

THERMOSTAT

ETS USER MANUAL

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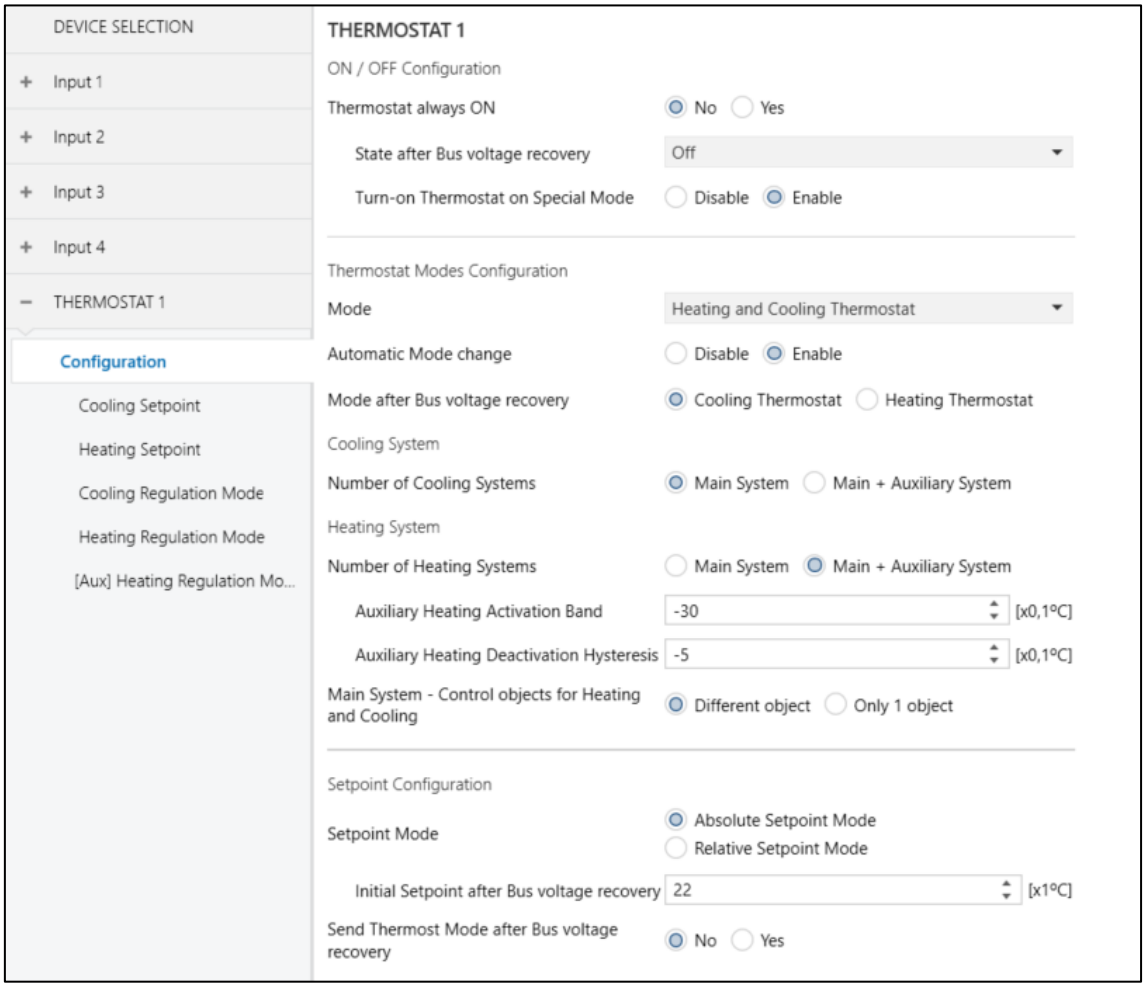
INTRODUCTION

This User Manual describes the operation and configuration of the thermostats incorporated in various DINUY Sensors and Actuators.

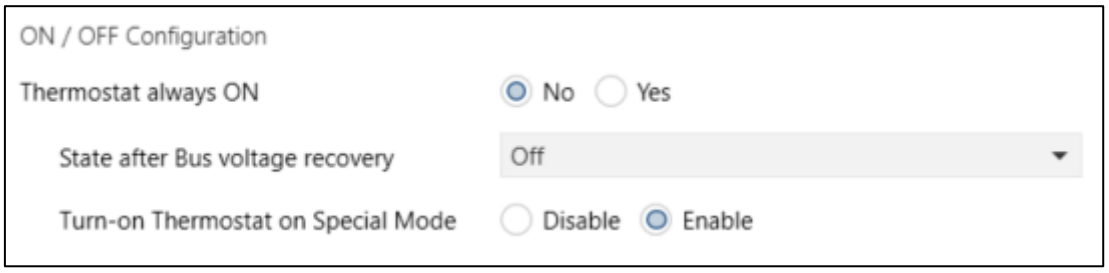
- Various DINUY devices incorporate the "**THERMOSTAT"** function to control room heating and cooling.
- Each thermostat provided by a device can be configured to control heating, air conditioning or both.
- Different control modes manage the operation of the various Sensors and Actuators according to the actual room temperature and the specified temperature setpoint.

