ZENNIO CLIMA

CLIMA I

Thermostat ZENNIO

Edition 2

INDEX

1. INTRODUCTION

The present document, **Thermostat ZENNIO – CLIMA I,** begins a **series** of **specific documentation** about Zennio's products aimed at the **air-conditioning discipline**. This series of documents consists of the following titles:

- **Thermostat ZENNIO – CLIMA I**
- **Split (Quick Guide) – CLIMA II**
- **Zoning KNX – CLIMA III**
- **Fan Coil – CLIMA IV**
- **Fan Coil: thermostatic control over fan – CLIMA V**
- **Radiant floor with additional heating source – CLIMA VI**

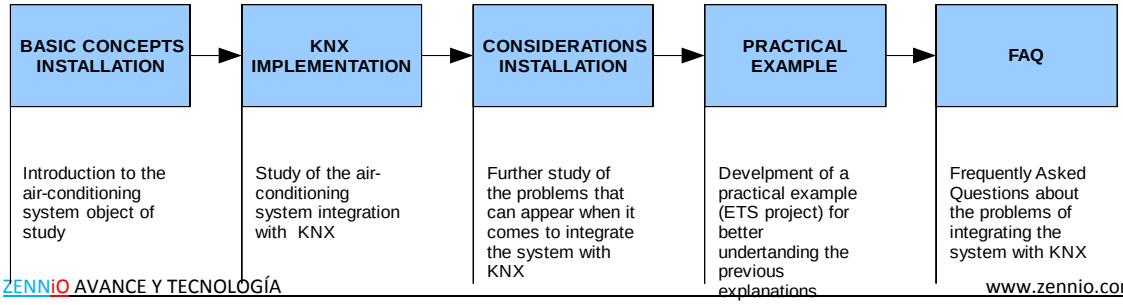
The integration of the air-conditioning in the domotic control is possibly one of the most complicated aspects to carry out. Moreover, there is also very little documentation about it in the standard KNX.

From Zennio, we want to take advantage of both our **experience** with this type of installations and the versatility of our products in this area for presenting this document. The documentation tries to **bring closer the air-conditioning integration** to all integrators.

The **purpose** for these manuals is making the best performance of those Zennio products dedicated to control air-conditioning devices, basing on two fundamental factors:

- **Product Knowledge**
- **Technical aspects of product integration in air-conditioning installations**

Therefore, this is not only a specific product guide but also a collection of information that facilitates the comprehension of product integration in installations. For that, in the specific air-conditioning guides (manuals CLIMA II, CLIMA III, CLIMA IV, CLIMA V and CLIMA VI), it is followed next document structure:



The document **CLIMA I** is a guide to understand the **thermostats** incorporated in some **Zennio's products**, and it is also useful as a general introduction of Zennio's products integration in installations for controlling the air-conditioning.

This documentation tries to bring up the integrator in the fundamental aspects of **thermostat control**, **basic principle** without which it is not possible to adjust the performance in an air-conditioning installation. And, consequently, the installation cannot be successfully achieved.

The aspects to deal with in this document are the following:

ASPECTS TO DEAL WITH	
DEVICES WITH THERMOSTAT	Touch Panel Z38i QUAD IRSC Zone ACTinBOX CLASSIC HYBRID ZAS
THERMOSTAT CONFIGURATION	2-Points with Hysteresis Proportional Integral Temperature Protection Freezing-Overheat Additional Heating-Cooling Source Automatic Mode Switching
ETS CONFIGURATION	ON/OFF Setpoint Temperature Operating Mode Fan Speed 1 Byte – Specific Modes Communication Objects
PRACTICAL QUESTIONS	Parameterizing PI Control Control Indicator PI-PWM External Control Special Modes Operation of the Automatic Mode Switching Thermostatic Control From Home

2. DEVICES WITH THERMOSTAT

In Zennio's products family, the thermostat can be found implemented in five of them:

1. Touch panel InZennio Z38i

The touch panel InZennio Z38i allows the implementation of up to **4 thermostats** in the same device. In addition, it incorporates a **temperature probe** that allows measuring the temperature of the room where it is located, enabling the use of that measure as input variable for the thermostat calculations.

This thermostat allows choosing among the types of thermostatic control, explained in the section *3.1Thermostat Configuration. Control Types*.

2. A/D Sensor QUAD

The A/D sensor QUAD allows enabling the **thermostat** function for **all the entries** when these are configured as temperature probes. The thermostat allows choosing among the types of thermostatic control, explained in the section *3.1Thermostat Configuration. Control Types*.

It is possible to connect up to **4 NTC probes in their entries**, obtaining 4 different measures of temperature, which can act as reference temperature in the thermostats.

3. IRSC (application program IRSC Zone)

The application program IRSC **Zone** incorporates one thermostatic function of type 2 points with hysteresis and PI-PWM, directly applied to the control of the grilles located in a zoning installation. Up to 8 zones can be parameterized, each of them with one **independent thermostatic calculation.**

This device does not have the temperature measuring function; instead, it gets the reference temperature from each zone through a communication object.

For expanding the information, look up the document **Zoning KNX – Clima III**.

4. ACTinBOX CLASSIC HYBRID

The ACTinBOX CLASSIC HYBRID actuator incorporates the thermostat function in the entries that allow being configurated as temperature probes (please, take a look at the *ACTinBOX CLASSIC HYBRID manual*).

It is possible to choose one of the types of thermostatic control, explained in the section *3.1Thermostat Configuration. Type of Control.*

5. ZAS

ZAS allows using a **room thermostatic control**, and you can use as reference temperature the one from its **internal sensor**, the one from its entries configured as **NTC probes**, a mix of them… (See the ZAS manual).

It is possible to choose one of the types of thermostatic control, explained in the section *3.1Thermostat Configuration. Type of Control*.

3. THERMOSTAT CONFIGURATION

3.1. TYPE OF CONTROL

The thermostatic control can be carried out in two different ways depending on the algorithm used for the calculations of that control.

Zennio's products offer two different control types:

- 2 POINTS WITH HYSTERESIS.
- PROPORTIONAL INTEGRAL (PI).

3.1.1. 2 POINTS WITH HYSTERESIS

The 2-points hysteresis control system is less efficient than other control systems that are more advanced. Nevertheless it may be very interesting for some installations. It is the control implemented in conventional thermostats.

In this control system we have to establish a **setpoint temperature**, and two **hysteresis**: lower and upper hysteresis. The purpose of the hysteresis is that the system is not continuously switching around a setpoint temperature in brief time periods.

Example: A setpoint temperature equal to 25 ºC is established (mode "heating").

Both the lower and the upper hysteresis are equal to 1ºC.

The initial room temperature is 19 ºC. When the temperature reaches 25 ºC, the system will go on heating, until the temperature reaches 26 ºC. Once the upper hysteresis is reached, the system is switched off. While the system is off, the temperature begins to decrease, but the system will not be switched on at 25 ºC (setpoint temperature): it will do it when the lower hysteresis is reached. This is when the room temperature is equal to 24 ºC.

In the course of this process, it is obtained a very typical graph similar to the saw teeth. See Figure 1.

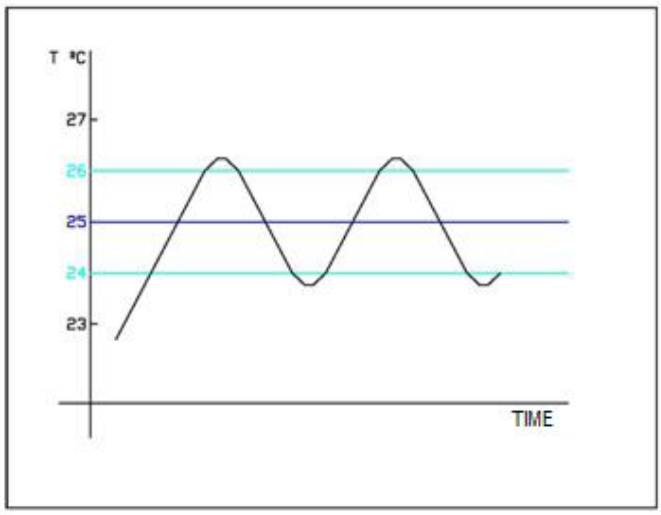


Figure 1. Typical graph of 2 points with hysteresis system

The problem of this control type is the continuous oscillation that has direct influences in the energetic consumption and comfort, as shown in next Figure:

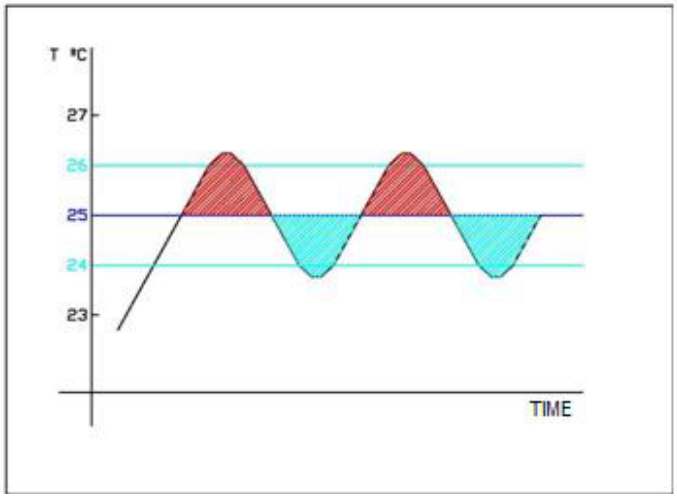


Figure 2. Inefficiency of 2 points with hysteresis control

The red zone indicates an excess in the energetic consumption, because the room temperature is upper than the setpoint temperature.

The blue zone indicates a lack of comfort because the room temperature is lower than the setpoint temperature. Moreover and unlike we could think at first, the blue zone or comfort lack does not compensate the excess energetic consumption of the red zone.

3.1.2. PROPORTIONAL INTEGRAL

Other possibility offered in Zennio's products for carrying out the thermostat function is the selection of the PROPORTIONAL INTEGRAL (PI) control. In short, this control type could be defined as a system of integral calculation that depends on two values:

- **K: Proportional constant**, in Kelvin grades (ºK), that allows estimating one error value de error proportional to the difference between the setpoint temperature and the room temperature.
- **T**: **Integration time**, in minutes (min) that depends on the thermal lag of the air-conditioning system that allows adjusting the approximation error in connection with the passed time.

