump management OUT2 relay are always activated during the disinfection. If the disinfection temperature does not last for sufficient time and the maximum available time is exceeded, the disinfection will be considered as failed by signalling the relevant alarm.



Thermal shock

The thermal shock mode can be controlled by the device from the "Controls sub-menu" or remotely through optional board

In this mode, the device raises the flow temperature to the set value for a certain period of time. The disinfection in progress OUT3 relay and the recirculation pump management OUT2 relay are always activated during the thermal shock.

Zero and full scale acquisition

In the zero acquisition mode, the device totally closes the adjusting screw to check the correct phasing between the motor and the valve. In full scale acquisition mode, the device fully opens the adjusting screw so it can check all the stroke (potentially hazardous condition indicate with fixed red LED). The zero and full scale acquisition controls are activated during the installation or after the "Reset alarms" control.

Reset

In the menu there is a special control to reset to the initial conditions. The history is not reset.

Test

The device performs full strokes in order to check that there are no obstructions during the motor opening and closing strokes. It is possible to interrupt the test function at any time pressing the control knob.

Disinfection programs:

Different programs can be set, chosen according to the type of system and its management:

Disinfection type with flow probe T1 enabled	
Disinfection Code	Description
d1	Disinfection performed at maximum available flow temperature, limited to the system maximum temperature set (T1 Hi). Disinfection check performed on probe T1.
d2	Disinfection performed at the minimum disinfection temperature (diS °C). Disinfection check performed on probe T1.

Disinfection type with recirculation probe T2 enabled	
Disinfection Code	Description
d1	Disinfection performed at maximum available flow temperature, limited to the system maximum temperature set (T1 Hi). Disinfection check performed on probe T2.
d2 (default)	Disinfection at the flow temperature calculated according to the return temperature T2. Disinfection check performed on probe T2.

Disinfection is considered successful when the temperature of the probe enabled remains above the minimum disinfection temperature (diS °C) for a minimum set time (tmin diS) within a maximum time limit (tHi diS).

ECO FUNCTION	
The ECO function does not take into account the minimum disinfection time, but calculates it based on the actual temperatures according to the following table. If the temperature drops below 60°C, counting starts from the beginning.	
Temperature [°C]	Time [min]
60	36
65	18
70	12
The ECO function is applicable to all disinfection modes, before using this mode, it is necessary to check that the proposed disinfection times are in accordance with the regulations in force in the country of installation.	

Example with ECO function disabled.

Disinfection code: d1
 Flow temperature = Maximum available temperature
 Minimum disinfection time = minimum disinfection time at a temperature diS °C = 30'

Disinfection is considered successful when: $\sum t_i \geq t_{min\ diS}$

Example with ECO function enabled.

Disinfection code: d1 - ECO function
 Flow temperature = Maximum available temperature
 Minimum disinfection time = automatic check

Area where time is counted

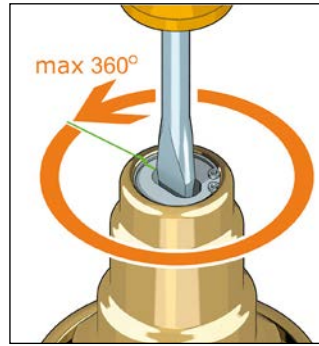
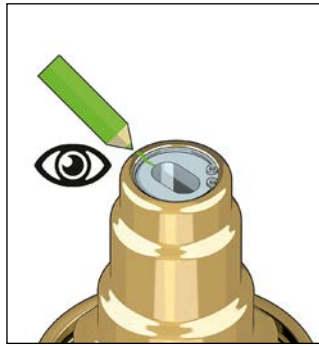
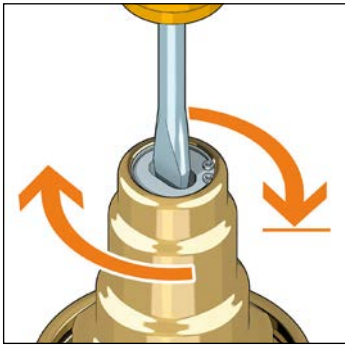
When the temperature drops below 60°C, the countdown stops and resumes from zero when it returns above this value.

