Clima2: Module for the regulation of the ambient temperature

Clima2 is a smart module that has been specially developed for the management of the ambient temperature, both for domestic appliance and for building automation, like school, offices and so on. Clima2 interfaces, through MCP XT controller, to the well tested **Contatto** world, allowing to integrate the many features offered by the system with an easy to use temperature regulation device.

Clima2 is a specialized module, allowing to decentralize the management of the ambient temperature regulation, thus simplifying the programming of **Contatto** MCP XT controller. Clima2 can control, in addition to the heating/cooling consents, a 3-speed fan-coil.

The main features of Clima2 module, in its full version, are the following:

➢ Integrated ambient temperature sensor (NTC)
➢ 0.1°C resolution temperature measurement available on the bus
➢ Regulation setpoint imposed through the bus by writing a channel of the output section
➢ Local adjustment of the setpoint by a rotary knob, allowing both positive and negative adjusting in respect to the setpoint fixed through the bus; the max correction can be configured through the bus
➢ 2 different algorithms for temperature regulation: time modulation and ON/OFF with hysteresis (both ones with configurable parameters); the choice among these two algorithms must be done during the setting up
➢ OFF command via bus, causing the imposition of the no-frost setpoint in Winter mode and the complete OFF status in Summer mode
➢ 5 digital **Contatto** inputs for external pushbuttons
➢ Heating request, cooling request and fan-coil speed are available on the bus; these points must be used by MCPXT to execute the desired functions
➢ 4 bi-color LEDs, organized as 8 **Contatto** output points; the function and the color can be easily assigned by proper programming of MCP XT
➢ The module takes 1 input and 1 output address, both ones arranged as 4-channel 16- bit

The remote control of Clima2 module via the **Contatto** bus is very simple: all operating parameters can be easily monitored and changed by supervisors, touch screen terminals, GSM devices, Internet, Intranet and so on.

Clima2 is a compact module, housed in a box suitable for the wall mounting; the rear side of the module features many holes, thus simplifying the mounting on all market available in-wall box.

Address programming

Clima2 module takes 1 input and 1 output address that are equal each one to the other, so only a base address is needed. This must be assigned by the FXPRO programmer through the proper programming cable inserted in the blue connector placed inside the module.

The temperature regulation

Clima2 module features two main regulation modes, one for Winter and one for Summer season.

For each season, the regulation takes places controlling the related point of the input section of the module (heating request in Winter and cooling request in Summer). Clima2 also controls 3 additional points of the input section that can be used, if needed, to handle a 3-speed fan-coil.

The regulation is based on a setpoint fixed through the bus by writing to a channel of the output section of Clima2 module; this setpoint, which in the following pages will be called "central setpoint", can be adjusted by the user by the rotary knob on the module panel. The maximum allowed negative and positive correction around the central setpoint can be defined writing the desired values into channel 3 and 4 of the output section.

The setpoint value as adjusted by the user will be called, in the following pages, "real setpoint", and this is the value considered by the temperature regulator.

The position of the rotary knob is also available as information on the bus, allowing to perform specific functions by proper programming of MCP XT controller.

An OFF mode can be set via bus, causing the no-frost setpoint in Winter season; the OFF mode causes instead the full stop of the temperature regulator in Summer season.

Types of regulation

The temperature regulation of Clima2 module can be chosen, during the setting up, among the ON/OFF type with hysteresis and the modulation type.

ON/OFF with programmable hysteresis

In this case the temperature regulation is performed by the activation or less the related point of the input section (heating or cooling request depending on the currently selected season), comparing the ambient temperature detected by the module with the real setpoint (that is equal to the value of the central setpoint corrected by the position of the rotary knob) and taking in account the hysteresis.

The hysteresis around the setpoint can be defined, with 0.1 °C resolution, during the setting up and two values, for each season, have to be chosen, corresponding to the positive and negative delta in respect of the setpoint.

In Winter season, when the ambient temperature exceeds the setpoint increased by the positive delta, the regulation will be switched OFF; this will be switched ON again when the temperature comes down under the setpoint decreased by the negative delta; in Summer season the principle is similar to that as soon as described.

The speed of the fan-coil is fixed by means of a proper algorithm (sees relative paragraph) and activating one or nobody of the three related points of the input section; the optimal speed is established evaluating the difference between ambient temperature and setpoint. The switching thresholds between a speed and the other one (independent for Winter and Summer seasons) can be defined during the setting up of the module.