When configuring this control type, the integrator will have to select from a pull down list, between a series of value pairs K and T. Some of these typical pairs are the following:

System	K	T
Split	4 ºK	90 min
Radiant Floor	5 ºK	240 min
Electric Heating	4 ºK	100 min

It is also given the chance of introducing manually this two parameters, but this is only advised for air-conditioning experts.

Moreover, it is necessary to specify a **time cycle** for carrying out the calculations. The time cycle depends a lot on the thermal lag of the air-conditioning system that is being installed. For air-conditioning systems with low thermal lag, the time cycle has to be higher.

For increasing the knowledge about this topic, it is advised the reading of the *Proportional Integral* in section 3.1.2.

The PI control system has two variants: **PI-Continuous** and **PI-PWM**.

PI – Continuous is carried out by means of one **variable of 1 byte**. This 1-byte variable keeps a **percentage** that indicates the opening percentage that the valve has to acquire in a certain time cycle. This means that a value of 50% for the PI – Continuous is indicating the valve to open in half.

The inconvenient for this type of control is that the systems need more sophisticated valves than the all – nothing valves, making difficult their control and increasing the installation cost.

For this reason the percentage value is traduced, by means of the **Pulse Width Modulation (PWM)**, for controlling all-nothing valves or status).

Example: Using a control PI – Continuous and a control PI – PWM.
When the value of variable PI-Continuous is equal to 50%, in PWM the variable is "1" during the first time cycle (Ton) and it is "0" during the last half time cycle (Toff).
When the value of PI-Continuous is equal to 50%, the modulation PWM maintains a pulse equal to "1" during ¼ of the time cycle, and a pulse equal to "0" during ¾ of the time-cycle.

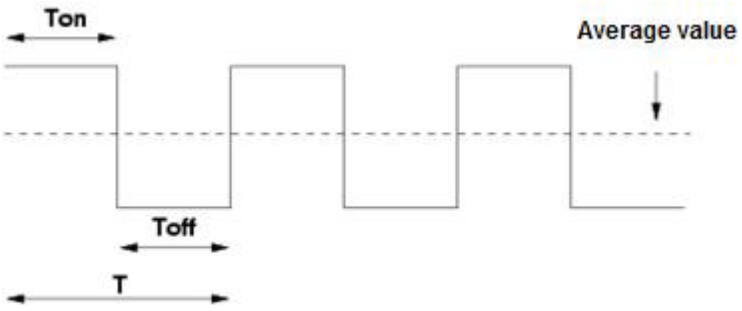


Figure 3. Value of variable PI equal to 50%.

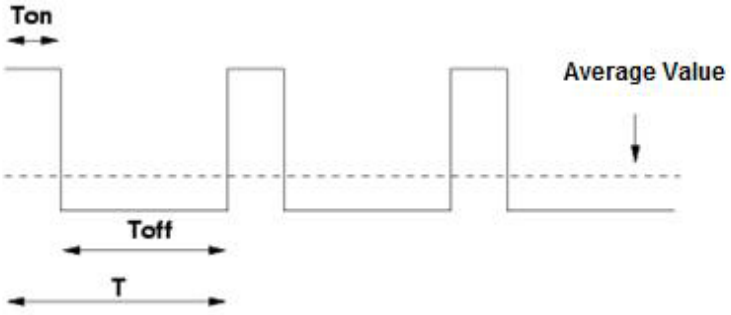


Figure 4. Value of variable PI equal to 25%.

To finish, a typical graph of the temperature evolution under a PI control system is shown (theoretical graph that is not the result of any real simulation):

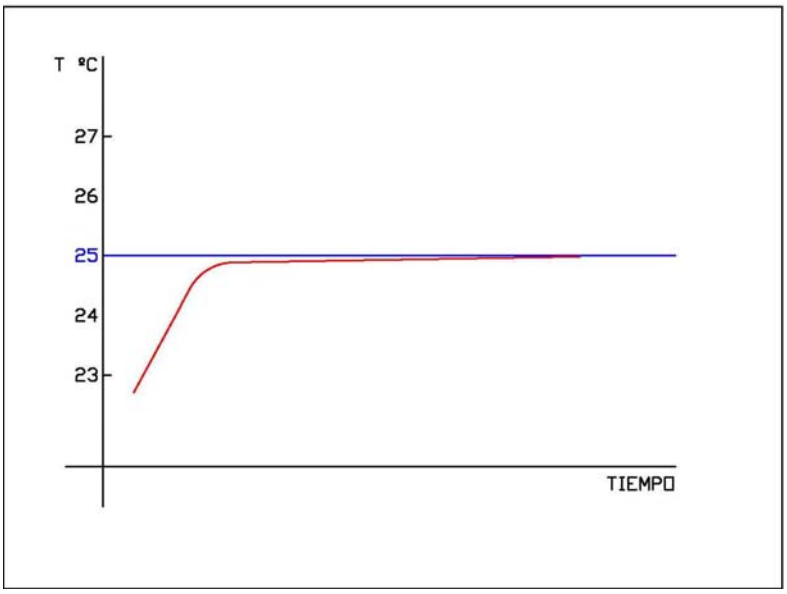


Figure 5. Typical graph of PI system

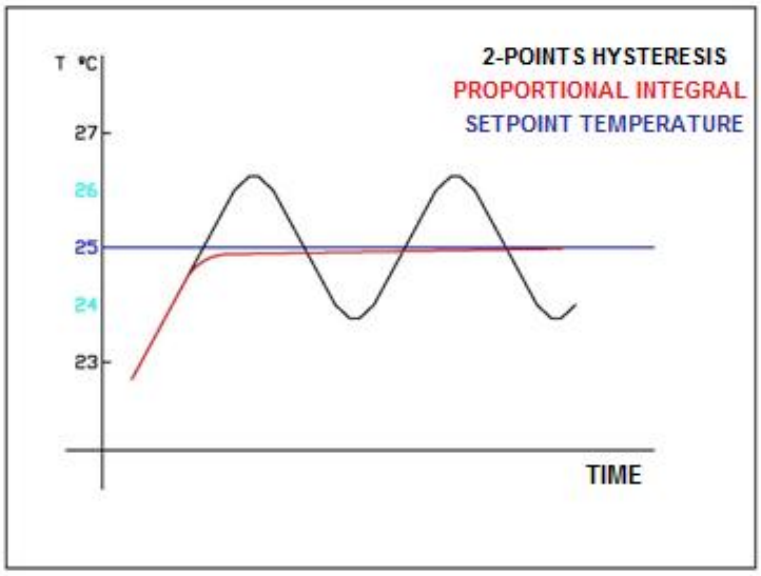


Figure 6. Ideal comparison between PI-control systems – 2 points with Hysteresis

3.2. TEMPERATURE

For the thermostatic control it is necessary to indicate two fundamental values to the calculating algorithm:

- **Setpoint temperature:** It is the **desired temperature** for the room. This temperature is selected by the user by means of devices used as interface between the installation and the user (i.e. with touch panel Z38i or ZAS).
- **Reference temperature:** It is the room temperature measured by one device able to do it.

As reference temperature, it can be used a **mixture of temperatures** in the devices, with the following proportions, parametrized in ETS:

Internal Probe / Source 1	External Probe / Source 2
100 %	0 %
75 %	25 %
50 %	50 %
25 %	75 %
0 %	100 %

The object of this option is to use different temperature measures for only one thermostat. This is very interesting, for example, for spacious rooms.

***Note**: In the QUAD, for the lots before 10AASxx, it can only be used as external sensor the value received through a communication object from another device, but not from another input of the same QUAD. For this aim, it will be necessary to use an intermediate device to transmit again its value to the bus, like, for instance, a module of logical functions with the identity operation.*

From these two input data, the algorithm of the thermostat will do the necessary calculations, depending directly on its own internal parameterization.

3.3. COOLING – HEATING PROTECTION: FUNCTIONING

Protection from overheating or freezing activates the suitable air-conditioning element to avoid **"extreme" temperatures**.

The protection, from overheating or freezing, is activated **when the thermostat is switched off**. It is permitted to activate/deactivate that function through the

thermostat parameterization, in the ETS tool. At this parameterization it is included the configuration of the **limit temperatures**, from which the protections are activated.

When activating/deactivating the protection a **hysteresis** equal to 1ºC has been implemented (lower for overheating protection and upper for freezing protection).

Although the protection is activated, there is no signal of it in *Clima* page. The only action is executed over the value of the implemented thermostatic control variable, forcing the **air-conditioning system** to act in the fastest way:

PROTECTION FROM OVERHEATING:

VARIABLE	SIZE	VALUE
PI – PWM (COOLING)	1 BIT	1
PI – CONTINUOS (COOLING)	1 BYTE	100 %
2 POINTS WITH HYSTERESIS (COOLING)	1 BIT	1

PROTECTION FROM FREEZING:

VARIABLE	SIZE	VALUE
PI – PWM (HEATING)	1 BIT	1
PI – WITHTINUO (HEATING)	1 BYTE	100%
2 POINTS WITH HYSTERESIS (HEATING)	1 BIT	1

Example. Establishing protection from overheating and freezing:

- Upper Limit: 35 ºC
- Lower Limit: 7 ºC
- Control Method: CONTINUOUS-PI

At a given moment, with the thermostat in the OFF status, the setpoint temperature for the thermostat is equal to 6.9 ºC. At this moment, the value of the variable is forced to the value 100%.

Due to the air-conditioning system action, the temperature begins to increase. Once the temperature is higher than 8 ºC (1 ºC of hysteresis), the value of the variable is again modified with value 0%.

3.4. ADDITIONAL COOLING-HEATING SOURCE

Zennio's thermostat incorporates the possibility of using **additional heating or cooling sources**, in order to control the temperature in the rooms to acclimatize (in case of having more than one air-conditioning system).