CONFIGURATION

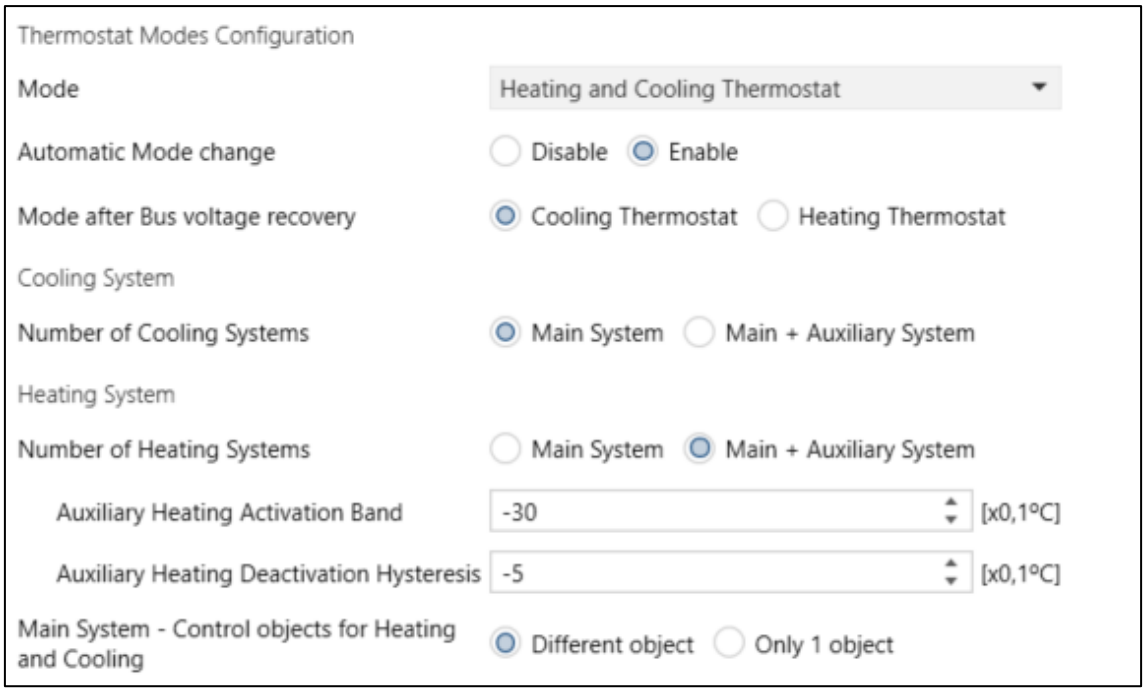
Each thermostat has a "**Configuration" section**. The window is shown below:



- ON / OFF configuration:

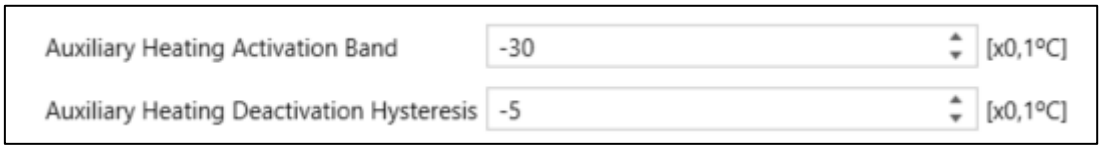


  - **Thermostat always On:** determines whether the thermostat will always remain on. Select "**Yes**" to keep it permanently on, or "**No**" if this is not required. Selecting "**No**" enables two additional parameters to define the switching-off conditions.
  - **State after bus voltage recovery: sets the** state of the thermostat immediately after bus voltage is restored. Select "**Off**" to switch it off, "**On**" to switch it on, or "**Last State"** to restore its previous **state**.
  - **Switch on Thermostat after Special Mode:** this function switches on the thermostat after a value is received through the special-mode input object. The object is "**[ThX] Special Mode Input [Data type]**".
- Thermostat mode configuration:



  - **Mode:** sets the thermostat mode. Select "**Cooling Thermostat" f**or cooling, "**Heating Thermostat" for heating, or "Heating and Cooling Thermostat" for bo**th. This selection determines the configuration options displayed in the menu and the communication objects available in the objects section.

- **Automatic mode changeover:** this option is available only when "**Heating and Cooling Thermostat" is sel**ected and enables automatic changeover. Automatic mode disables the "**[ThX] Heating or Cooling Mode**" object and changes between the two modes automatically instead. The system is programmed to detect when this change is required.
- **Mode after bus voltage recovery: this** option is available only when "**Heating and Cooling Thermostat" is s**elected. It sets the operating mode after bus voltage is restored.
- **Number of Cooling Systems:** cooling can use a single system or an auxiliary system to help cool the room more quickly. Once the room has reached steady-state conditions, the auxiliary system stops. To configure an auxiliary system, select "**Main + Auxiliary System**". Additional variables are then displayed to configure it.
- **Auxiliary Cooling Activation Band:** difference from the specified setpoint, in tenths of a degree Celsius, at which the auxiliary mode starts.
- **Auxiliary** Cooling Deactivation Hysteresis: temperature range for switching off auxiliary cooling.
- **Number of Heating Systems:** heating can use a single system or an auxiliary system to help heat the room more quickly. Once the room has reached steady-state conditions, the auxiliary system stops. To configure an auxiliary system, select "**Main + Auxiliary System**". Additional variables are then displayed to configure it. These variables are configured in the same way as for cooling mode.
- **Main System – Heating and Cooling Control Objects: this option is available only if "Heating and Cooling Thermostat" is selected under "Mode". It allows the system to be controlled through a single communication object or through a different object for each system. If "Single object" is selected, control us**es object 77 "**Output**". If "**Separate objects**" is selected, control uses objects 78 "**Cooling Output" and** 79 "**Heating Output"**.
- **Auxiliary Heating/Cooling Activation Band:** configures the auxiliary heating/cooling activation band.
- **Auxiliary Heating/Cooling Deactivation Hysteresis:** configures the auxiliary heating/cooling deactivation hysteresis.