When the heating request (or cooling request depending on the currently selected season), the fan is always activated at least to the minimum speed.

Modulation

In this case the temperature regulation performed by Clima2 module is of proportional/integral type with fixed time-base. The Clima2 module regulates modulating the points "heating request" or "cooling request" (depending on the currently selected season) in respect to a fixed time. At the beginning of every cycle of regulation it detects the difference between the ambient temperature and the real set-point. The relationship (Tempo_ON/Tempo_OFF) will be then chosen depending on the found difference.

In this case too, the speed of fan-coil is established evaluating the difference between ambient temperature and set-point, with programmable switching thresholds for every of the two seasons.

Digital inputs

The Clima2 module features 5 generic Contatto digital inputs, that can be used exclusively for the connection of external pushbuttons with normally opened contact.

Avoid to connect contacts that can be closed for a long period of time, because the internal dissipation generated by this situation, that of course produces heat, could cause errors in the temperature measurement performed by the internal probe.

Connections

Clima2, for proper operation, requires the connection to the 4 wires of the Contatto bus according to the labels near to the 4-way terminal block inside the module. As already said, Clima2 features 5 digital inputs for the connection of normally opened pushbuttons only (potential free) that must be connected to the 6-way terminal block as shown by the related labels printed on the card.
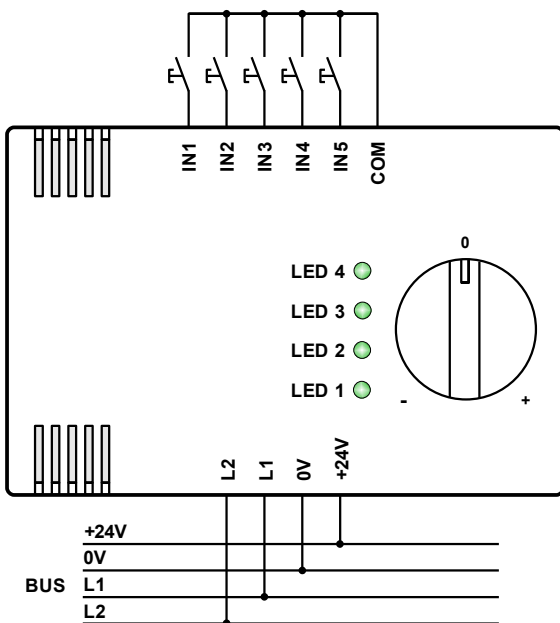

Installation

To install Clima2 module follow the steps here bottom described.

Opening of the module

Find the two fissures where the small dull tooths of the rear panel are housed (normally on the bottom side). Insert the tip of a small screwdriver in one of these fissures so that the rear panel releases towards the outside. Then insert the screwdriver in the other fissure so to extract completely he rear panel.
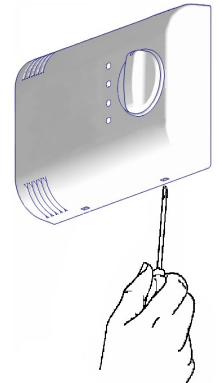
Removing the electronic card

Insert the tip of a screwdriver in one of the two milling of the electronic card, making then lever towards the outside, so to remove it from its fitting in the cover. Avoid to touch the electronic parts.
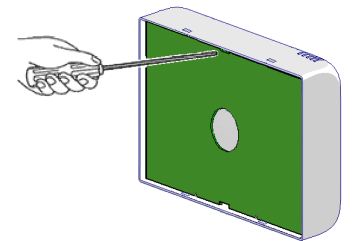
Address assignment

Insert the proper connector of FXPRO programmer in the blue connector and assign the base address following the normal procedure of all Contatto modules.
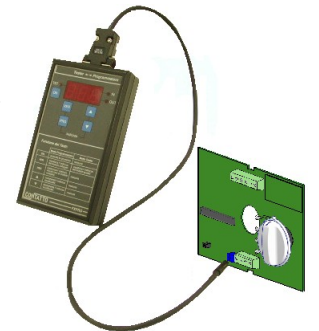
Connection

