Temperature regulating unit

series 152 - 153

01082/03 GB

Function

The temperature regulating unit is designed to guarantee the correct contribution of heating energy required by the user, by measuring the outside and room temperature values to regulate the correct system flow temperature.

It is supplied complete with:
4-way mixing valve, servomotor, pump, flow temperature sensor, outside temperature sensor, temperature controller, flow and return thermometers and unions for connecting to the primary and secondary circuits.
The unit is designed for connection for remote data transmission.
This unit solves the problems of installation of regulating components in modern small and medium-sized systems, due to its compact size and ease of use.

The unit is factory set for use with underfloor heating systems.

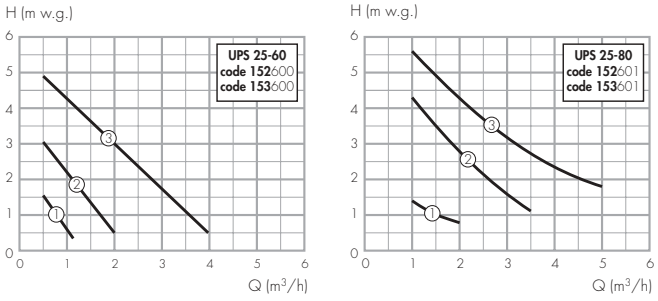
Gamma prodotti

Code 152600	Temperature regulating unit with pump UPS 25-60
Code 152601	Temperature regulating unit with pump UPS 25-80
Code 153600	Temperature regulating unit complete with room thermostat and clock, with pump UPS 25-60
Code 153601	Temperature regulating unit complete with room thermostat and clock, with pump UPS 25-80
Code 151000	Room thermostat and indoor sensor
Code 151002	Room thermostat and indoor sensor with 3-position selector and digital clock

Technical specifications

- Materials:	- body:	grey cast iron GG19
	- hydraulic seals:	EPDM
- Mixing valve:		4-way
- Medium:		water, glycol solutions
- Max percentage of glycol:		30%
- Working temperature range:		20÷90°C
- Max working pressure:		6 bar
- By-pass regulating range:		0,05÷0,5 bar
- Thermometer scale:		20÷100°C
- Primary and secondary circuit connections:		1" F with union
- Servomotor:	electric supply:	230V 50 Hz
	rating:	10 VA
	cycle time:	240 s
	torque:	10 N·m
- Grundfos pump:	code 152600/153600	model UPS 25-60
	code 152601/153601	model UPS 25-80
- Max ambient relative humidity:		95%
- Ambient temperature:		0÷40°C
- Protection class:		IP 42

