Easy timed thermostat

GW 10 761
GW 14 761

Technical Manual

Summary

1 Introduction 3
2 Application 4
 2.1 Limits to the associations........ 4
3 *"Settings"* menu 5
 3.1 Parameters 5
 3.2 Communication objects 6
4 *"Control algorithm"* menu........ 8
 4.1 Parameters 8
 4.2 Communication objects 13
5 "Temperature setpoint" menu 14
 5.1 Parameters 14
 5.2 Communication objects 15
6 *"Scenes management"* menu 16
 6.1 Parameters 16
 6.2 Communication objects 17

1 Introduction

This manual describes the functions of the devices named GW1x761 “**Easy timed thermostat**” and how to use the ETS configuration software to change the settings and configurations.

2 Application

The Easy timed thermostat is a device that manages the HVAC system. It is able to regulate the temperature in the environment in which it is installed, using the KNX/EIB system to manage the actuators that control the solenoid valves, boilers etc that comprise the heating and air-conditioning systems. This device, combined with the Easy Thermostat, can regulate the temperatures per zone and act as a master device when a master-slave system is setup.
The device manages two operating types (HEATING and AIR CONDITIONING), and controls both systems whilst providing 5 different operating modes for each operating type (AUTO/ ECONOMY/PRECOMFORT/COMFORT/OFF), each with its own customisable setpoint.
The AUTO operating mode foresees that the device regulates the temperature in the environment where it is installed according to an internally programmed timer profile; a weekly timer profile can be configured on the device where you can define the device operating mode for every day of the week, with a 15 minute resolution and no restrictions on variations; if the device is connected to one or more thermostats in a master-slave configuration setup, it will automatically notify the slave devices of the operating modes they must enable.
The device is always able to autonomously manage the temperature in the environment it is installed in, using control algorithms (two point or PI) which depend on the type of system built.
It is however only able to manage the heating and air conditioning system if it is a 4-pipe configuration as it is designed to manage one actuator for the heating system and another for the air-conditioning system. This manual refers solely to the configuration using the ETS software. Please refer to the INSTALLATION AND USER MANUAL supplied with the product for instructions on how to use the internal menu and the various local key functions.

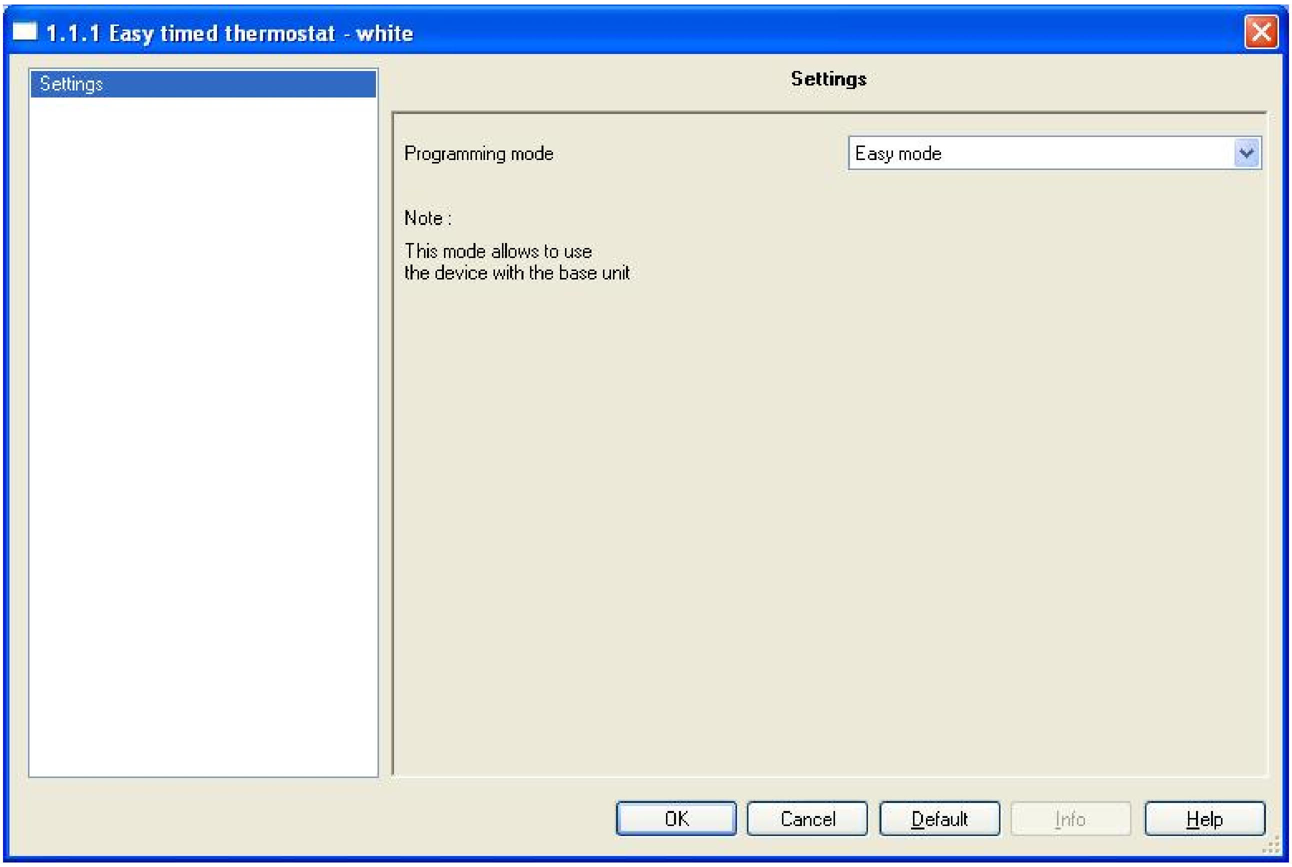
2.1 Limits to the associations

Maximum number of group addresses: 115
Maximum number of logical associations: 115

This means that it could be possible to define maximum 115 group addresses and realize maximum 115 associations between group addresses and communication objects.