Number	Name	Object Function	Lin	Gr	Length	C	R	W	T	U	Data Type	Priority
1	[In1] Disable Temperature functionality	1 = Block; 0 = Unblock			1 bit	C	-	W	-	-	switch	Low
2	[In1] Temperature Output	Temperature Value			2 bytes	C	-	-	T	-	temperature (°C)	Low
3	[In1] Over-Heating Output	1 = Over-Heating; 0 = No Over-Heating			1 bit	C	-	-	T	-	alarm	Low
4	[In1] Over-Cooling Output	1 = Over-Cooling; 0 = No Over-Cooling			1 bit	C	-	-	T	-	alarm	Low
72	[Th1] Thermostat On/Off	1 = On; 0 = Off			1 bit	C	-	W	-	-	switch	Low
73	[Th1] Thermostat On/Off Status	1 = On; 0 = Off			1 bit	C	-	-	T	-	switch	Low
74	[Th1] Setpoint Input	Setpoint			2 bytes	C	-	W	-	-	temperature (°C)	Low
76	[Th1] Setpoint Status	Current Setpoint			2 bytes	C	-	-	T	-	temperature (°C)	Low
78	[Th1] Cooling Output	Output (2-point & Hysteresis)			1 bit	C	-	-	T	-	switch	Low
79	[Th1] Heating Output	Output (2-point & Hysteresis)			1 bit	C	-	-	T	-	switch	Low
95	[Th1] Temperature Sensor 1	Input Temperature Sensor 1			2 bytes	C	-	W	-	-	temperature (°C)	Low
97	[Th1] Special Mode Input 1-Byte	1-Byte HVAC Mode			1 byte	C	-	W	-	-	HVAC mode	Low
98	[Th1] Special Mode 1-Byte Status	1-Byte HVAC Mode Status			1 byte	C	-	-	T	-	HVAC mode	Low
105	[Th1] Heating or Cooling Mode Status	0 = Cooling; 1 = Heating			1 bit	C	-	-	T	-	cooling/heating	Low

- **Setpoint Mode:** the temperature setpoint can operate in absolute or relative mode. Use this variable to select "**Absolute Setpoint Mode" or "Relative Setpoint Mode"**. Both modes are explained below in the setpoint configuration sections, where their values are selected.
- **Initial Comfort Setpoint after bus voltage recovery: sets th**e setpoint value, in °C, after KNX bus voltage is restored.
- **Special Mode after bus voltage recovery: sets the special** mode in which the system starts after KNX bus voltage is restored. The available modes are "**Comfort**", "**Standby**" and "**Eco**".
- **Send Thermostat Mode after bus voltag**e recovery: allows the thermostat mode to be remembered and restored when bus voltage returns.
- **Reference Temperature Source:** sets the reference system used by the device to check temperature. Select "**One source**" for a single temperature source, or "**Two sources 75%(1) – 25%(2)**", "**Two sources 50%(1) – 50%(2)**" or "**Two sources 25%(1) – 75%(2)**" for two sources with different weightings. To read the temperature sources, the system uses communication objects 95 "**Temperature Sensor 1" and 96 "Temperature Sensor 2**".
- Enable 1-Bit Mode Objects: allows the required mode to be selected through 4 different 1-bit objects "**[T] Comfort/Standby/Economy/Protection Special Mode**".

  However, a 1-byte input object "**[T] Special Mode Input 1 Byte**" is available by default. This object acts on all bits at the same time and would override what has been written through the 1-bit objects. The 1-bit objects only write to their own mode bit. It can take the following values:

  · 00: Auto

  · 01: Comfort

  · 02: Standby

  · 03: Economy

  · 04: Protection

  The 4 1-bit objects can operate in 2 different ways:

  - Switch Mode: setting any of the 4 1-bit objects to "**1**" activates the corresponding special mode. "**0**" deactivates the corresponding mode. If one bit is set to "**1**" and another bit is then set to "**1**", the mode with the highest priority will be activated. To clear a bit set to "**1**", "**0**" must be sent. The priority order is as follows: Protection > Comfort > Standby > Economy.

- Impulse Mode: setting any of the 4 1-bit objects to "**1**" activates the corresponding special mode. "**0**" has no effect. When a bit is set to "**1**", it automatically returns to "**0**" as soon as the mode is activated. Therefore, if another bit is subsequently set to "**1**", there will not be two bits set to "**1**", only the last one.