Head available at regulating unit connections

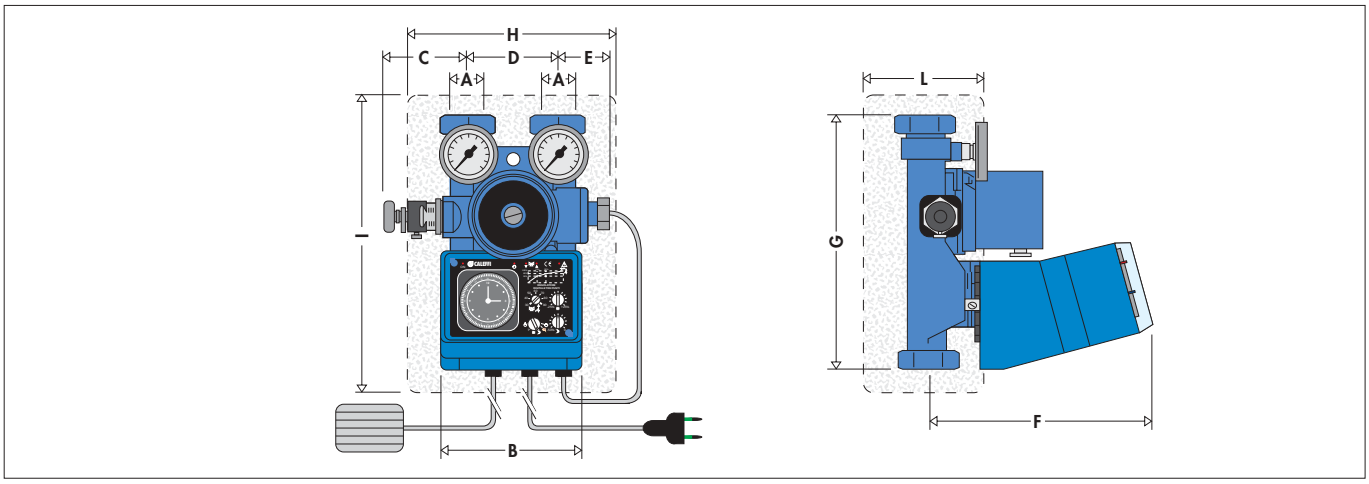


Power consumption

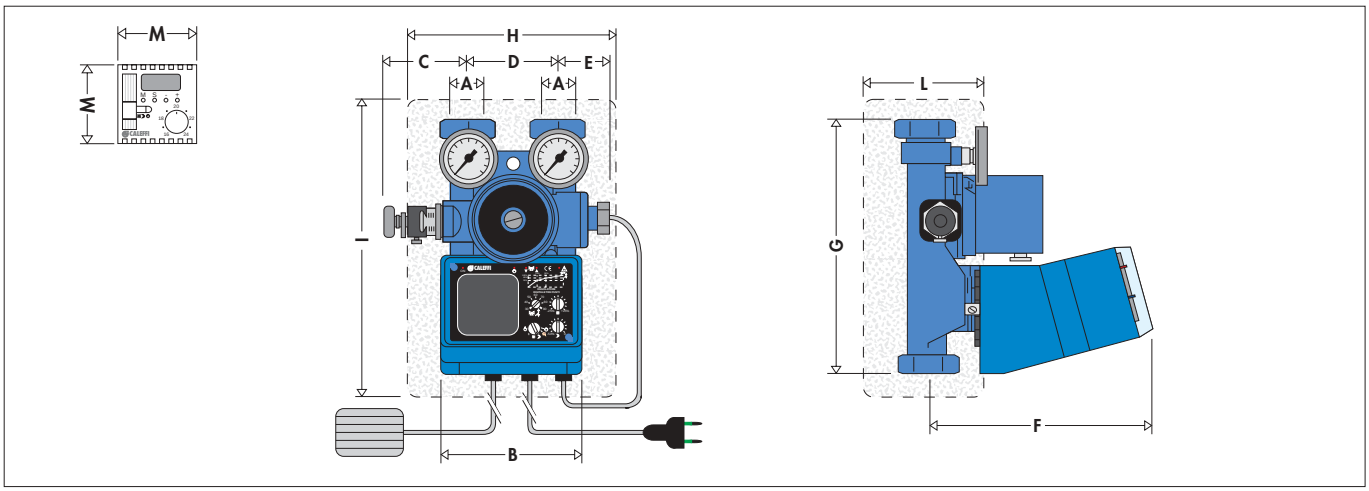
Speed	I (A)	P (W)	n (rpm)
3	0,45	100	1800
2	0,30	65	1100
1	0,17	35	700

Speed	I (A)	P (W)	n (rpm)
3	1,13	250	2450
2	1,04	220	1500
1	0,69	140	1000

Dimensions

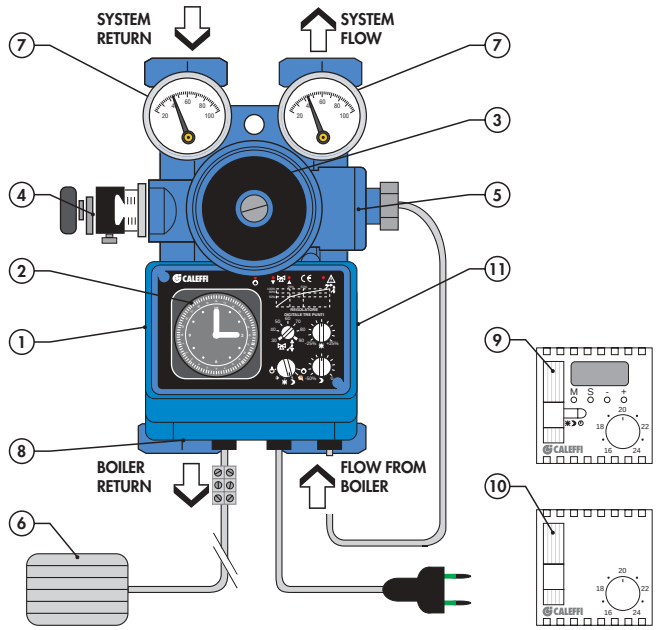


Code	A	B	C	D	E	F	G	H	I	L
152600/601	1"	142	78	90	40	234	267	205	320	120



Code	A	B	C	D	E	F	G	H	I	L	M
153600/601	1"	142	78	90	40	234	267	205	320	120	70

Characteristic components



1 **4-way mixing valve**.

2 **Digital temperature controller.**

3 **Circulating pump:**
code **152**600 - **153**600 GRUNDFOS UPS 25-60
code **152**601 - **153**601 GRUNDFOS UPS 25-80.

4 **Differential by-pass valve** with graduated scale.

5 **Flow temperature sensor.**

6 **Outside temperature sensor**, on mounting plate.

7 **Circuit flow and return thermometers** in pockets.

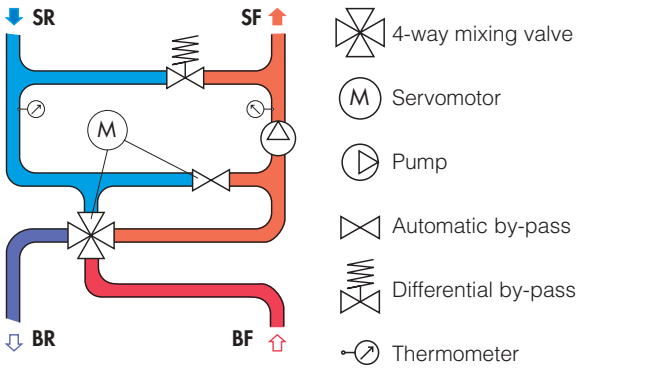
8 **Connection point for remote transmission.**

9 **Room thermostat and indoor sensor** with digital clock and selector for series 153 (option for series 152).