Open the hole on the rear panel helping yourself with a small pincers or a pair of scissors. Insert the wires (those of the bus and eventually those of the pushbuttons to be connected to the module inputs) in the hole of the rear panel, making attention to correctly orient it in respect to the wall. Make sure to remove any supply to the system before this operation.
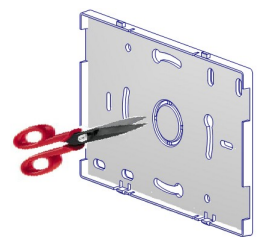
Fix the rear panel, with the dull tooths towards the bottom, to the box inside the wall by means of the appropriate screws (or directly to the wall by means of proper fixings). Insert the same wires in the hole of the insulating sheet and the in the hole of the electronic card, making attention that components be on the opposite side in respect to the wall.
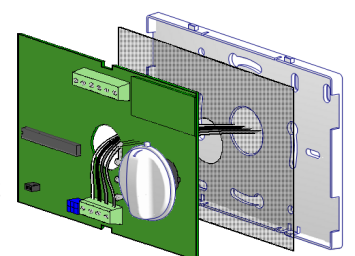
Connect the wires to the terminal blocks of the electronic card according to the labels printed on the card itself.

Closing of the module

Place the cover on the electronic card, orienting it correctly so that the rotary knob be on the same side of the related hole on the cover. Make a light pressure so that the card enters in its fitting, verifying that the rotary knob and the LEDs fit correctly in the related holes.
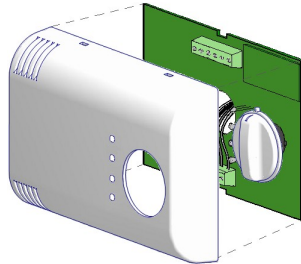
Place the top side of the cover on the rear panel fixed to the wall, so that the two tooths on the top side of the rear panel itself fit in the related fissures. At this point, delicately push the bottom side of the cover towards the rear panel, until the two dull tooths on the rear panel fit in the related fissures of the cover.
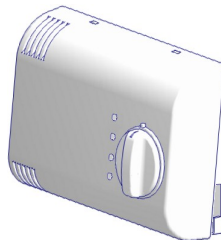
Information from and to Clima2 module

Clima2 module takes, inside the Contatto system, one input and one output address with the same value, both ones 4-channel 16-bit type. The meaning of the available point/value is here described.

Input channels

	Input section			
Point	**CH1**	**CH2**	**CH3**	**CH4**
1	Pushbutton input 1			
2	Pushbutton input 2			
3	Pushbutton input 3			
4	Pushbutton input 4			
5	Pushbutton input 5			
6	Speed MIN			
7	Speed MED	Ambient Temperature (°Kx10)	Real Setpoint (°Kx10)	Position of rotary knob (0÷1000)
8	Speed MAX			
9	Heating request			
10	Cooling request			
11	NTC probe failure			
12	-			
13	OFF status			
14	-			
15	-			
16	Summer status			

Description

CH1 input

➢ **Points 1..5:** digital generic input points for the connection to external pushbuttons; point=1 means pressed pushbutton.

➢ **Points 6..8:** mutually exclusive points; a point=1 means that regulator needs to switch ON the related speed of fan-coil (if used). If all points are 0, the fan must be OFF.

➢ **Point 9:** point=1 means that regulator needs to switch ON the heating device (in Winter mode).

➢ **Point 10:** point=1 means that regulator needs to switch ON the cooling device (in Summer mode).

➢ **Point 11:** point=1 means failure of the temperature probe (e.g. open or short circuit).

➢ **Point 12:** not used.

➢ **Point 13:** point=1 means that regulator is currently set to no-frost setpoint (in Winter mode) or the regulation is completely OFF (in Summer mode).

➢ **Points 14..15:** not used.

➢ **Point 16:** point=1 means that Clima2 is currently set for Summer mode; point=0 means that it is currently set for Winter mode.

CH2 input

➢ **Points 1..16:** value of ambient temperature, in °Kx10; for instance 2980 means: (2980-2730)/10= 25.0°C

CH3 input

➢ **Points 1..16:** value of real setpoint (central setpoint corrected by the rotary knob); this channel always shows the real setpoint even if the regulator was set to OFF (it does not show the value of no-frost setpoint).

CH4 input

➢ **Points 1..16:** value of the the position of rotary knob expressed in 1/1000; this value is 0 when the knob is fully rotated to left side, while it is 1000 when the knob is fully rotated to right side.

The input points of CH1 must be used in MCP XT program to perform the wanted operations. For example, assuming that address 100 has been assigned to Clima2 module, the command to the heating device must be implemented by a simple equation like the following:

    O31.1 = I100:1.9

where O31.1 1 is the relay output connected to the heating device and I100:1.9 is the related point of Clima2.