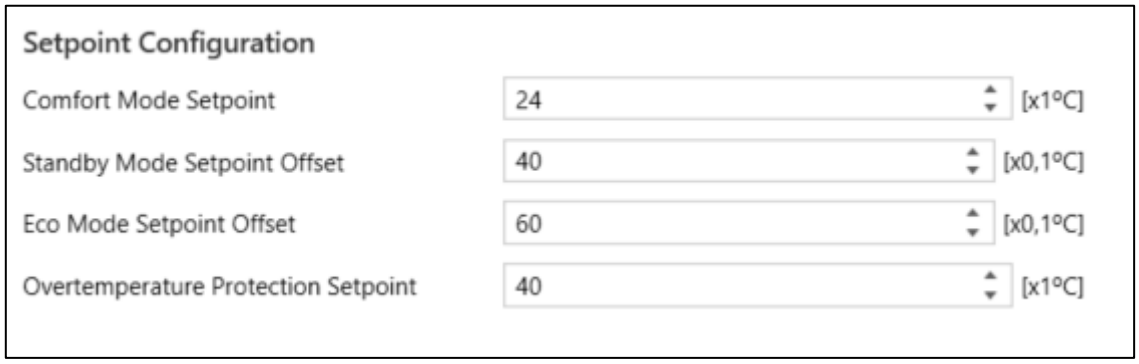
- **Enable Window Protection: protection of t**he temperature window can be enabled by selecting "**Enable"**. This activates four communication objects, 106 "**Window Alarm 1**", 107 "**Window Alarm 2**", 108 "**Window Alarm 3" and** 109 "**Window Alarm 4", which can b**e used as alarms.



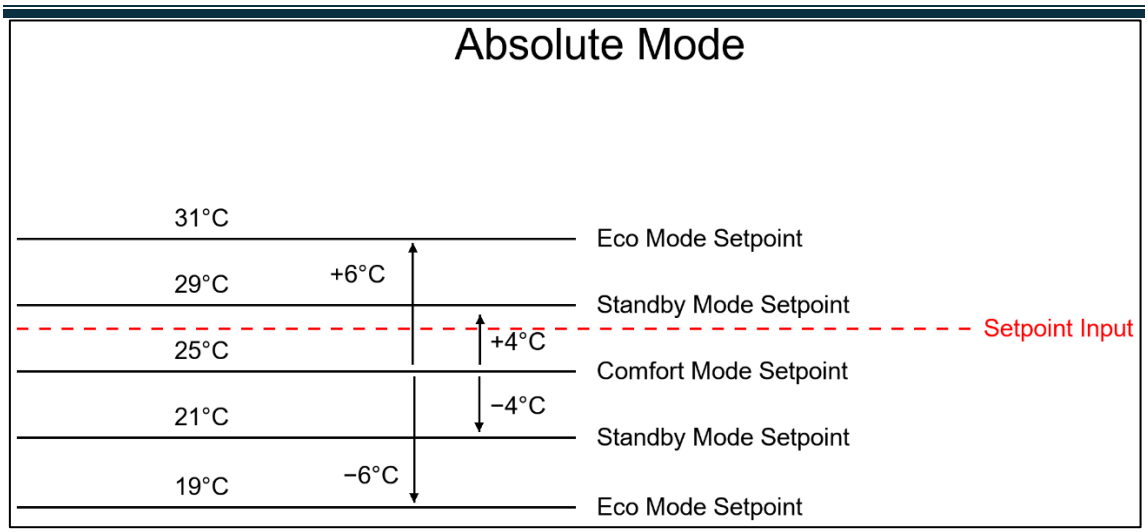
Cooling Setpoint

- **Absolute Setpoint Mode:** the setpoint is specified through the "**[Th1] Setpoint Input**" communication objec**t.**

  An additional drop-down menu with several special modes is displayed. In this mode, the "**Comfort Mode Setpoint" i**s a fixed temperature in °C. The other special modes are specified as differences, in tenths of a degree Celsius, relative to Comfort Mode.



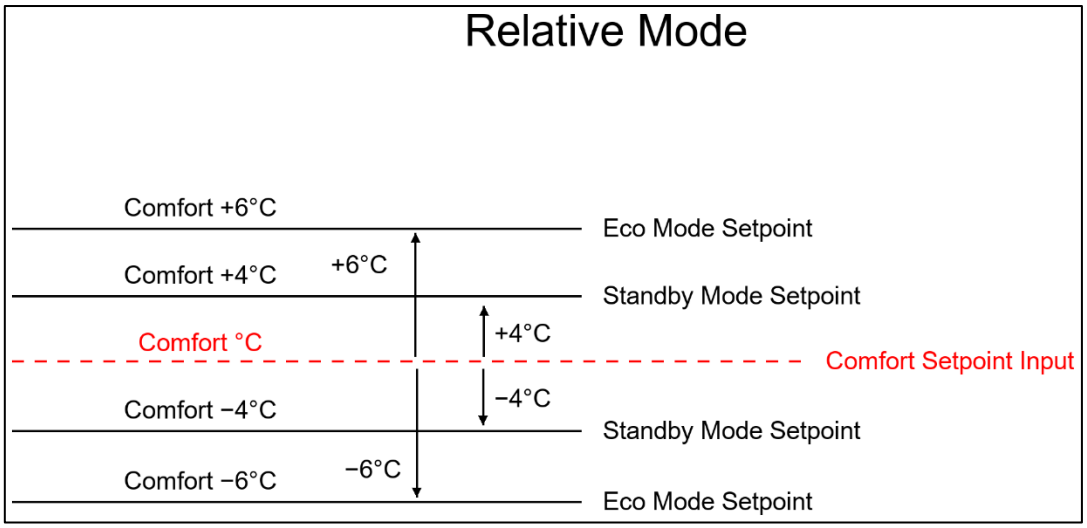
The following image helps explain this operation. It shows that the setpoint input is independent of the other special modes, which remain at a fixed configured offset from the Comfort mode setpoint.