Disinfection is considered successful when the following conditions are continuously respected:

- Flow temperature $\geq 60^\circ\text{C}$ \rightarrow minimum time = 36'
- Flow temperature $\geq 65^\circ\text{C}$ \rightarrow minimum time = 18'
- Flow temperature $\geq 70^\circ\text{C}$ \rightarrow minimum time = 12'

Thermostatic function ensured

In case of motor failure or power failure, the device is able to guarantee the temperature adjustment through the thermostatic element. To ensure thermostatic adjustment, it is necessary to perform the following operations:

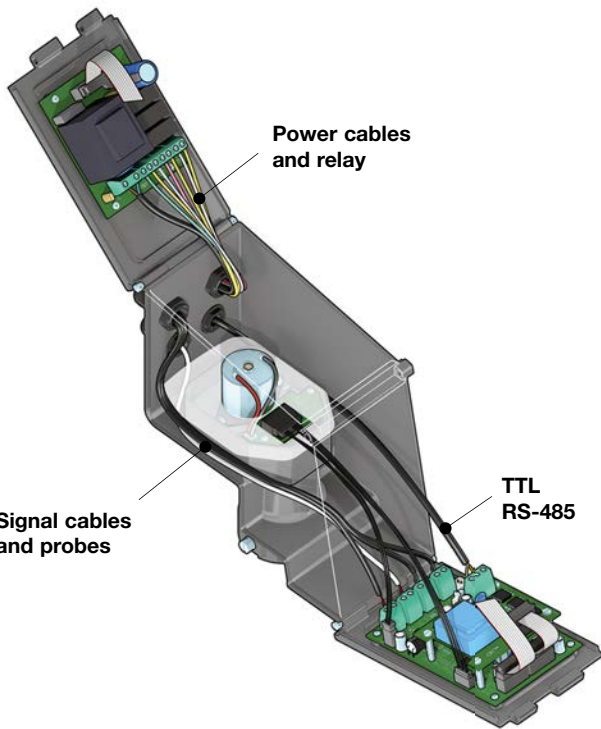


- Screw up to stop (clockwise)
- Make a reference
- Adjust the desired set point reading the temperature using suitable instruments (make a maximum of 1 turn).

The device is also able to ensure the thermal closing function, i.e. in case of failure of the cold water supply, the mixing valve immediately shuts off the flow of hot water. Also in case of failure of the hot water supply, the device shuts off the cold water port and thus the outlet mixed water (in order to prevent thermal shocks to the equipment).

Cables wiring and positioning

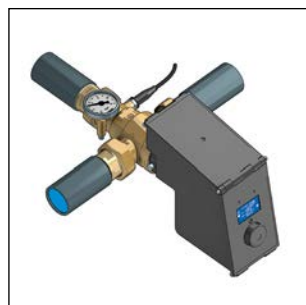
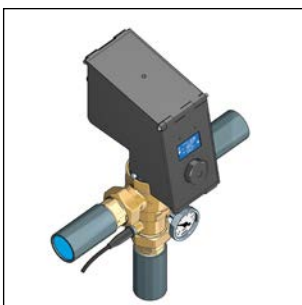
This image shows an example of a possible cable layout and their passage through the cable seals and cable glands included in the supply.



Connections layout: connections must not create thrust stresses on the circuit board.

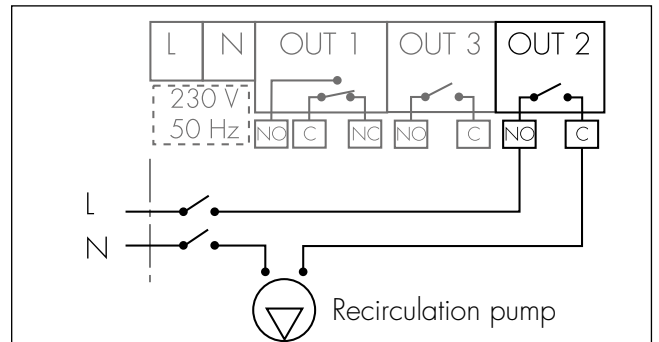
Facilitated positioning

To facilitate reading the display, it is possible to change the panels positioning depending on the different installations. For correct inversion see f.i. H0002123.