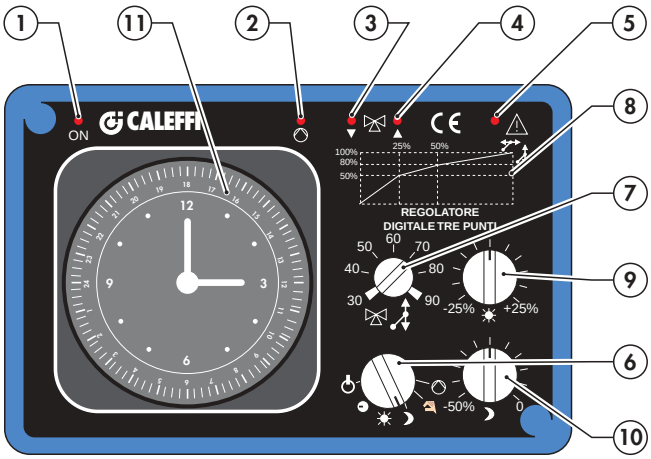
10 **Room thermostat and indoor sensor** (option for series 152).

11 **Servomotor.**

Hydraulic diagram



Temperature controller



The controller, which is normally installed on the unit, can also be positioned remotely, following the electrical wiring scheme.

The front panel of the controller shows the following functions:

1) ON Mains electric on: LED continuously lit.
Flashes in screed drying mode.

2) Pump operating ON: LED continuously lit.

3) Mixing valve closing: LED lit.

4) Mixing valve opening: LED lit.

5) Sensor malfunction: LED lit.

6) Function selector, 6 different functions possible:

a) Main controller off. In models where clock fitted, clock remains on.

b) Controller in operation according to the cycles of the comfort or set-back modes, controlled by the fitted analogue clock or the remote digital clock.

c) Controller operating in comfort mode.

d) Controller operating in set-back mode.

e) Controller de-activated (pump ON, mixing valve ON). This function guarantees heating to the maximum temperature value set on the printed circuit board (PCB).

f) Controller in "summer" mode (pump OFF, mixing valve OFF). However, pump is activated daily for two minutes every 24 hours in order to prevent it from becoming seized when inactive.

7) Temperature and characteristic curve selector. This selector enables the user to input the maximum required flow temperature, corresponding to the minimum outside design temperature.
Also enables optimisation of the standard configuration set at the factory, allowing personal control of the operation of the system. If this value matches the setting on the main printed circuit board (item 6 PCB), the regulation complies with the calculation criteria given by its own characteristic curve.
If this value is different from the setting on the main printed circuit board (item 6 PCB), the controller will recalculate the new characteristic curve. The maximum set temperature on PCB, however, remains active.

8) Reference graph for calculation of the characteristic curve. This is calculated on the basis of the following parameters:

a) Max flow temperature set on controller (item 7). *Factory setting 45°C.*

b) Min flow temperature set on printed circuit board (item 5 PCB). *Factory setting 20°C.*

c) Min outside temperature set on printed circuit board (item 1 PCB). *Factory setting -10°C.*

d) Outside temperature limit for heating start in summer, set on printed circuit board (item 3 PCB). *Factory setting 18°C.*

The characteristic curve has a straight line format.
In the example shown below, it has been calculated using the factory set values.

Example of calculation of characteristic curve

X axis - Outside temperature - TX
Y axis - Flow temperature - TY

Calculation of minimum and maximum points

Point A: given by the intersection of Tmax X (18°C) and Tmin Y (20°C).
Point B: given by the intersection of Tmin X (-10°C) and Tmax Y (45°C).

Calculation of change points

Calculate the difference ΔX between Tmax X and Tmin X.
Thus: ΔX = 18 - (-10) = 28°C.

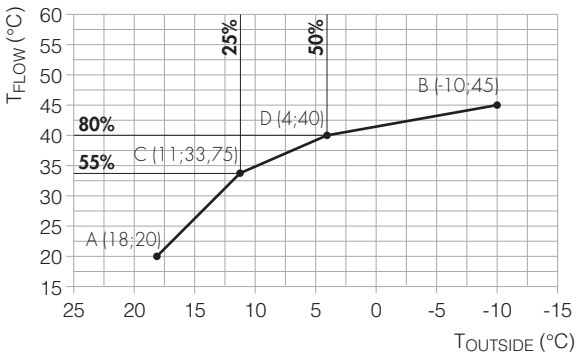
Calculate the difference ΔY between Tmax Y and Tmin Y.
Thus : ΔY = 45 - 20 = 25°C.

Points of change C and D of the curve are identified as follows:

Point C given by the intersection between:
X = Tmax X - 25% ΔX = 18 - 0,25 · 28 = 11°C
Y = Tmin Y + 55% ΔY = 20 + 0,55 · 25 = 33,75°C

Point D given by the intersection between:
X = Tmax X - 50% ΔX = 18 - 0,5 · 28 = 4°C
Y = Tmin Y + 80% ΔY = 20 + 0,8 · 25 = 40°C

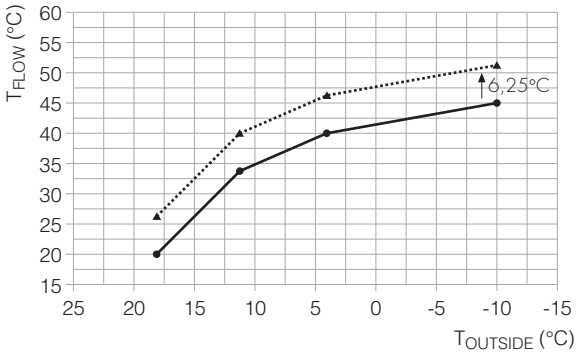
Characteristic curve



9) Correction selector for comfort mode.
Range of adjustment -25% to +25%.
Factory setting: correction = 0%

The selector determines a parallel displacement of the characteristic curve according to the new percentage value selected in the comfort range (red indicator).
Example: if the selector is set to + 25%, its effect on the flow temperature will be as follows:
+25% ΔY = 0,25 · 25 = 6,25°C.
The characteristic curve is then moved upwards by 6,25°C.