- **Relative Setpoint Mode:** when this mode is selected, the "**[ThX] Setpoint Input**" communication object is no longer available. The "**[ThX] Comfort Setpoint Input" object is configured instead. All setpoints then increase or** decrease to maintain the range specified in the setpoint configurati**on**.



The following image helps explain this operation. It shows that all setpoints depend on the Comfort setpoint input. When this setpoint changes, all the others move with it.



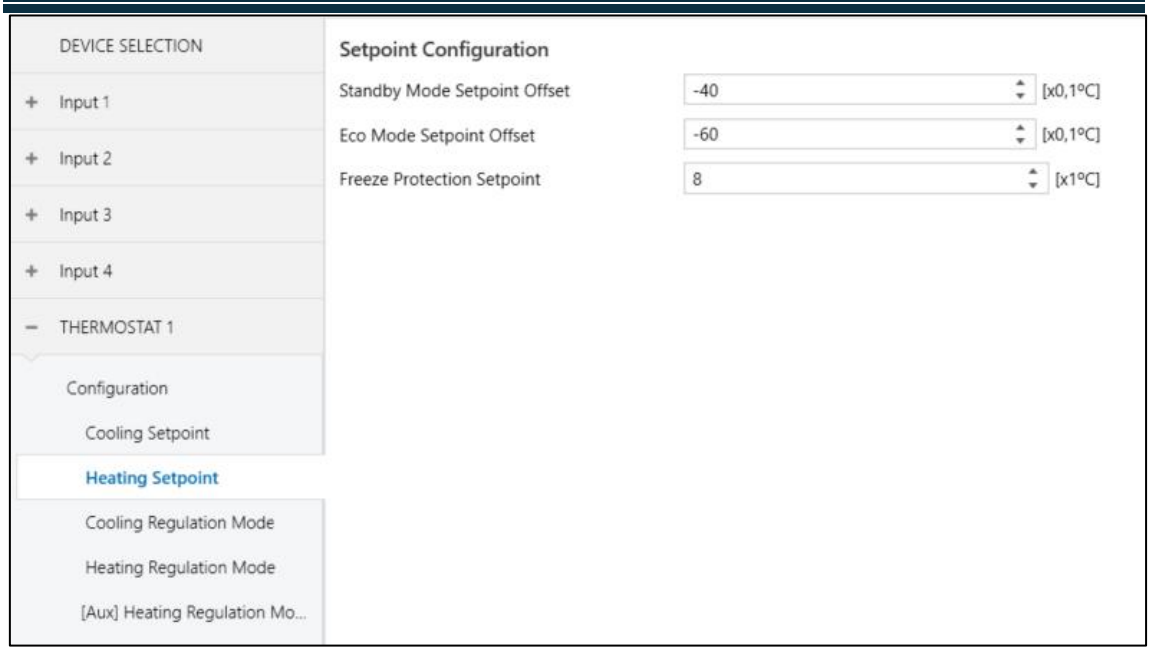
If the thermostat mode is configured as "**Cooling Thermostat**" or "**Heating and Cooling Thermostat**", a "**Cooling Setpoint**" section appears in the drop-down menu to enter the setpoint configura**tion** parameters. It has 4 fields in "**Absolute Setpoint Mode**" and 3 in "**Relative Setpoint Mode**":

- Comfort Mode Setpoint: displayed only in "**Absolute Setpoint Mode**"; sets the Comfort temperature for cooling, in ºC. Standby and Eco offsets are applied relative to this value. This field is not displayed in "**Relative Setpoint Mode**": Comfort is received through "**[ThX] Comfort Setpoint Input**", with the configured initial value after bus voltage recovery.
- **Standby Mode Setpoint Offset:** temperature, in tenths of a degree Celsius, at which the setpoint is configured in Standby mode.
- **Eco Mode Setpoint Offset:** temperature, in tenths of a degree Celsius, at which the setpoint is configured in Eco mode.
- **Overtemperature Protection Setpoint:** temperature, in ºC, above which overtemperature protection is activated.

Heating Setpoint

If the thermostat mode is configured as "**Heating Thermostat**" or "**Heating and Cooling Thermostat**", a "**Heating Setpoint**" section appears in the drop-down menu to enter the setpoint configura**tion** parameters. It has 4 fields in "**Absolute Setpoint Mode**" and 3 in "**Relative Setpoint Mode**":

- Comfort Mode Setpoint: displayed only in "**Absolute Setpoint Mode**"; sets the Comfort temperature for heating, in ºC. Standby and Eco offsets are applied relative to this value. This field is not displayed in "**Relative Setpoint Mode**": Comfort is received through "**[ThX] Comfort Setpoint Input**", with the configured initial value after bus voltage recovery.
- **Standby Mode Setpoint Offset:** temperature, in tenths of a degree Celsius, at which the setpoint is configured in Standby mode.
- **Eco Mode Setpoint Offset:** temperature, in tenths of a degree Celsius, at which the setpoint is configured in Eco mode.
- **Frost Protection Setpoint:** temperature, in ºC, above which frost protection is activated.