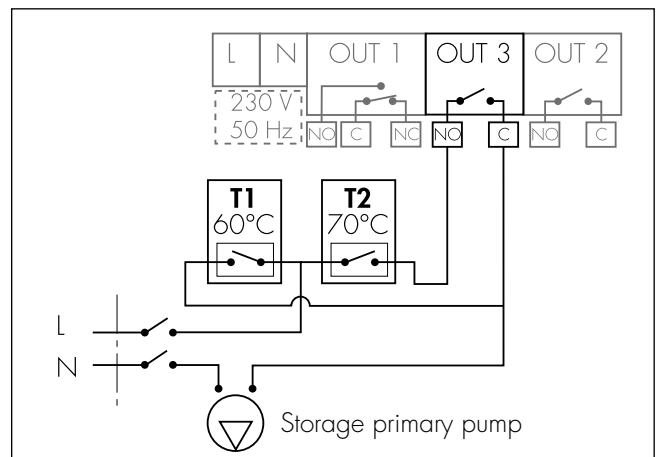


Relay contact for recirculation pump and second storage thermostat and alarm management

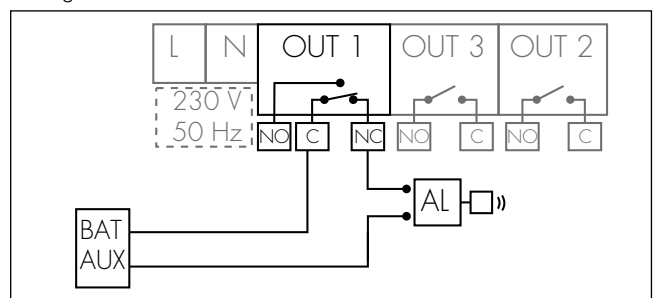
Here following the wiring diagram of the OUT 2 relay for managing the recirculation pump. The device incorporates a digital clock used to manage a recirculating pump according to pre-set time slots.