By means of the thermostat parameters, it can be defined the **temperature band** where the additional system begins to work. The parameter *"Additional heating band"* determines the difference between the maximum temperature of the additional heating band and the setpoint temperature. In case of using an additional cooling source, the "*Additional cooling band*" determines the minimum difference between the minimum temperature of the additional cooling band and the setpoint temperature.

The intervention of the additional system is activated with a dedicated **communication object** of **1-bit**. When the room temperature is in the additional band, the communication object gets the value "1", and returns the value "0" when the temperature is inside the usual working band. There is no hysteresis for this function.

This function is very useful to make the most of installations, because the comfort provided by them is increased, since different air-conditioning systems interact with the same aim.

An example could be the use of one Split as additional heating source in a room where the main air-conditioning system is a radiant floor which has a slower thermal lag than other systems like the split and, it reacts more gradually to setpoint temperature. That is the reason why the Split is a suitable system when great temperature changes are required (for example, an increase of 2 ºC in setpoint temperature).

Example. Using an additional heating system to acclimatize a room:

- Main air-conditioning system: Radiant floor
- Additional heating system: Split
- Additional heating band: 3 ºC
- Room temperature: 22 ºC.

At a given moment, a setpoint temperature equal to 26 ºC is required. Since the difference between the setpoint temperature and the room temperature is higher than 3ºC, the additional heating source (Split) is activated. Once the room temperature exceeds 23 ºC (lower difference than the specified additional heating band), the additional heating source is switched off.

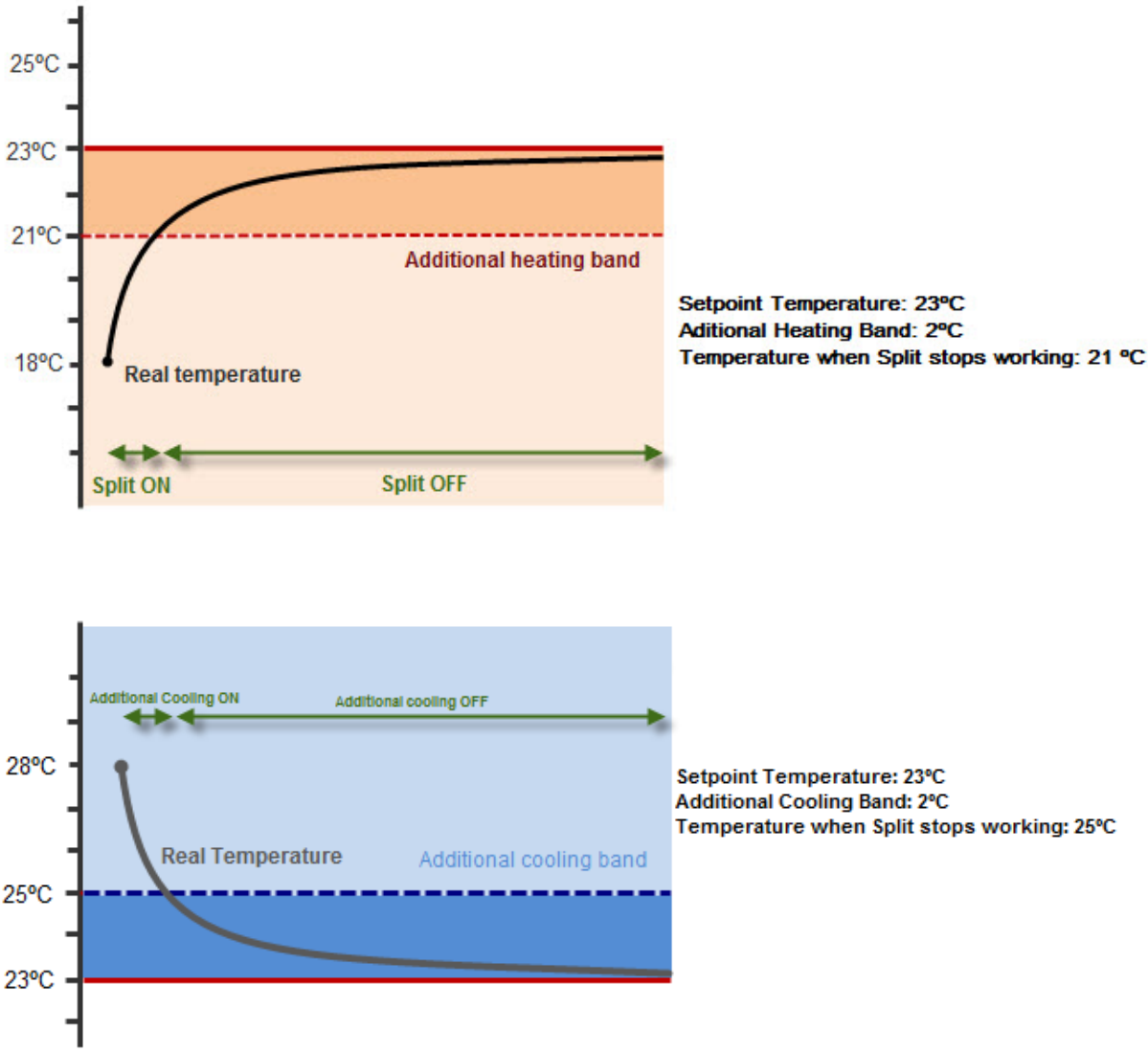


Figure 7. Additional heating and cooling activation.

3.5. AUTOMATIC MODE SWITCHING

Zennio thermostat is able to work in **heating mode** or **cooling mode** in case these modes are enabled. There are two ways of **mode switching**: **manual switching** or **automatic switching**.

The **manual mode switching** can be carried out by:

- **1-bit mode communication object**
- **Z38i box (in ZN1VI-TP38i device)**
- **Thermostat menu of ZAS (in ZN1VI-TPZAS device)**

The **automatic mode switching** of thermostat consist in setting the mode (heating/cooling) according to the difference between real temperature and setpoint, without having to change it manually. The criterion followed for this automatic change of mode is detailed in section *5.5 Operation of the automatic mode switching.*

3.6. IRSC (APPLICATION PROGRAM IRSC ZONE)

The IRSC device does not incorporate an analogue input to which connect a NTC probe to measure the temperatures, nor a temperature probe directly incorporated in its hardware.

However, as mentioned before, this device does have **a thermostat function for controlling the motorized grilles** in zoning. For this purpose, the application program of the IRSC Zone has a communication object of 2 bytes floating point for every zone, following the standard being able to use the temperature given by any KNX device (like a Z38i panel, QUAD, ACTinBOX CLASSIC Hybrid, or ZAS), which will be the one to be used for the thermostatic calculation. For this reason, it is not possible to mix proportionally different measurements of temperature to calculate a reference temperature in the thermostat.

Since the functionality of the IRSC Zone device is limited to the grille control, the functionalities for Overheating or Freezing protection, additional Cooling-Heating source, Special Modes or Automatic Change of Mode are not included.

4. ETS CONFIGURATION

In this section, the thermostat configuration of the different devices with the tool ETS is shown.

This configuration is detailed for the Z38i panel and the QUAD. For the ACTinBOX CLASIC Hybrid and the ZAS it is only indicated how to enable it, because this parameterization is the same as the QUAD one.

The thermostat configuration of IRSC with the application program Zone is detailed in the manual Zoning KNX – Clima III.

4.1. TOUCH PANEL Z38I

For enabling the thermostat in the touch panel Z38i it is necessary to enable one ***Clima*** page in Pages first. Once it has been done, the thermostat is enabled in the Clima tab as shown in the following figure:

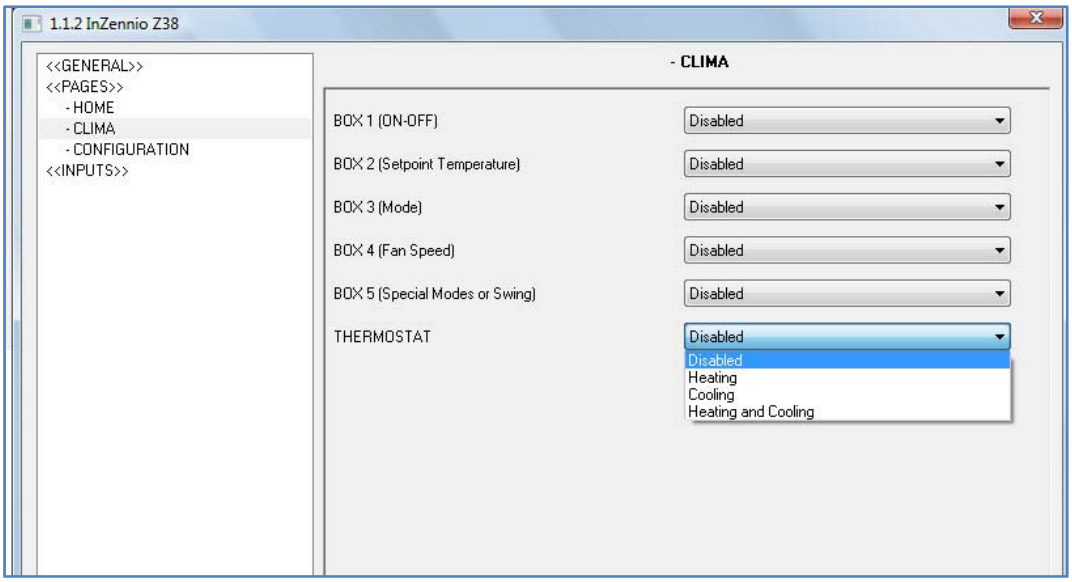


Figure 8. Enabling thermostat in Z38i

Select the type of thermostat according to the application for which is going to be used:

- **Only Heating**
- **Only Cooling**
- **Heating and Cooling**

If the option **Heating and Cooling** is selected, it shows up the option for the configuration of the **HEATING/COOLING AUTOMATIC SWITCHING** with the following options:

- **Always enabled:** the mode switching is always automatic.
    - **Upper band [x0.1ºC] Heating -> Cooling:** it sets the limit temperature over the setpoint, where the real temperature should rise so that automatic switching from heating to cooling mode takes place. Its value will be 0.5 to 4ºC.
    - **Lower band [x0.1ºC] Cooling -> Heating**: it sets the limit temperature below the setpoint, where the real temperature should decrease so that automatic switching from cooling to heating mode takes place. Its value will be 0.5 to 4ºC.
- **Always disabled:** the mode switching is always manual.
- **Enable using 1 bit object:** a 1bit communication object, called Heating/Cooling automatic switching, is enabled. If value 1 is received, the automatic mode switching is activated and if it receives value 0 it is deactivated, so the mode switching is manually made.
    - **Upper band [x0.1ºC] Heating -> Cooling**: it sets the limit temperature over the setpoint, where the real temperature should rise so that automatic switching from heating to cooling mode takes place. Its value will be 0.5 to 4ºC.
    - **Lower band [x0.1ºC] Cooling -> Heating**: it sets the limit temperature below the setpoint, where the real temperature should decrease so that automatic switching from cooling to heating mode takes place. Its value will be 0.5 to 4ºC.