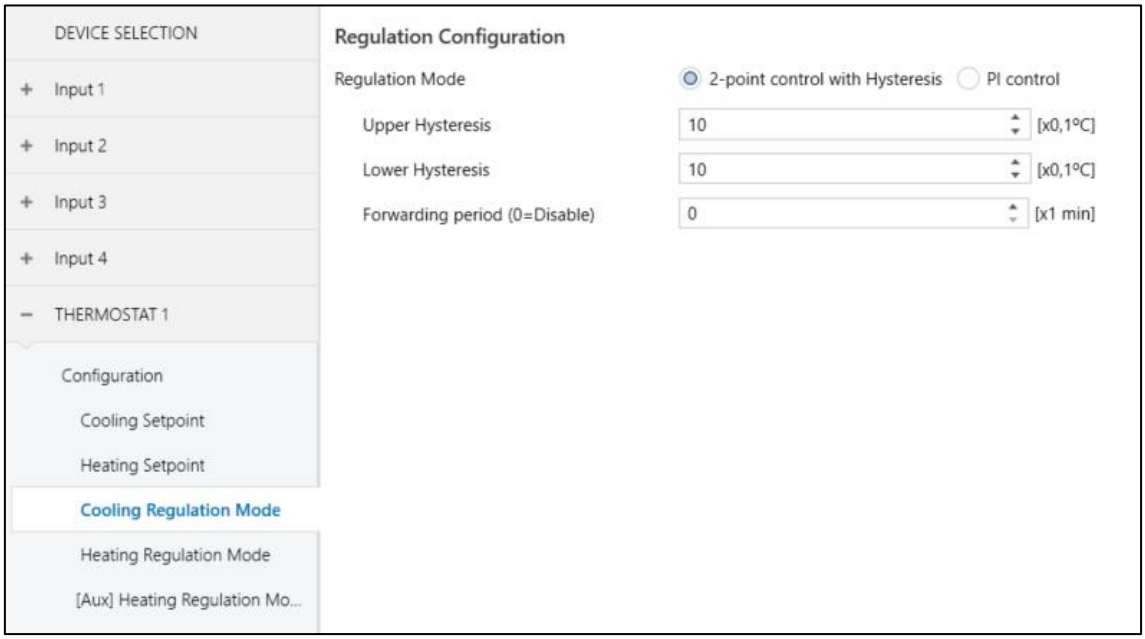

DEVICE SELECTION
+ Input 1
+ Input 2
+ Input 3
+ Input 4
− THERMOSTAT 1
Configuration
Cooling Setpoint
Heating Setpoint
Cooling Regulation Mode
Heating Regulation Mode
[Aux] Heating Regulation Mo...
Setpoint Configuration
Standby Mode Setpoint Offset
-40
[x0,1ºC]
Eco Mode Setpoint Offset
-60
[x0,1ºC]
Freeze Protection Setpoint
8
[x1ºC]

Cooling / Heating Control Mode

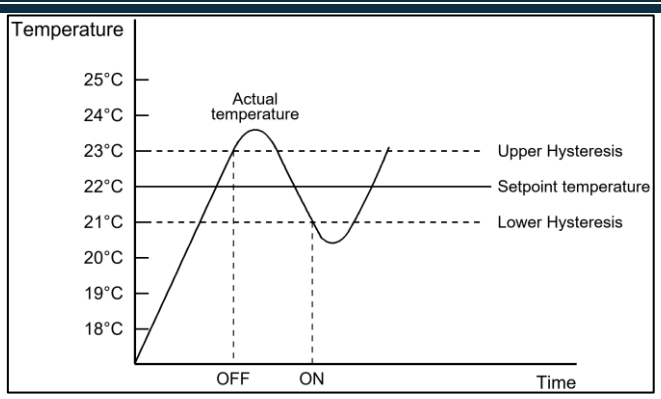
Configures the thermostat control mode when operating as a "**Cooling Thermostat"** for cooling or a "**Heating Thermostat" for** heating.

- **Control Mode: there** are two main control modes: hysteresis control, selected through "**2-Point Control with Hysteresis**", and proportional-integral loop control, selected through "**PI Control"**.