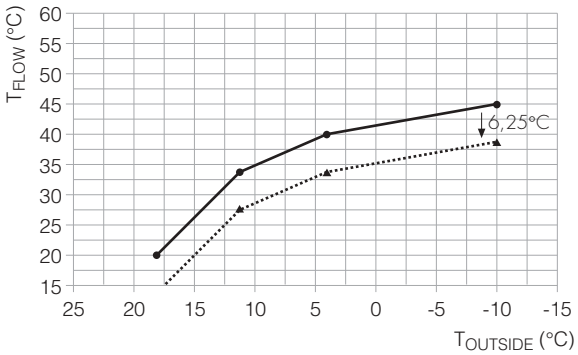
Curve with comfort correction



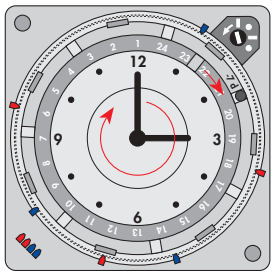
10) Correction selector for set-back mode.
Range of adjustment 0% to -50%.
Factory setting: correction = -25%.

The selector determines a parallel displacement of the characteristic curve according to the new percentage value selected in the set-back range (blue indicators).
Example: if the selector is set to -25%, its effect on the flow temperature will be as follows:
-25% ΔY = -0,25 · 25 = -6,25°C.
The characteristic curve is then moved downwards by 6,25°C.
In addition if, following this move, the flow temperature has to be lower than the minimum temperature for starting heating (Tmin Y), the following state will be obtained: circulator OFF and mixing valve closed.

Curve with set-back correction

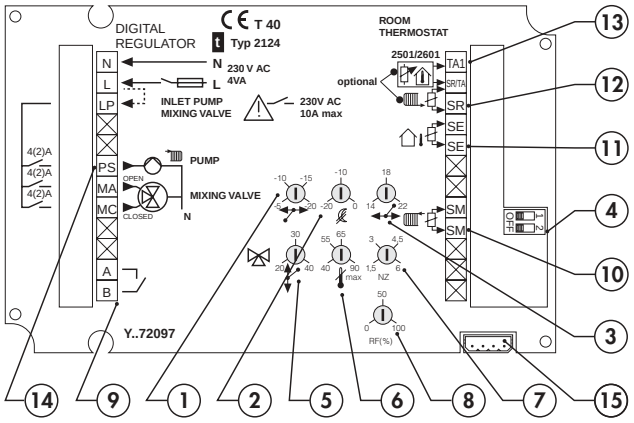


11) Daily or weekly analogue clock, used to select the required heating phases.
Comfort with red indicators or set-back with blue indicators.
Factory setting: daily mode, minimum selection interval 15 min.
The changeover from daily to weekly with a 60 min minimum selection interval, is carried out as follows:
raise the outer ring and move the drive ring to the required position; to do this, turn the pointer clockwise until the innermost notch coincides with one of the outer notches. Reposition the outer ring, making sure that the reference day shown falls within the operating sector of the switching point.



Printed circuit board

The surface of the printed circuit board identifies the following functions:



1) Minimum outside temperature (Tmin X), adjustable from -5°C to -20°C, to which the set maximum flow temperature corresponds (Tmax Y).
Factory setting: -10°C.

2) Set-back mode exclusion selector, adjustable from 0°C to -20°C.
Factory setting: -15°C.
If the outside temperature falls below the set value, the heating is reactivated according to the characteristic curve of the comfort mode.

3) Maximum outside temperature to start heating, or summer limit, (Tmax X), adjustable from 14°C to 22°C.
Factory setting: 18°C.
An outside temperature higher than the set temperature will cause the following state: circulator OFF and mixing valve closed.

4) Selection microswitch for screed drying program.
Factory setting: OFF.

ON Position.

This program is used for carrying out correct drying of the screed, above which the final flooring will be laid (its activation excludes all other functions).
The program has a duration of seven days; during the first three days, the flow temperature is maintained at 25°C, whilst for the remaining four days, the flow temperature is raised and maintained at the maximum temperature value set at point 7 of the front panel. The activation of this program is displayed by the flashing LED on the front panel, point 1.
The frequency of flashing indicates the number of drying days which have passed; one pulse every 8 seconds indicates day 1, two pulses every 8 seconds indicates day 2, and so on.
If the electricity has to be switched off in this phase, the controller will start its drying cycle again from the beginning.
The front panel LED, point 1, continuously lit, indicates the end of the drying program. At this point, the microswitch must be turned to OFF.
N.B.: In manual mode, the screed drying procedure cannot be activated.

5) Selector for minimum flow temperature at heating start-up (Tmin Y).
Adjustable from 20°C to 40°C
Factory setting: 20°C

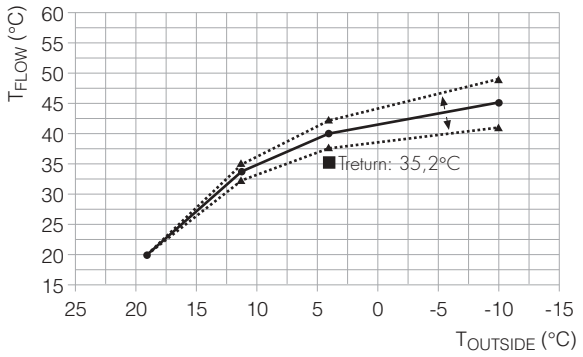
6) Maximum limit temperature selector.
Adjustable from 40°C to 90°C.
Factory setting: 50°C
In case a higher value has been set at point 7 of the panel front, this will be restricted to the limit value.