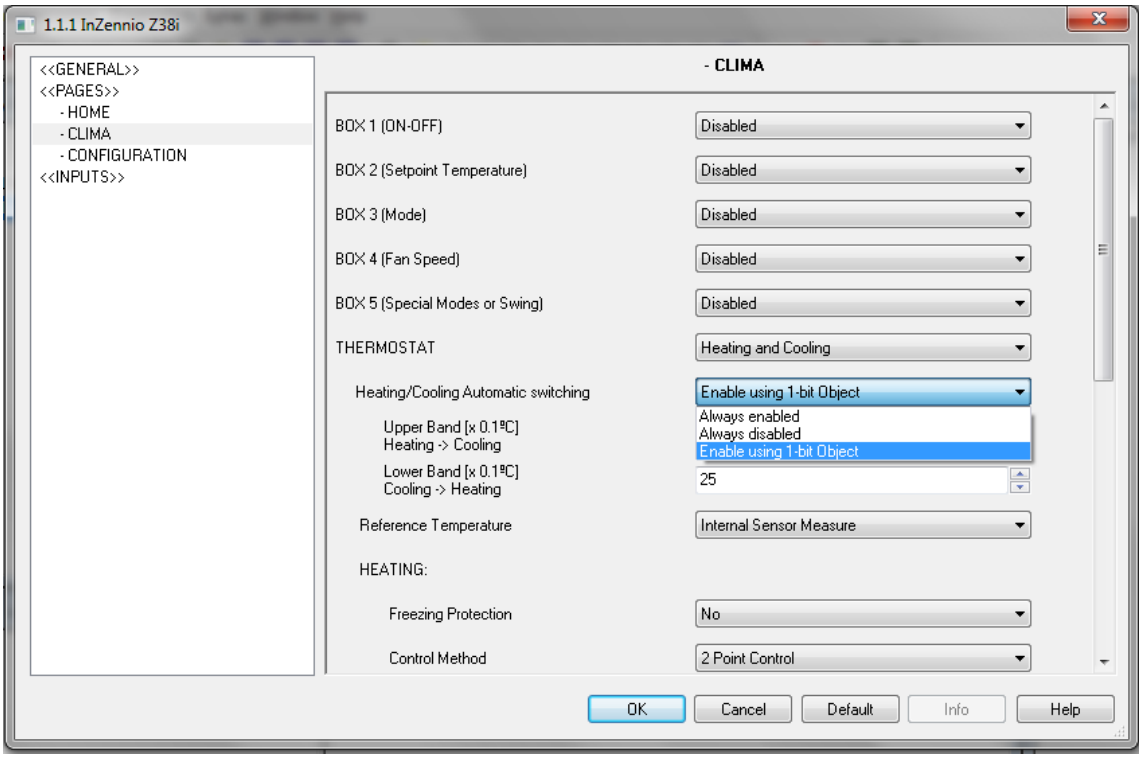


Figure 9. Z38i thermostat – automatic mode switching

Both for the "Only Heating", "Only Cooling" or "Heating and Cooling" thermostat types, there are two possible options for configuring the thermostat control:

- **2-Points Hysteresis Control**
  - The upper and lower hysteresis are introduced.
- **PI Control**
  - **PI PWM** or **PI-Continuous** is selected.
  - Specify the control parameter according to the application for which the thermostat is going to be used.

It also exists protection options from extreme temperatures. In the **heating mode** of the thermostat it is possible to enable the **protection from freezing**, and in the **cooling mode**, the **protection from overheating**. It is necessary to set a **protection temperature** in both of them.

In the following figure the Thermostat configuration zone for "Heating and Cooling" applications is shown. For the heating mode, a PI-continuous control was selected and for the cooling mode, a 2-Point Hysteresis control. Protection options are enabled.

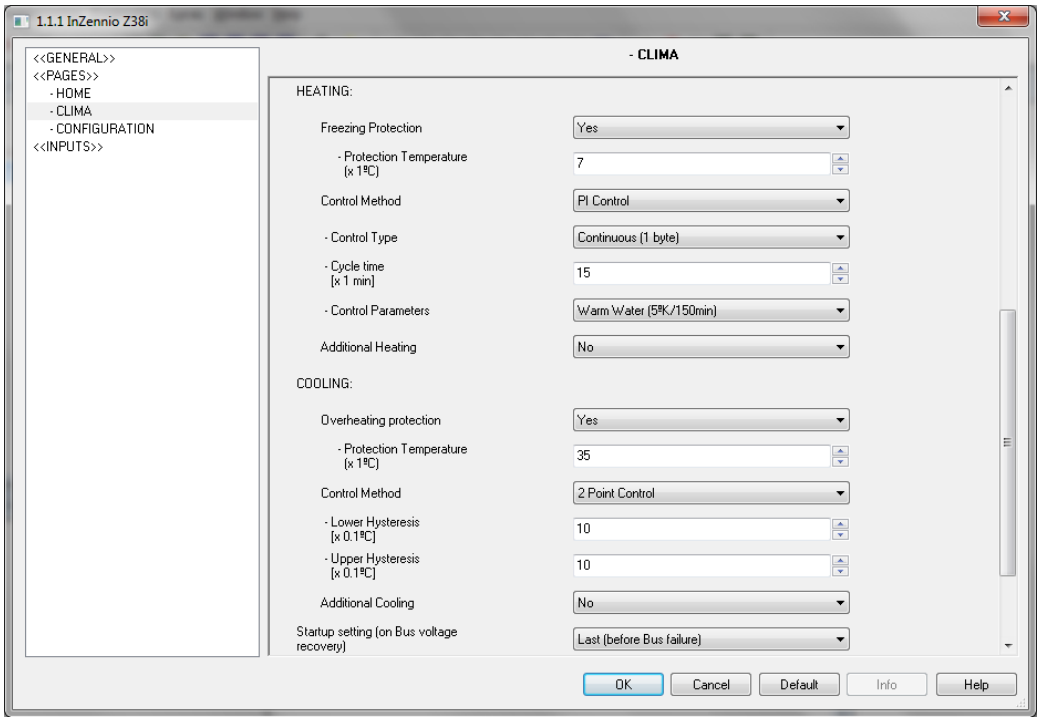


Figure 10. Z38i Thermostat: Cooling and heating

4.2. QUAD

In the device QUAD, the thermostat is enabled in the tab "**General**" selecting "Temperature Probe and Thermostat" as shown in next figure.

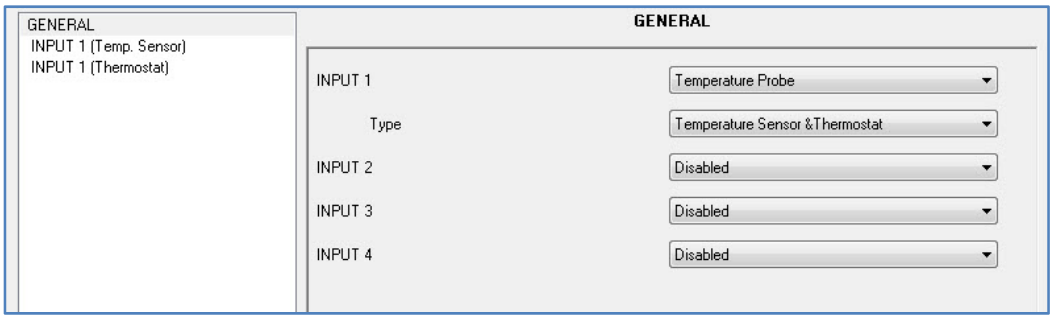


Figure 11. QUAD Thermostat: Enabling Thermostat

In the tab ***Input n*** (**Thermostat**) for the thermostatic control, select the option that fits the needs of the air-conditioning system:

- **Only Heating**
- **Only Cooling**
- **Heating and Cooling**

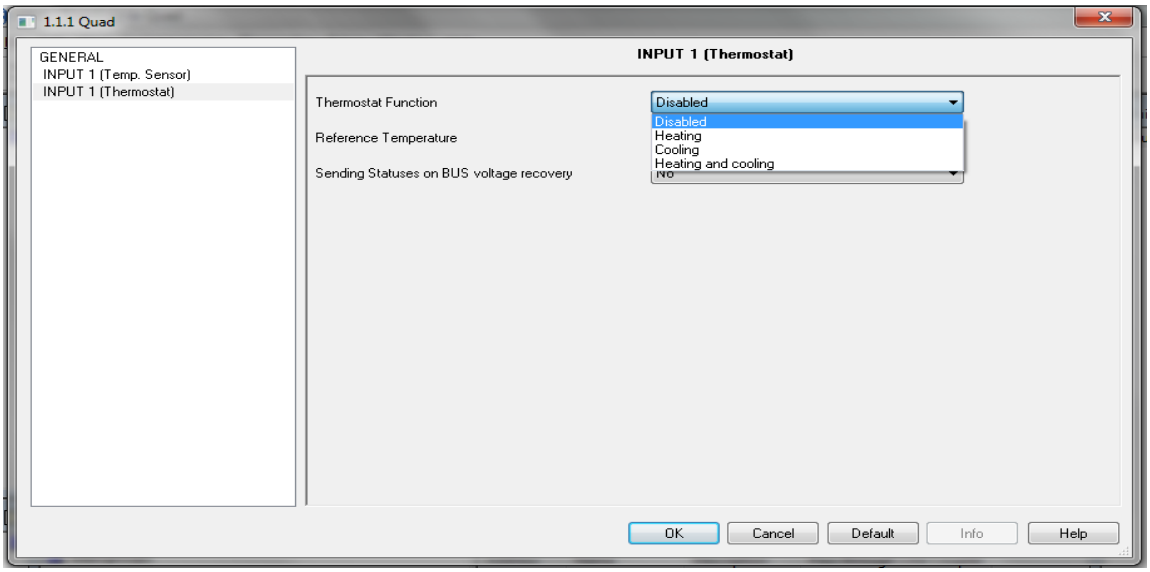


Figure 12. QUAD Thermostat: Thermostat Function

And the desired **reference temperature**:

- Measured by internal sensor
- Measured by external sensor
- Proportion 1 (25 internal, 75% external)
- Proportion 2 (50 internal, 50% external)
- Proportion 3 (75 internal, 25% external)

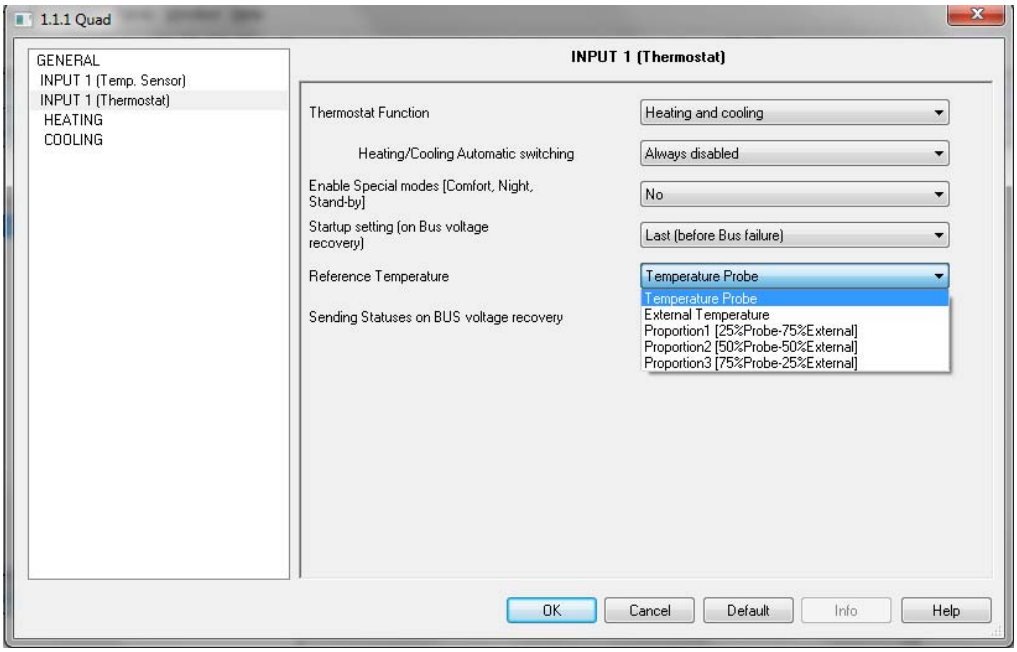


Figure 13. QUAD Thermostat: Reference Temperature

If the heating and cooling option is selected, the parameter of automatic switching between cooling and heating appears, as shown below:

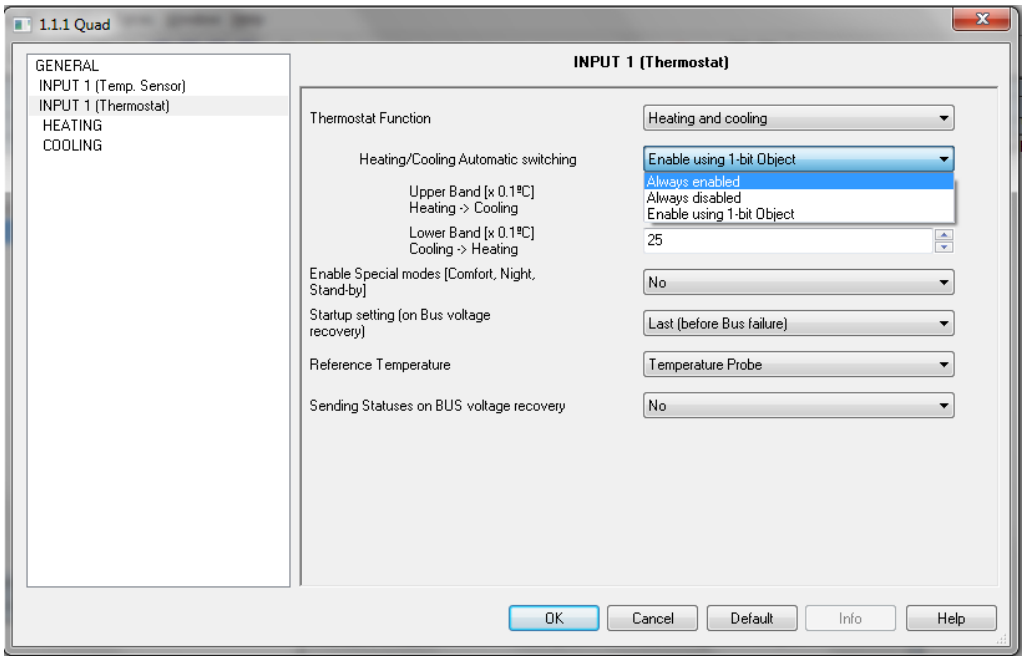


Figure 14. QUAD Thermostat – Automatic mode switching

Once the thermostat function is selected, we have to configure the thermostat control for Cooling and/or Heating:

- **2-Points with Hysteresis Control**
  - The upper and lower hysteresis are introduced
- **PI Control**
  - **PI PWM** or **PI-Continuous** is introduced.
  - Specify the control parameter according to the application for which the thermostat is going to be used.

Heating mode also allows enabling the **protection from Freezing** and the **Cooling Mode**, the **protection from Overheating**. It is necessary to set a **protection temperature** in both of them.