In the same way, called O10.1, O10.2 and O10.3 the outputs connected to the fan-coil, the following equations must be included in MCP XT:

    O10.1 = I100:1.6
    O10.2 = I100:1.7
    O10.3 = I100:1.8

Output channels

	Output section			
Point	**CH1**	**CH2**	**CH3**	**CH4**
1	LED 1 red			
2	LED 2 red			
3	LED 3 red			
4	LED 4 red			
5	LED 1 green			
6	LED 2 green	Set and read the value of central setpoint (°Kx10)	Set and read the MAX negative delta (°Cx10)	Set and read the MAX positive delta (°Cx10)
7	LED 3 green			
8	LED 4 green			
9	-			
10	-			
11	-			
12	-			
13	Set OFF			
14	-			
15	-			
16	Set Summer			

Description

CH1 output

➢ **Points 1..8:** command to the 4 LEDs of Clima2; for instance, the point 1 lights the LED 1 in red color, the point 5 lights it in green color. Activating both point 1 and point 5, the LED 1 will be lighted in yellow color.

➢ **Points 9..12:** not used.

➢ **Point 13:** point=1 set Clima2 to OFF, that is no-frost setpoint in Winter and OFF in Summer.

➢ **Points 14..15:** not used.

➢ **Point 16:** point=1 set Clima2 to Summer, point=0 set it to Winter.

CH2 output

➢ **Points 1..16:** Read/Write. Set and read the current value of the central setpoint, in °Kx10 (for instance 2980 means (2980-2730)/10= 25.0°C).

CH3 output

➢ **Points 1..16:** Read/Write. Set and read the maximum allowed value of the negative delta, in °Cx10 (for instance 35 means 35/10= 3.5°C). This value must be a positive number.

CH4 output

➢ **Points 1..16:** Read/Write. Set and read the maximum allowed value of the positive delta, in °Cx10 (for instance 35 means 35/10= 3.5°C). This value must be a positive number.

Clima2 module stores in its non-volatile memory the settings related to OFF mode and Winter/Summer season, in addition to the values of the central setpoint and MIN and MAX delta. To find the module in the same operating conditions, in the event of a break and restoring of the supply, it is however mandatory to include in MCP XT program a proper **FIELDtoRAM** directive. In this way the RAM memory of MCP XT will be aligned to the settings of installed Clima2 modules.

Supposing to have assigned the base address 100 to a Clima2 module, the configuration directive will be:

```
FIELDtoRAM = ( O100:1.13, O100:1.16, \
                AO100:2, \
                AO100:3, \
                AO100:4, )
```

Setting up Clima2 module

This paragraph describes the setting up of the module; this step allows to adapt the operation of Clima2 module according to the application requirements.

An easy to use program is available, free of charge, for the setting up of the module; this program is named CLIMATools and it is distributed together MCP IDE package (rel. 1.0.8 or higher) for MCP XT. The setting up is made through the **Contatto** bus.

Note: Clima2 can operate only in systems where MCP XT controller is installed; the setting up and the programming of MCP XT requires the program MCP IDE.

All Clima2 modules installed in the application must be declared in the MCP XT configuration, specifying the addresses as in the following example:

```
CLIMA2 = ( I100, O100 )
CLIMA2 = ( I101, O101 )
CLIMA2 = ( I102, O102 )
… … … …
```

After having transferred a program to MCP XT containing at least the addresses of installed Clima2 modules, the second step is the configuration of the operating parameters.

As said before, to perform this operation, the CLIMATools program is required. From the menu of MCP Visio select Configuration and then Clima2. The following window will appear:
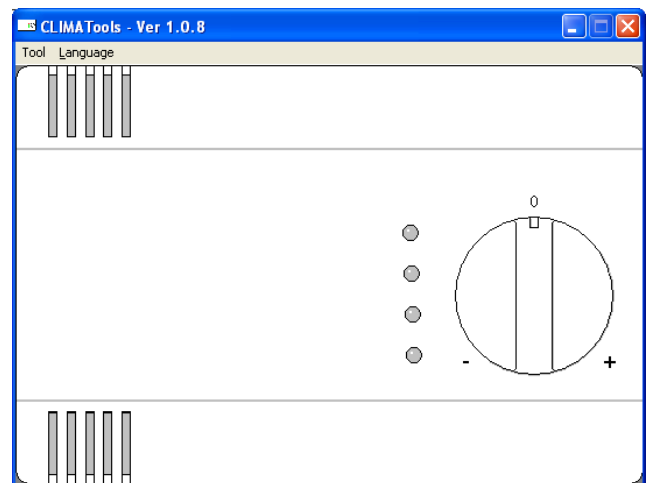
From this window select Tool and then Clima2 Configuration. The window shown in Figure 1 will be shown.