7) NZ Neutral zone regulating selector.
Adjustable from 1,5°C to 6°C.
Factory setting: 2°C (equivalent to ±1°C).
If the variation of the flow temperature remains within the temperature value selected in the neutral zone, the mixing valve remains inactive. Moving the temperature in relation to the calculated setting does not produce any movement of the valve.

8) RF(%) Return sensor regulating selector (optional).
Adjustable from 0% to 100%.
Factory setting: 80%.
This selector is used to optimise the system output according to the difference between flow and return temperatures (ΔT).
ΔT is calculated as a percentage of the flow temperature calculated on the characteristic curve.
$\Delta TY = (T_{flow}$ set Y-Tmin Y)
$\Delta T = \Delta TY \cdot$ %set $\cdot$ 0,3.
T_{return} set Y = T_{flow} set Y - ΔT.

Example with factory settings:
Flow temperature calculated on the characteristic curve, T_{flow} set Y = 40°C (project conditions).
Thus:
$\Delta TY = (40 - 20) = 20°C$
$\Delta T = 20 \cdot 0,8 \cdot 0,3 = 4,8°C$
T_{return} set Y = 40 - 4,8 = 35,2°C.
If the return temperature measured (T_{return} Y) is ≠ T_{return} set Y, the controller will modify the characteristic curve, moving it upwards or downwards, to move the return temperature to the set value.
This continuous comparison prevents any overheating in the room caused by gratuitous heat sources modifying the heating load.

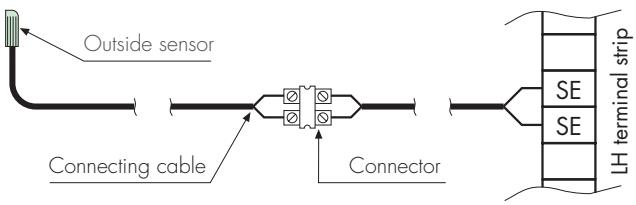
Curve with return temperature regulation



9) Auxiliary contact. This contact opens when the mixing valve is completely closed to the secondary and open to the primary. It can be used to shut down the pump or heat generator of the primary circuit.

10) SM Flow sensor wiring. Factory fitted.

11) SE Outside sensor wiring. Connect the outside sensor by two-core cable (2x0,75) to the connector supplied with the unit.

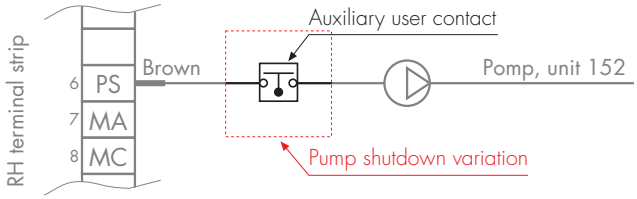


12) SR Return sensor wiring. Optional.

13) TA1 Room thermostat wiring. Optional.

14) Pump shutdown variant. Sometimes the temperature regulating unit is installed in a system where there are one or more users with different usage requirements.
In this case, for users requiring ON/OFF, it may be necessary to shut down the unit circulator.
The electrical diagram shown below illustrates this possibility; the user auxiliary contact must be inserted in series with the normal wiring.

Pump shutdown wiring



15) Connector for remote data transmission.

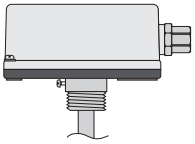
Table of sensor resistance values

°C	Ohm	°C	Ohm	°C	Ohm	°C	Ohm	°C	Ohm
-15	11.382	0	5.632	20	2.431	55	690	90	240
-12	9.912	2	5.187	25	2.000	60	587	95	209
-10	8.933	4	4.742	30	1.655	65	501	100	183
-6	7.439	6	4.347	35	1.376	70	430		
-3	6.492	8	4.000	40	1.150	75	370		
-2	6.206	10	3.553	45	966	80	319		
0	5.632	15	2.971	50	815	85	276		

Safety

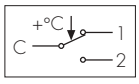
If the outside or flow sensor shows an ohm resistance value outside the working range (damaged or detached sensor), the following operating state is automatically activated:
Pump OFF, Mixing valve OFF, LED 5 continuously lit.

Safety thermostat, code 622001

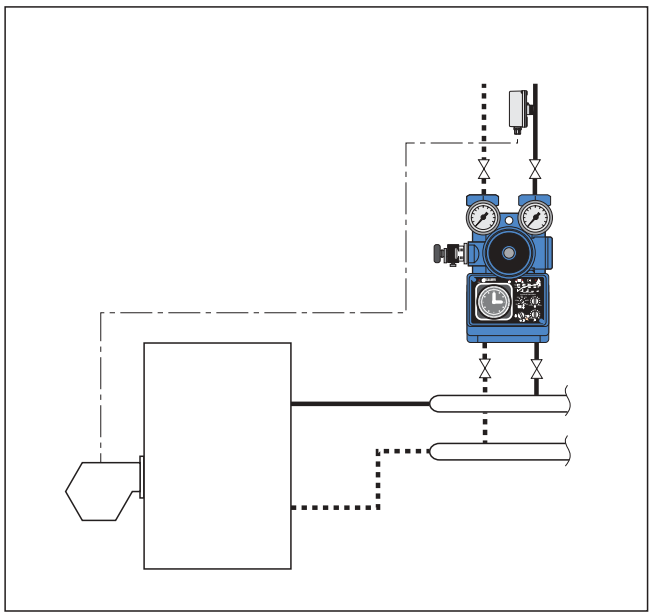


Additional, for use with underfloor heating systems.