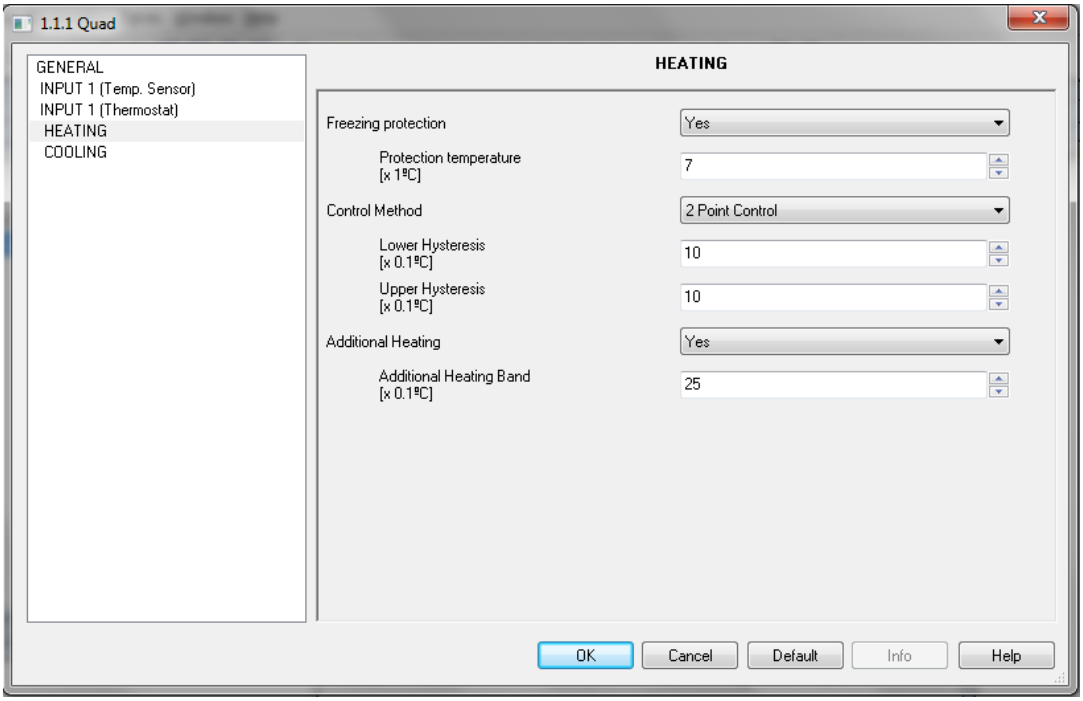


Figure 16. QUAD Thermostat. Heating mode. 2-Point Hysteresis control

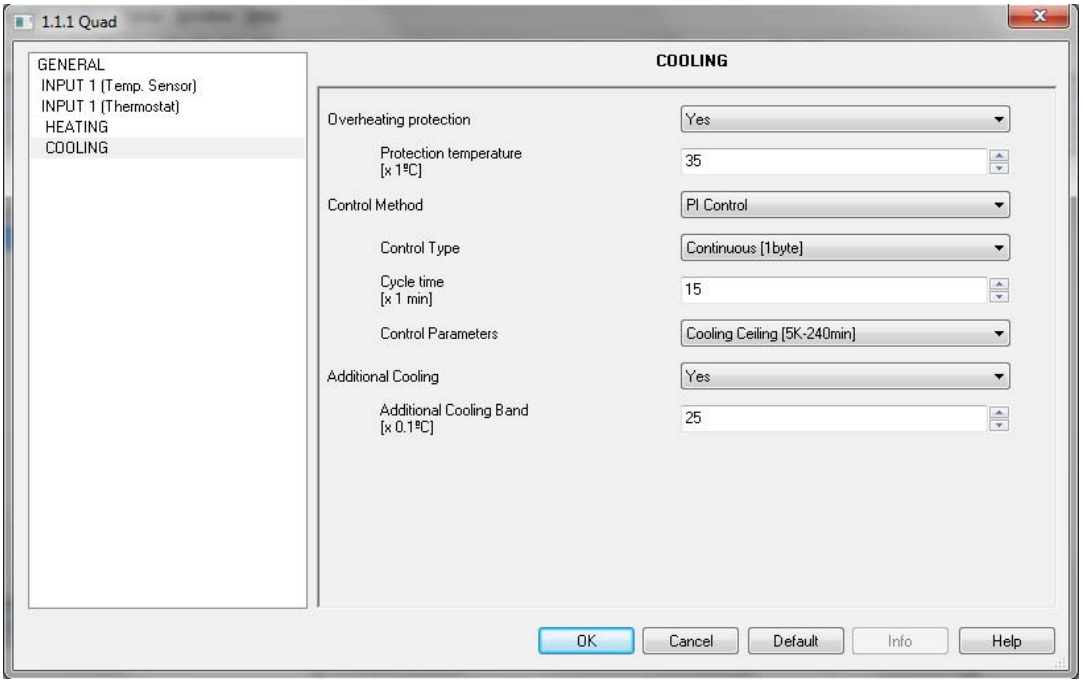


Figure 15. QUAD Thermostat: Cooling – PI control

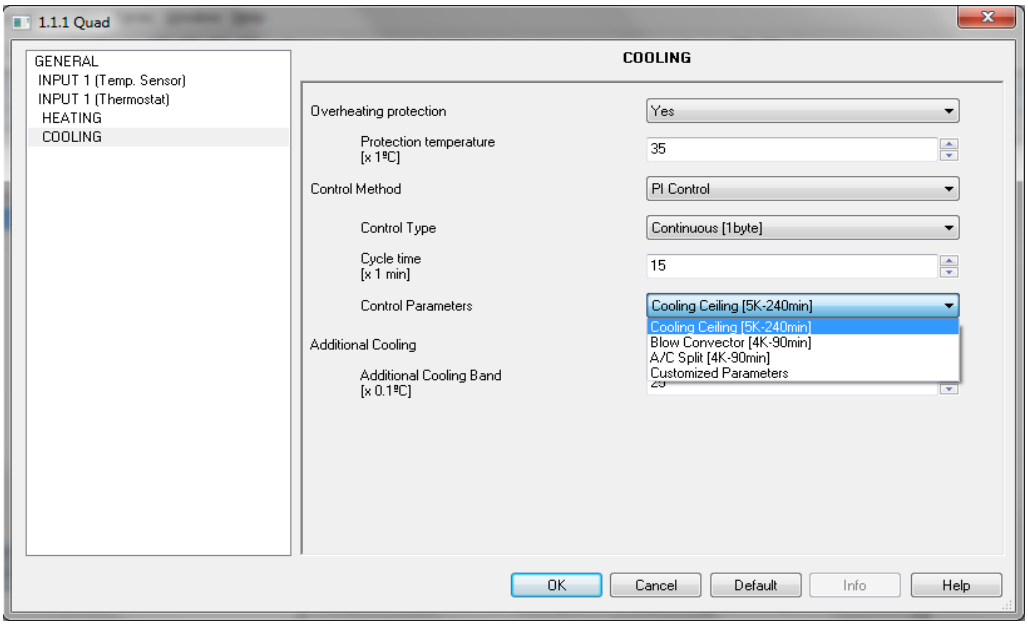


Figure 17. QUAD Thermostat. PI Control Parameters

4.3. ACTINBOX CLASSIC HYBRID

In the ACTinBOX CLASSIC HYBRID device, the thermostat is enabled selecting "Temperature Probe and Thermostat" for the input 5 (the analogue/digital input for temperature probe), as shown in the figure below. Next, the thermostat functions are configured in the tag ***Input 5 (Thermostat),*** the same way as in QUAD.

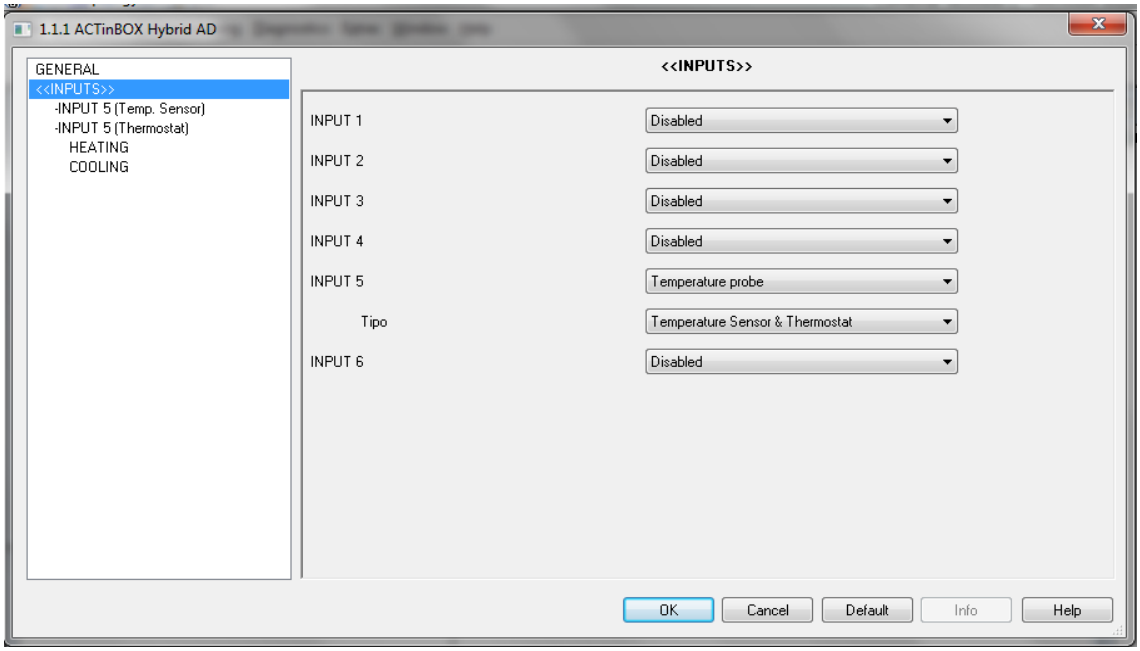


Figure 18. ACTinBOX CLASSIC HYBRID Thermostat: enabling Thermostat

4.4. ZAS

In the ZAS, the thermostat is enabled in the tag ***MENU***, as shown in the figure below. Next, in the ***Thermostat (Config)*** tag, the thermostat options are configured as in the QUAD.

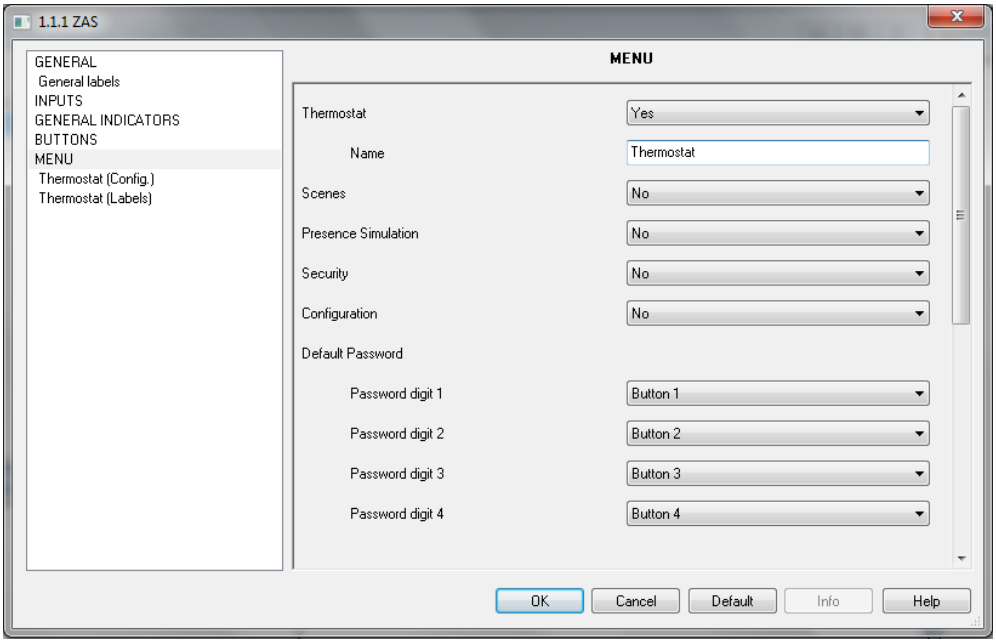


Figure 19. ZAS Thermostat: enabling thermostat

4.5. IRSC ZONE

The thermostat configuration for the IRSC with the application program IRSC Zone requires additional knowledge, detailed in manual Zoning KNX – Clima III.

5. PRACTICAL QUESTIONS

In this section it can be found a series of notes to take into account for configuring and understanding the thermostat performance in Zennio's devices.

5.1. PARAMETERIZING THE PI CONTROL

When configuring a PI Thermostatic Control, there is a control parameter, which specifies the type of air-conditioning system that is used to calculate the control variable.

For the parameterization of PI we can choose among the following air-conditioning systems (see **¡Error! No se encuentra el origen de la referencia.**):

- Warm Water [5K – 150min]
- Floor Heating [5K – 240min]
- Electric Heating [4K – 100min]
- Blow Convector [4K – 90min]
- A/C Split [4K – 90min]
- Customized parameters

In case of selecting "**customized** parameters" we have to introduce:

- ***Proportional Band (ºK):*** error value proportional to the difference between setpoint temperature and room temperature.
- ***Integral Time (minutes)***: it depends on the thermal lag of the air-conditioning system that can adjust the approximation error as time goes by.

For making sure the correct performance of the system it is hardly recommended to choose between the defined options according to the air-conditioning system, since only air conditioning experts will be able to select the suitable configuration in these cases.