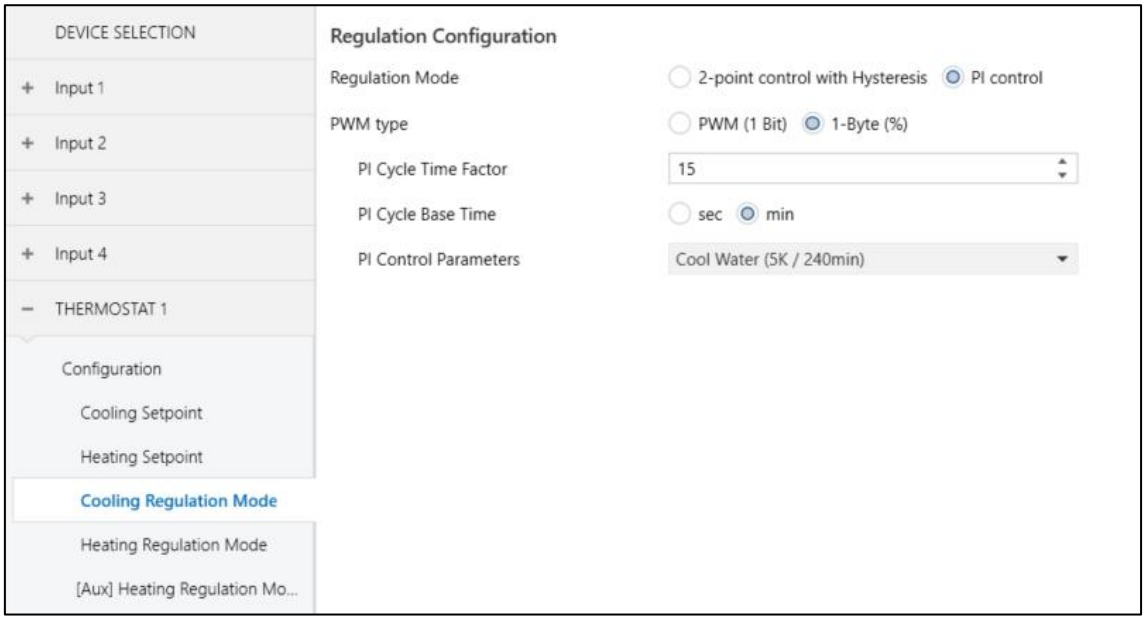
To use hysteresis control:



- **Upper Hysteresis:** temperature, in tenths of a degree Celsius, above which the system starts cooling in cooling mode or stops in heating mode.
- **Lower Hysteresis:** temperature, in tenths of a degree Celsius, below which the cooling system switches off in cooling mode or the heating system switches on in heating mode.
- **Resend Period (0=Disable):** the time, in minutes, at which the system periodically resends the current thermostat output value, even if unchanged, to refresh its state in the receivers. A value of 0 disables periodic resending.



To use PI control:

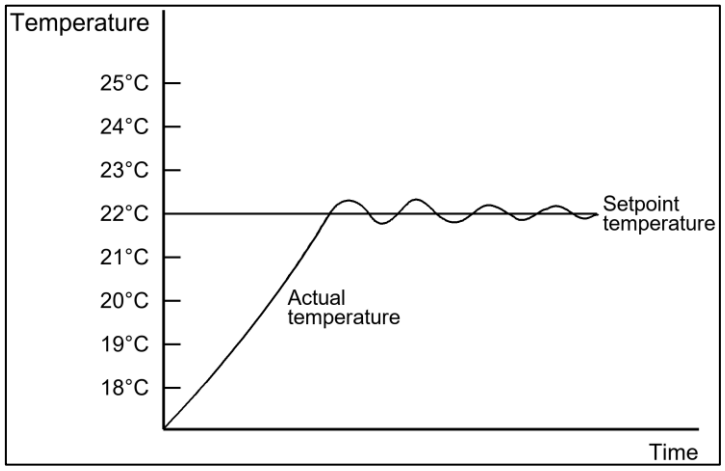


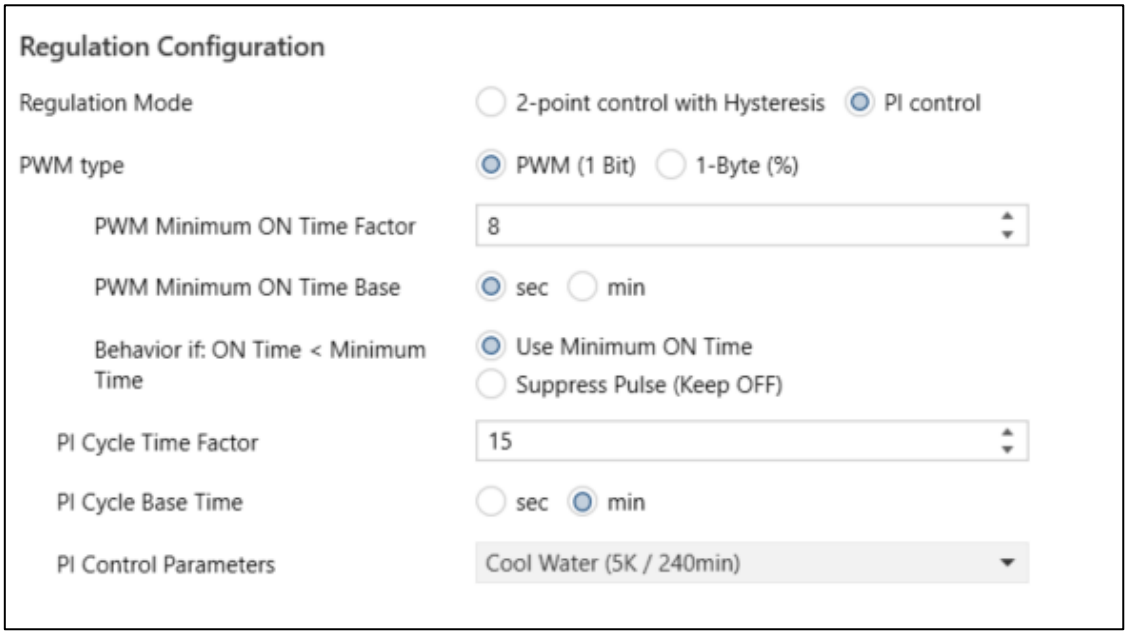
- **PWM Type:** control can use on/off values, "**PWM (1 Bit)**", or different incremental values from 0 to 100 %, "**1 Byte**".
- **PI Cycle Time Factor: time** value for the duration of the PI cycle. No units.
- **PI Cycle Time Base:** units for the variable described immediately above. Select "**s**" for seconds or "**min**" for minutes.
- **PI Control Parameters:** parameters that control the PI controller. Many predefined cases are available, but a custom case can also be selected using "**Advanced (User-defined)**". The preset systems and their values are shown in the following table; each preset defines the proportional band and integral time.