- Range of adjustment: 5 ÷ 55°C
- Factory setting: 50°C
- Protection class: IP 40
- Contacts load: (C-1) 10(2,5)A / 250V
- Contacts load: (C-2) 1(1)A / 250V



Example of safety thermostat application on system low temperature branch circuit



Frost protection function

When the selector, point 6 on the front panel, is positioned at ⏻ or ◠, there are two types of intervention:

a) If the flow temperature is below 7°C, the controller activates the operation of the unit until a flow temperature of 20°C is reached. Once this value has been reached, it will return to the inactive status.

b) If the outside temperature is below 4°C (+2 -0), the controller keeps the pump running.

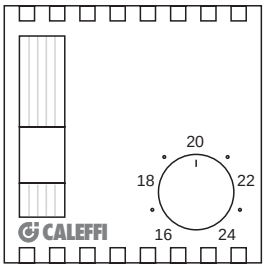
Manual control

To carry out adjustment:
- Remove the servomotor fixing screws.
- Lift the servomotor. This gives access to the control knob.
  Refer to the information given on the knob itself.

Options

1) Room thermostat, code 151000.

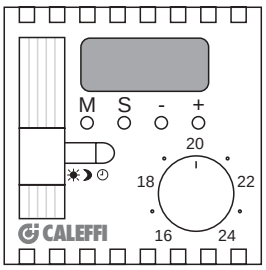
The regulating unit can be completed with a room thermostat able to adjust the value of the flow temperature according to the actual room temperature. This configuration makes it possible to take account of gratuitous heat gains by refining further the flow temperature value, with optimum results in terms of comfort and energy saving.



2) Room thermostat with 3-position selector and daily/weekly digital clock, code 151002.

This device is similar in operation to code 151000, with the following variations:

a) Selector with 3 positions ☀ ☽ 🕘, making it possible to change the operation of the regulator remotely from the boiler room. In this case, the regulator must be set at ☀.

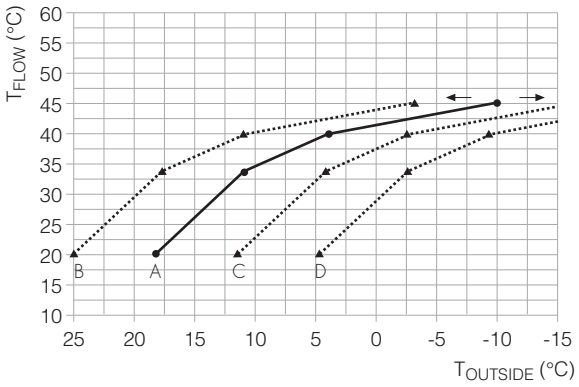


b) Daily/weekly digital clock allowing for programming comfort cycles and set-back directly from the room. In this case, remove the analogue clock from the regulating unit itself, and add the appropriate cover.

Operation of room thermostat

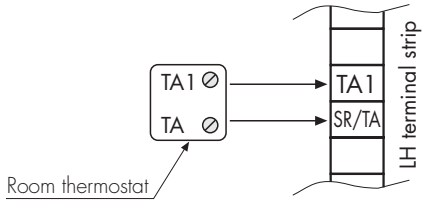
The room thermostat makes it possible to optimise the operation of the system, as it modifies the regulating curve automatically.
According to the time bands for comfort and set-back selected on the clock and the room temperature setting, it will read the actual temperature in the room. On the basis of this parameter, it will make a substantial modification in the characteristic curve (A) to bring it into operation and prevent excessive heating of the room.
The difference between the actual room temperature measured by the thermostat and the set temperature produces an amplified effect in relation to that produced by a similar variation in the outside temperature.
A difference of 1°C in the room temperature causes a move of the characteristic curve equal to 7°C of the outside temperature, with the corresponding variation in flow temperature.
For example, if T_{room} set = 20°C and T_{room} measured = 19°C, then the difference of 1°C will cause a characteristic curve movement of 7°C towards the left (B).
The flow temperature will consequently be raised.
In case of a negative difference the movement will be on curve C.
This behaviour is applicable for a maximum difference of 3°C in room temperature.
In addition, the maximum temperature limit set at item 6 on the PCB remains active.
In the set-back band, the set room temperature is automatically reduced by 2°C, defining the $T_{set\text{-}back}$ set.
This reduction will cause a move to the right of the characteristic curve, equating to 14°C of the outside temperature (D), with a corresponding variation in flow temperature. In case of room thermostat code 151000 the set-back correction set at point 10 is applied.