It is also specified for the PI control a ***Cycle Time*** in minutes. This cycle time depends on the **inertial lag** of the installed system. For air-conditioning systems with slow thermal lags, we will have to indicate a higher cycle of time. For instance:

SYSTEM TYPE	CYCLE TIME
RADIANT FLOOR	30-50 minutes
AIR SYSTEM	8-12 minutes

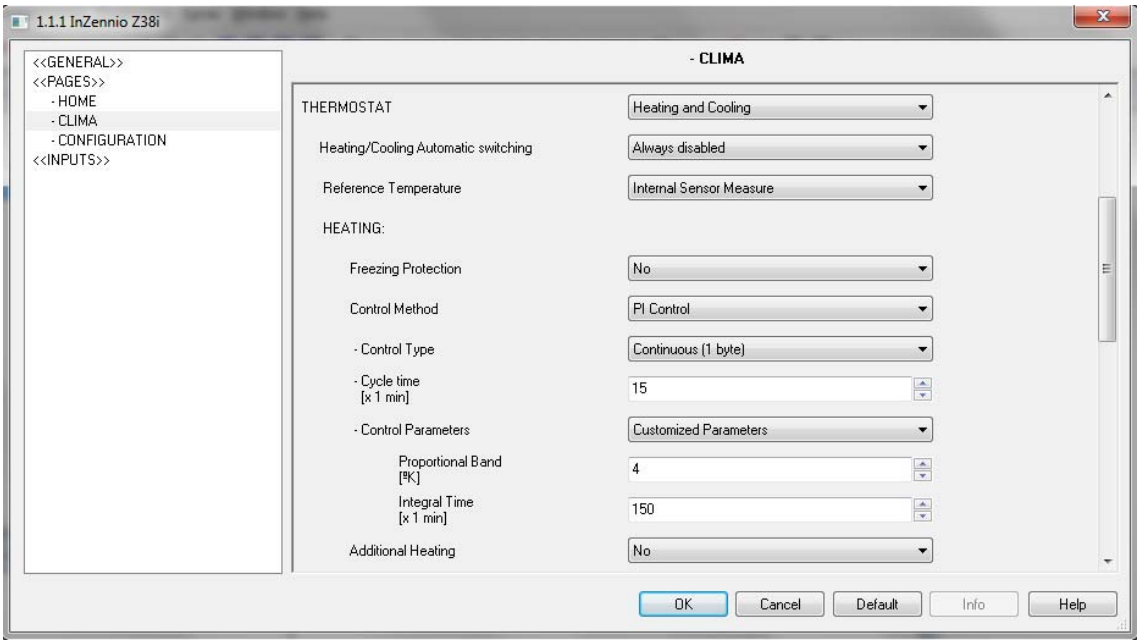


Figure 20. Touch Panel Z38i – Configuring the personalized Control Parameters for PI control

5.2. PI-PWM CONTROL INDICATOR (Z38I)

In Touch Pannel Z38i, when the **thermostatic control PI-PWM** is used, there is an indicator of the value of the control variable. In the specific tab for Clima, in the right upper part of the thermostat status indicator (ON) the symbol asterisk (*) will appear when the variable PI-PWM is equal to “1” and it will not appear when this variable is equal to “0”.

Figure 21. Touch Panel Z38i - Indicator of the control variable PI-PWM

5.3. EXTERNAL CLIMA CONTROL (Z38I AND QUAD)

The **clima parameters** in QUAD, ACTinBOX CLASSIC HYBRID and IRSC Zone (ON/OFF, setpoint temperature and mode) can be established from **external devices**, i.e touch panel Z38i or ZAS.

The corresponding sending communication objects of Z38i are the following:

- **[Clima X]: Sending ON/OFF**
- **[Clima X]: Sending Mode**
- **[Clima X]: Sending Setpoint Temperature**

The sending communication objects of ZAS are:

- **Thermostat – ON/OFF Status**
- **Cooling/Heating**
- **Setpoint Temperature Status**

In the same way, the clima parameters for controlling the thermostat in the Z38i or ZAS can be externally established, with another touch panel. This is useful in the case of a **centralized air-conditioning** system in all zones of a house. For this external control we will have to link the above-mentioned sending communication objects of the main touch panel, that controls the clima parameters, and the receiving communication objects in the rest of touch panels, that carries out the thermostatic control.

The corresponding receiving communication objects of Z38i are the following:

- **[Clima X]: Receiving ON/OFF**
- **[Clima X]: Receiving Mode**
- **[Clima X]: Receiving Setpoint Temperature**

The receiving communication objects of ZAS are:

- **Thermostat ON/OFF**
- **Cooling/Heating**
- **Setpoint Temperature**

5.4. SPECIAL MODES

The Zennio thermostat can be parameterized with special modes (**Comfort, Night, Stand-by**). With these modes, pre-defined setpoint temperatures can be established for achieving a comfort situation in every case.

When the special modes are established in **Z38i**, a touch panel is used for modifying the **setpoint temperatures pre-defined** by every mode. You can access to it through the *Box 6 of Clima X.*

In **ZAS,** the "**Enable Special Modes" option** is also used, to enable the mode and to modify the setpoint temperature of each of them.

In case of using the special modes in the QUAD or ACTinBOX CLASSIC HYBRID, the **communication objects** of temperature for each special mode are necessary, for cooling and heating, depending on the thermostat function:

- Comfort Setpoint Temperatura (cooling)
- Comfort Setpoint Temperature (heating)
- Night Setpoint Temperature (cooling)
- Night Setpoint Temperature (heating)
- Stand-by Setpoint Temperature (cooling)
- Stand-by Setpoint Temperature (heating)

When the thermostat is ON and a special mode is established, the setpoint temperature is modified. And, for the Z38i and ZAS, a "1" is sent through the communication object corresponding to the established mode.

Nevertheless, when the thermostat is OFF and a special mode is established, the thermostat performance will depend on the *Reaction of Clima in OFF when receiving a Special Mode*, according to the selected option among the following:

- It remains OFF and nothing changes
- It remains OFF but setpoint temperature is updated
- Setpoint temperature changes and Clima turns ON

In case of the Touch Panel Z38i, this parameter is established in the ETS configuring the BOX 5 of the **Clima** where the thermostatic control is carried out:

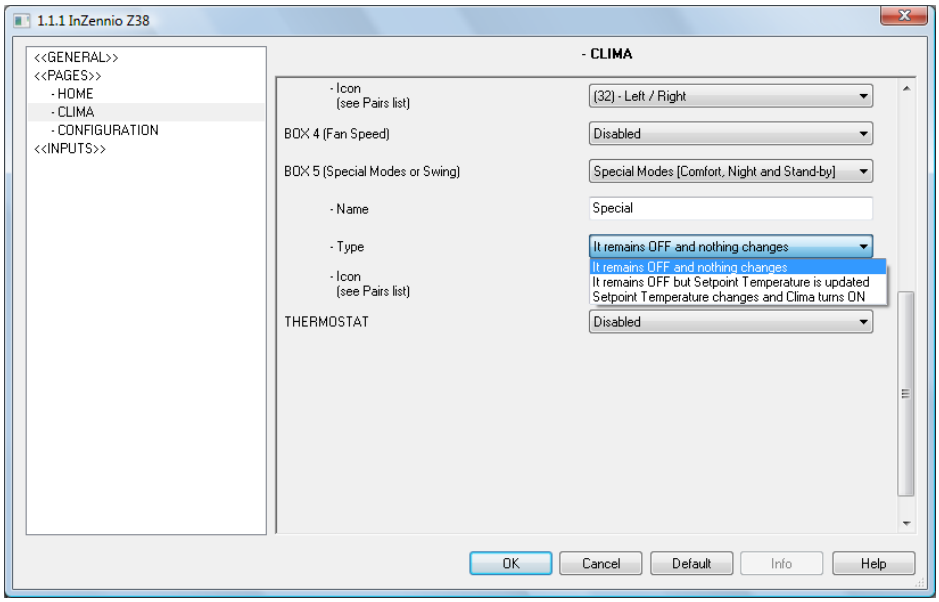


Figure 22. Special Modes in Z38i

In the case of QUAD and ACTinBOX CLASSIC HYBRID, this parameter is configured in the tab ***Input n (thermostat)***, where n is the input number.

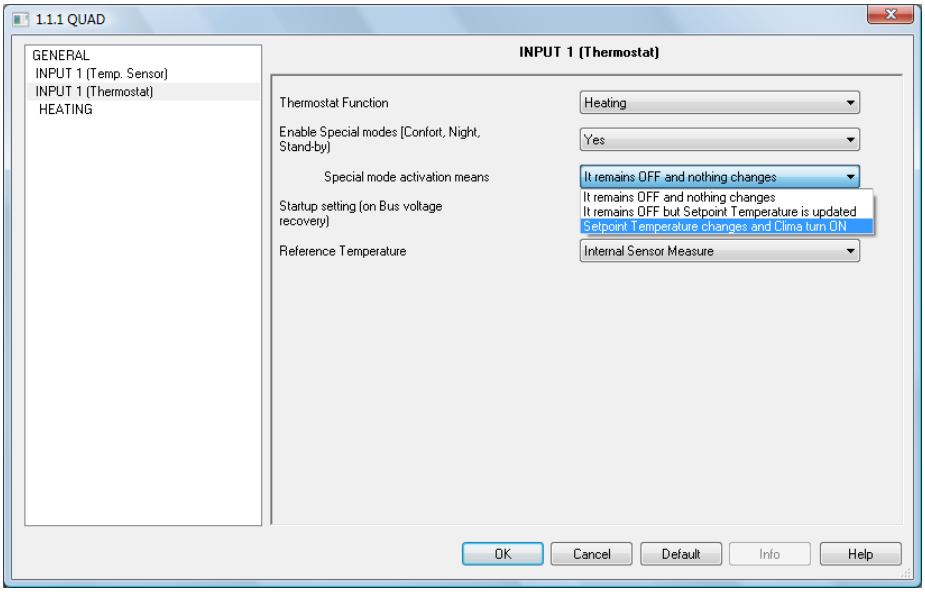


Figure 23. Special Modes in QUAD

For the **ZAS**, this configuration is carried out in the tag ***Thermostat (Config.)***. Its parameterization is the same.

In the **IRSC Zone** this option is not permitted.

5.5. OPERATION OF THE AUTOMATIC MODE SWITCHING

When a setpoint is established, the thermostat sends the control value according to the current mode, so that the climate system makes the real temperature reach the setpoint.

The automatic mode switching is based on the **difference between real temperature and setpoint**, besides some limits for this difference, which are defined in thermostat parameters.