The **Regulation Mode** can be set in the upper left side of the window; select ON/OFF to activate the type ON/OFF with hysteresis, or Time Modulation for the other available type.
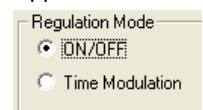
The section **Set Points** in the configuration windows allows to set the several parameters related to the setpoint of the temperature regulator. In details, the first parameter is the central setpoint, whose allowed values are in the range 0.0 to 40.0°C.

The two fields Min regulation and Max regulation allows to enter the negative delta and the positive delta granted to the user as correction of the fixed central setpoint; allowed values are in the range 0.0 to 12.7°C. *If the installed Clima2 is without rotary knob, then set these values to 0.*

The correction of the central setpoint is performed by the rotation of the knob on the panel of the module; if the negative and positive deltas have the same value, then the central position of the knob (0) will match exactly the fixed central setpoint.

The last field is the value of the no-frost setpoint for OFF mode in Winter season; this value must be in the range 0.0 to 25.5°C.

The following figure shows the default values for these parameters.

Set points	Winter	
Set point	21,0	°C
Min regulation	3,0	°C
Max regulation	3,0	°C
Nofrost set point	8,0	°C

The section **Hysteresis for ON/OFF mode** allows to define, with the help of a clear graphical representation, the two values of the temperature delta in respect of the current real setpoint (SPx) that regulator uses to switch ON and OFF the heating or cooling device; for each season, a pair of value has to be defined. These values must be in the range -12.8 to 12.7°C and the negative delta must not necessarily be equal to the positive one.

The section **Delta for fan-coil** allows to define, with the help of a clear graphical representation, the various several deltas to be used for switching from a speed to the other one, both for Winter and Summer season. The delta values are intended in respect to the current setpoint (SPx) and they can be positive or negative numbers. These values must be in the range -12.8 to 12.7°C;

The values related to the deltas depend on the specific application, but the default values may be suitable for most of them.

Once all desired parameters have been entered, press the button "Write CLIMA2" to send to the module the information shown in the "CLIMA2 Configuration" window. The following window will be shown:
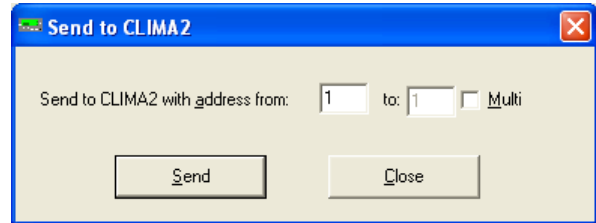
Specify the address of the Clima2 module to be programmed or, activating the "Multi" option, specify a starting and an ending address; in this case the program will transfer the setting to all Clima2 modules found in that address range.

Of course, before the transferring, the communication with MCP XT has to be enabled py the button "Com. To MCPXT". The button "Read CLIMA2" perform the opposite operation, that is from Clima2 to configuration window.

The CLIMATools program allows to save in a file, having .CL2 extension, the data shown in the Clima2 configuration window ("Write File"). It is also possible the opposite operation ("Read File").