Curve with room thermostat regulation



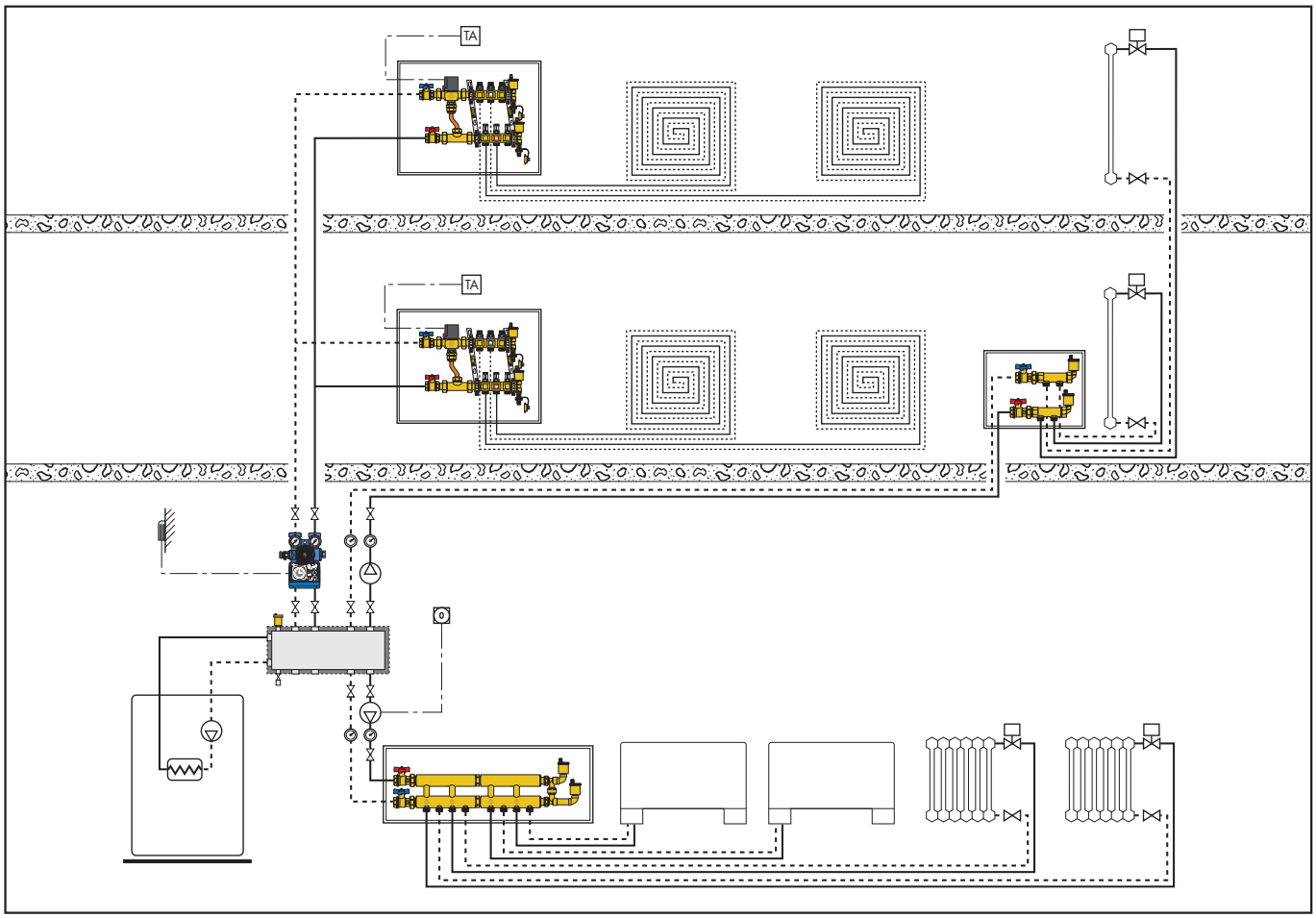
Room thermostat electrical connection

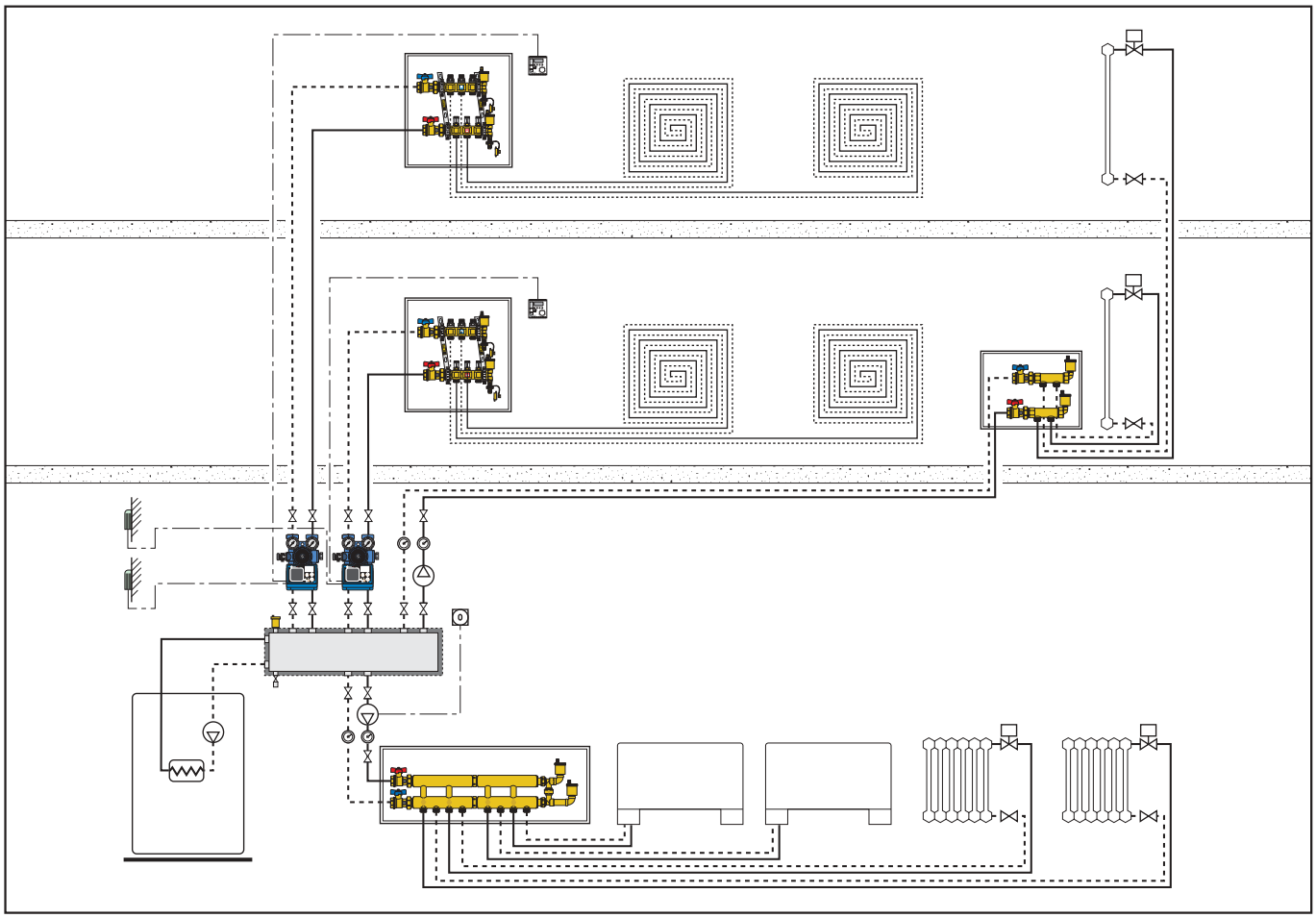
Install the room thermostat and connect by sheathed 2-core cable (2 x 0,75) to the terminal strip of the regulator PCB as shown below.



WARNING - If the connecting cable between the thermostat and the control unit is not sheathed, it must run in its own ducting.
The maximum length is 150 m.

Application diagrams





SPECIFICATION SUMMARIES

Code 152600

Temperature regulating unit. Connections 1" F with unions. Body in grey cast iron GG19. EPDM hydraulic seals. Maximum working pressure 6 bar. Ambient temperature 0 to 40°C. Regulating temperature from 20 to 90°C (factory setting 45°C). Consisting of: 4-way mixing valve; mixing valve servomotor with the following characteristics: supply 230 V 50 Hz, rating 10 VA, cycle time 240 s, torque 10 N·m, pump UPS 25 – 60; by-pass valve with regulating scale from 0,05 to 0,5 bar; temperature controller with clock for daily/weekly programming; flow temperature sensor; outside temperature sensor, connectable to terminal; flow and return thermometers with pocket, scale 20÷100°C.

Code 152601

Temperature regulating unit. Connections 1" F with unions. Body in grey cast iron GG19. EPDM hydraulic seals. Maximum working pressure 6 bar. Ambient temperature 0 to 40°C. Regulating temperature from 20 to 90°C (factory setting 45°C). Consisting of: 4-way mixing valve; mixing valve servomotor with the following characteristics: supply 230 V 50 Hz, rating 10 VA, cycle time 240 s, torque 10 N·m; pump UPS 25 – 80; by-pass valve with regulating scale from 0,05 to 0,5 bar; temperature controller with clock for daily/weekly programming; flow temperature sensor; outside temperature sensor, connectable to terminal flow and return thermometers with pocket, scale 20÷100°C.