Mode	System preset	Proportional band	Integral time
Cooling	Chilled Water	5 K	240 min
Cooling	Fan Coil	4 K	90 min
Cooling	Split A/C	4 K	90 min
Cooling	Fast Cooling System	3 K	60 min
Heating	Hot Water	5 K	150 min
Heating	Underfloor Heating	5 K	240 min
Heating	Electric Heating	4 K	100 min
Heating	Air Convector	4 K	90 min
Heating	Split A/C	4 K	90 min

- **Proportional Band:** proportional constant, in °C, used by the system for control.
- **Integral Time:** integral time constant, in minutes, used by the system for control.

Only if "**PWM (1 Bit)**" is selected, the following additional information must also be specified:





- **Minimum PWM ON-Time Factor: minimum time** factor required for the system to begin regulating temperature. It prevents unnecessary activation when the required control action is much smaller than the time for which the system will remain off.
- **Minimum PWM ON-Time Base:** variable used to select the units for the time factor described above.
- **Behaviour if ON-Time < Minimum Time: applies to the** condition described by the previous two variables. Determines whether the system operates for the selected minimum duration, "**Use Minimum ON-Time",** or stops acting, "**Suppress Pulse (keep OFF)**".

Thermostat Communication Objects

Number	Name	Object Function	Lir	Gr	Length	C	R	W	T	U	Data Type	Priority
1	[In1] Disable Temperature functionality	1 = Block; 0 = Unblock			1 bit	C	-	W	-	-	switch	Low
2	[In1] Temperature Output	Temperature Value			2 bytes	C	-	-	T	-	temperature (°C)	Low
3	[In1] Over-Heating Output	1 = Over-Heating; 0 = No Over-Heating			1 bit	C	-	-	T	-	alarm	Low
4	[In1] Over-Cooling Output	1 = Over-Cooling; 0 = No Over-Cooling			1 bit	C	-	-	T	-	alarm	Low
72	[Th1] Thermostat On/Off	1 = On; 0 = Off			1 bit	C	-	W	-	-	switch	Low
73	[Th1] Thermostat On/Off Status	1 = On; 0 = Off			1 bit	C	-	-	T	-	switch	Low
75	[Th1] Comfort Setpoint Input	Comfort Setpoint			2 bytes	C	-	W	-	-	temperature (°C)	Low
76	[Th1] Setpoint Status	Current Setpoint			2 bytes	C	-	-	T	-	temperature (°C)	Low
79	[Th1] Heating Output	Output (2-point & Hysteresis)			1 bit	C	-	-	T	-	switch	Low
84	[Th1] Cooling Output	Output (PWM PI)			1 bit	C	-	-	T	-	switch	Low
95	[Th1] Temperature Sensor 1	Input Temperature Sensor 1			2 bytes	C	-	W	-	-	temperature (°C)	Low
97	[Th1] Special Mode Input 1-Byte	1-Byte HVAC Mode			1 byte	C	-	W	-	-	HVAC mode	Low
98	[Th1] Special Mode 1-Byte Status	1-Byte HVAC Mode Status			1 byte	C	-	-	T	-	HVAC mode	Low
105	[Th1] Heating or Cooling Mode Status	0 = Cooling; 1 = Heating			1 bit	C	-	-	T	-	cooling/heating	Low

Name	Function	Description
[ThX] Thermostat On/Off	1 = On; 0 = Off	Switches the thermostat on or off.
[ThX] Thermostat On/Off Status	1 = On; 0 = Off	Shows whether the thermostat is on or off.
[ThX] Setpoint Input	Setpoint	Sets the temperature setpoint.
[ThX] Setpoint Status	Current setpoint	Shows the current temperature setpoint.
[ThX] Cooling Output	Output (PWM PI)	PWM output for PI cooling control.
[ThX] Heating Output	Output (% PI)	Output (in %) for PI heating control.
[ThX] Temperature Sensor 1	Temperature Sensor 1 Input	Input from the configured temperature sensor or probe.
[ThX] Special Mode Input 1 Byte	HVAC Mode 1 Byte	Sets the special-mode temperature.
[ThX] Special Mode Status 1 Byte	HVAC Mode Status 1 Byte	Shows the current Special Mode status.
[ThX] Comfort Special Mode	0 = Off; 1 = On	Activates or deactivates Comfort Special Mode.
[ThX] Standby Special Mode	0 = Off; 1 = On	Activates or deactivates Standby Special Mode.
[ThX] Eco Special Mode	0 = Off; 1 = On	Activates or deactivates Eco Special Mode.
[ThX] Protection Special Mode	0 = Off; 1 = On	Activates or deactivates Protection Special Mode.
[ThX] Heating or Cooling Mode	0 = Cooling; 1 = Heating	Selects whether Cooling or Heating mode is used.
[ThX] Heating or Cooling Mode Status	0 = Cooling; 1 = Heating	Shows the current mode, Cooling or Heating.