For **automatic switching from heating to cooling**, an **upper band** is defined. This is the band over the setpoint, where the real temperature should be in order to remain in heating mode. When real temperature rises over this band, the automatic switching from heating to cooling mode happens.

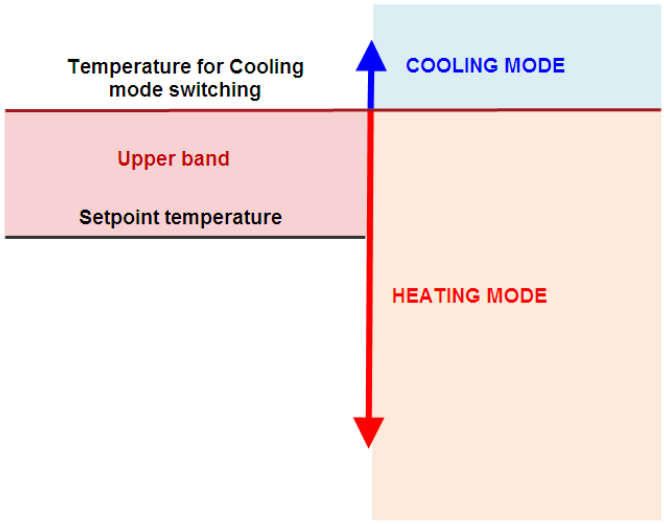


Figure 24. Switching from Heating to Cooling mode

For **automatic switching from cooling to heating** a lower **band** is defined. This is the band below the setpoint, where the real temperature should be in order to remain in cooling mode. When real temperature drops below this band, the automatic switching from cooling to heating mode happens.

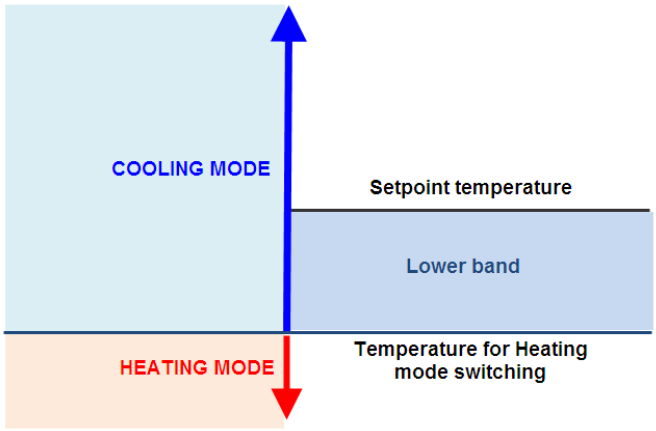


Figure 25. Switching from Cooling to Heating mode

In the figure below the thermostat is in Heating mode at the beginning and the real temperature is varying. Due to this variation, two automatic mode switches take place.

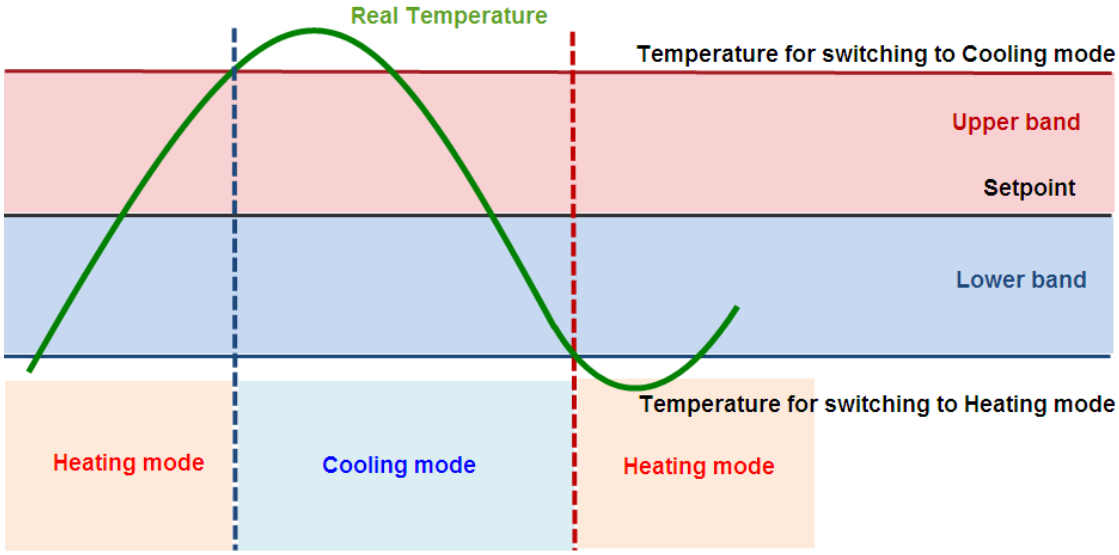


Figure 26. Example of automatic mode switching

We should take into account that a **change of setpoint** results in a **change in the temperatures of upper and lower bands**, for a current temperature. Thus, an automatic mode switching could take place due to the setpoint change.

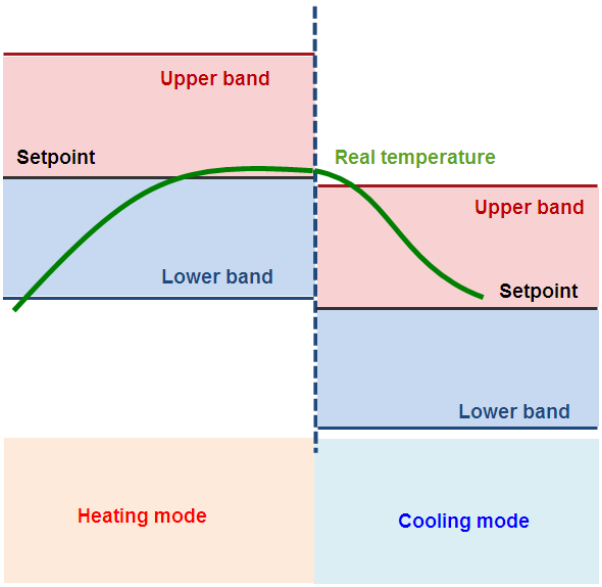


Figure 27. Automatic mode switching due to setpoint change

5.6. THERMOSTAT CONTROL FROM HOME PAGE

The clima parameters of thermostat (ON/OFF, setpoint temperature or mode) can be modified from the *Home* page of Touch Panel Z38i.

For carrying out this type of control from *Home*, first we have to configure the Clima page. Then we have to configure a box specifying that it is for:

- **Binary control:** ON/OFF
- **Temperature control:** for Setpoint Temperature
- **Clima control of Mode type:** for Mode

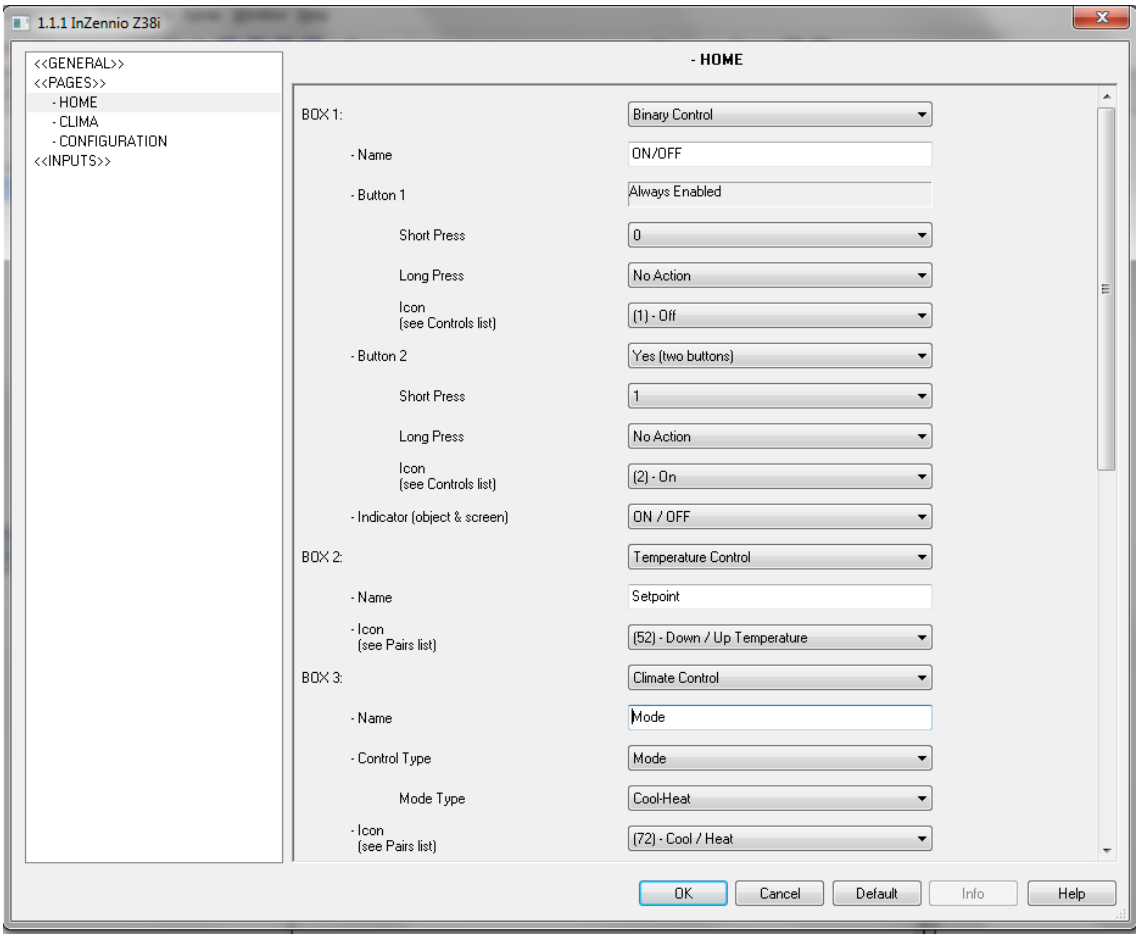


Figure 28. Thermostat Control from Home page

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