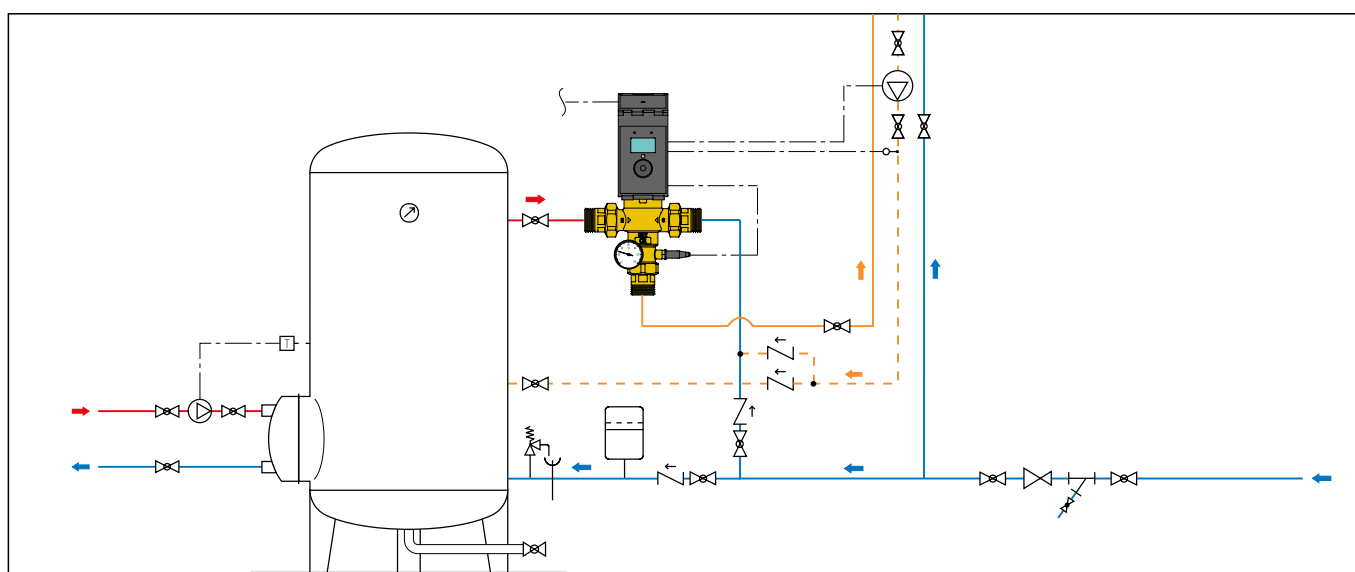
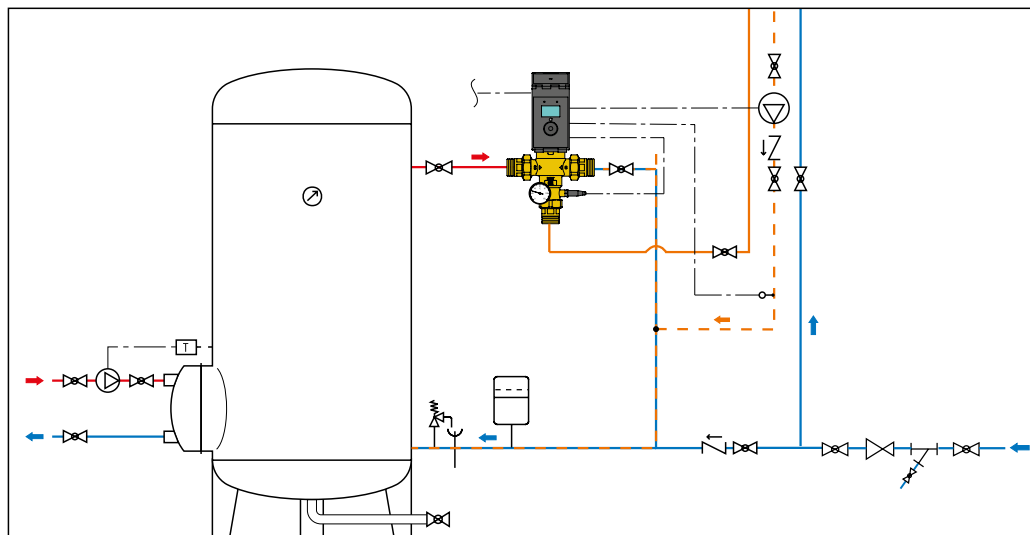
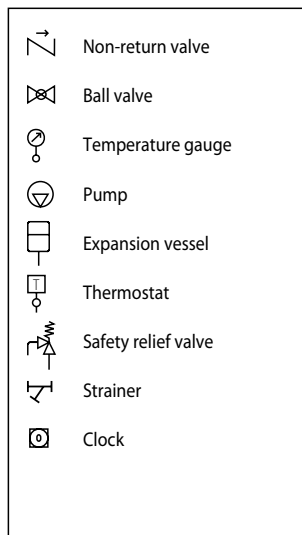
Here following the wiring diagram of the OUT 3 relay for connection to the second storage thermostat.



Here following the wiring diagram of the OUT 1 relay for alarm management.



Application diagrams



SPECIFICATION SUMMARIES

6000 EST series LEGIOMIX® 2.0

Electronic hybrid mixing valve with programmable thermal disinfection. Consisting of: Valve body. Hot and cold water connections threaded 1/2" M (from 1/2" to 2"), with union, mixed water connection 1/2" F (from 1/2" to 2") Dezincification resistant alloy body. PPSG40 obturator. EPDM hydraulic seals. Regulator-actuator. Housing and covers in PAG6G30 anti-UV black. Electric supply 230 V (ac)-50/60 Hz. Running power consumption 6,5 VA. Protection class IP 54. Adjustment temperature range 35–65°C. Disinfection temperature range 50–85°C. Mixing valve. Maximum working pressure (dynamic) 5 bar. Maximum working pressure (static) 10 bar. Maximum inlet temperature 90°C. Temperature gauge scale 0–120°C. Accuracy ±2°C. Maximum inlet pressure ratio (H/C or C/H) with G = 0,5 Kv, 2:1. Conforms to EC directives.

600001

Optional board with logs.

600002

RS-485/USB cable Cable and Caleffi Software.

We reserve the right to make changes and improvements to the products and related data in this publication, at any time and without prior notice.