Firmware upgrade

The firmware of Clima2 module can be easily upgraded through the bus. This feature allows to have the module always updated with last modifications or new features.
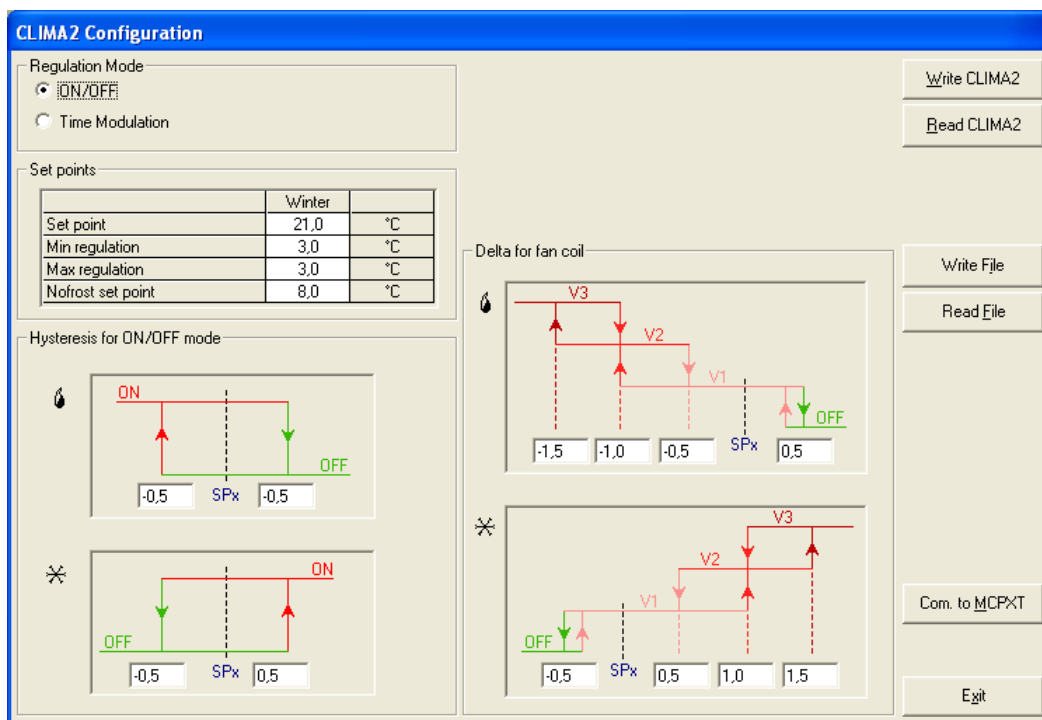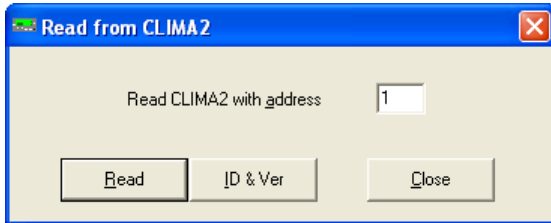

Figure 1: Configuration window for Clima2 parameters

To check the firmware version currently loaded in a Clima2 module, use the same program CLIMATools. Clicking on the button "Read CLIMA2" in the configuration window, the following one will be shown:

Read from CLIMA2

Read CLIMA2 with address   1

Read   ID & Ver   Close

Enter the address of the Clima2 module whose firmware version has to been checked and then click on the button "ID & Ver"; at this point, the searched information will be shown in the same window.

To update the firmware of a Clima2 module, the program named BootPIC must be used. This program is part of MCP IDE software package. An application note explaining the updating procedure can be provided; for more details contact **DUEMMEGI**.

Options

Clima2 module can be provided, under request, without rotary knob. In this case, the two fields "Min regulation" and "Max regulation", in the window shown in Figure 1, must be both set to 0.
In this way, the central setpoint (that set via bus) and the real setpoint (that considered by the regulation algorithm of Clima2) will have always the same value, regardless of the position of the potentiometer that is anyway mounted also in the version without the rotary knob.
The ordering codes are:

➢ Clima2 module, ivory color, with rotary knob:
   CLIMA2-B-CM-CL (cod. 01135)

➢ Clima2 module, ivory color, without rotary knob:
   CLIMA2-B-SM-CL (cod. 01136)

Technical characteristics

Supply voltage	24V ⎓ ± 25% SELV
Current consumption	30mA TYP a 24V ⎓ 50mA MAX a 24V ⎓
Digital inputs	5, for N.O. and potential free pushbuttons only
Current for each digital IN	4mA (with closed contact) TYP
Threshold voltage for digit. IN	8V ⎓ TYP
Max allowed length for the wires between the module and external pushbuttons	15 meters
Signaling	4 bi-color LEDs with freely programmable function; 3 colors can be assigned to each LED
Built-in temperature probe: Type Range Resolution Max error Linearity	 NTC 0.0 ÷ 40.0°C 0.1 °C ±0.5 °C ±0.5 °C
Temperature regulation algorithm	Configurable among: • ON/OFF with programmable hysteresis • PI with fixed timebase
Fan control	3 speeds (with configurable deltas)
Setpoint	1 central programmable setpoint and correction by rotary knob on the panel + 1 no-frost setpoint in Winter mode
Operating temperature	0 ÷ +50 °C
Storage temperature	-30 ÷ +85 °C
Protection degree	IP20

Note: *this manual refers to Clima2 module equipped by firmware 1.0 or higher. All information, characteristics and features described in this manual are subject to change without notice.*

Outline dimensions