Code 153600

Temperature regulating unit. Connections 1" F with unions. Body in grey cast iron GG19. EPDM hydraulic seals. Maximum working pressure 6 bar. Ambient temperature 0 to 40°C. Regulating temperature from 20 to 90°C (factory setting 45°C). Consisting of: 4-way mixing valve; mixing valve servomotor with the following characteristics: supply 230 V 50 Hz, rating 10 VA, cycle time 240 s, torque 10 N·m; pump UPS 25 – 60; by-pass valve with regulating scale from 0,05 to 0,5 bar; temperature controller; flow temperature sensor; outside temperature sensor, connectable to terminal; flow and return thermometers with pocket, scale 20÷100°C; room thermostat with programmable daily/weekly digital clock and 3-position selector (comfort, set-back and clock).

Code 153601

Temperature regulating unit. Connections 1" F with unions. Body in grey cast iron GG19. EPDM hydraulic seals. Maximum working pressure 6 bar. Ambient temperature 0 to 40°C. Regulating temperature from 20 to 90°C (factory setting 45°C). Consisting of: 4-way mixing valve; mixing valve servomotor with the following characteristics: supply 230 V 50 Hz, rating 10 VA, cycle time 240 s, torque 10 N·m; pump UPS 25 – 80; by-pass valve with regulating scale from 0,05 to 0,5 bar; temperature controller; flow temperature sensor; outside temperature sensor, connectable to terminal; flow and return thermometers with pocket, scale 20÷100°C, room thermostat with programmable daily/weekly digital clock and 3-position selector (comfort, set-back and clock).

Code 151000

Room thermostat and indoor sensor for temperature regulating unit.

Code 151002

Room thermostat and indoor sensor for temperature regulating unit with 3-position selector (comfort, set-back and clock) and daily/weekly digital clock.

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