3 *“Settings”* menu

Here it is possible to configure the programming mode between ETS mode (S-Mode) and Easy mode by the Easy controller software (Kit GW90837, Kit GW90838, GW90840) see Diag 3.1.



Diag. 3.1

3.1 Parameters

➢ ***3.1.1 Programming mode***

This parameter determines the programming mode of the device:

- ***ETS mode***

Select this value if you want to configure the device with ETS (S-Mode); all the configuration parameters are now visible.

- ***Easy mode***

Select this value if you want to configure the device with the Easy controller software.
Remember to download the application program with this value selected before using the device by the Easy controller software if you have already used the device in an ETS project.

3.2 Communication objects

The ***Settings*** menu makes the following communication objects visible (see Diag. 3.2.):

Number	Name	Object Function	Length	C	R	W	T	U	Data Type	Priority
4	HVAC mode output	Eco/Precom/Comf/Off	1 Byte	C	R	-	T	-		Low
5	Operating type output	Heating/Air conditioning	1 bit	C	R	-	T	-		Low
6	HVAC mode input	Auto/Eco/Precom/Comf/Off	1 Byte	C	-	W	-	-		Low
7	Window status	1=open/0=closed	1 bit	C	-	W	-	-		Low
9	Operating type input	Heating/Air conditioning	1 bit	C	-	W	-	-		Low
10	HVAC mode feedback	Auto/Eco/Precom/Comf/Off	1 Byte	C	R	-	T	-		Low
11	Operating type feedback	Heating/Air conditioning	1 bit	C	R	-	T	-		Low
12	Measured temperature output	Value °C	2 Byte	C	R	-	T	-		Low

Diag. 3.2

➢ *3.2.1 HVAC mode output*

This allows the device to send HVAC mode update bus telegrams to the slave devices. When the operating mode is modified on the “master” device, the device sends a bus telegram through this object to the “slave” devices with the information on the new operating mode.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *20.102 DPT_HVACMode*, the size of the object is *1 byte* and the commands it sends are *HVAC mode: Economy/Precomfort/Comfort/Off.*

➢ *3.2.2 Operating type output*

This allows the device to send operating type update bus telegrams to the “slave” devices. When the operating type on the “master” device is set to HEATING, the device sends a bus telegram through this object to the “slave” devices with a “1” logic value; vice versa, when the operating type on the master device is set to AIR CONDITIONING, the device will send a “0” logic value through this object.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *1.100 DPT_Heat/Cool*, the size of the object is *1 bit* and the commands it sends are *operating type: Heating/Air conditioning*

➢ *3.2.3 HVAC mode input*

Here you can configure the remote control of the device operating mode (or HVAC mode) by bus command. When this communication object receives a telegram from the bus with the operating mode information that is to be set, the device sets the operating mode according to the command received, indicated by a pilot light on the display.
It is however possible to modify the operating mode using the local navigation menu on the device, which does nothing more than replicate the command reception event on the communication object in question to modify, with each pressing, the operating mode.
The enabled flags are C (communication), W (written by bus).
The standard format of the object is *20.102 DPT_HVACMode*, the size of the object is *1 byte* and the commands it receives are *Operating mode* commands: *Auto/Economy/Precomfort/Comfort/Off.*

➢ *3.2.4 Window status*

Here you can enable the remote control of the device OFF operating mode (or HVAC mode) by bus command, when a windows is open. When this object receives a telegram with a "1" logic value (window open), the device instantly switches to OFF mode, indicated by a pilot light on the display, given the enabling of this object has a higher priority than any other HVAC setting; vice versa, when this object receives a "0" logic value (windows closed), the device instantly disables the OFF operating mode and the new operating mode is enabled automatically by the device according to the last command received (HVAC mode or scene) or the HVAC mode installed before windows status activation.
The enabled flags are C (communication), W (written by bus) .
The standard format of the object is *1.019 DPT_Window_Door*, the size of the object is *1 bit* and the commands it receives are *windows status open/close*.

3.2.5 Operating type input

Here you can configure the remote control of the device operating type by bus command. When this communication object receives a telegram with "1" a logic value, the device sets the operating type to Heating, indicated by a pilot light on the display, maintaining the same operating mode as before; vice versa, when this communication object receives a telegram with a "0" logic value, the device sets the operating type to Air conditioning, indicated by a pilot light on the display, maintaining the same operating mode as before.
It is however possible to modify the operating type using the local navigation menu on the device.
The enabled flags are C (communication), W (written by bus) .
The standard format of the object is *1.100 DPT_Heat/Cool*, the size of the object is *1 bit* and the commands it receives are *operating type* commands: *Heating/Air conditioning*.

3.2.6 HVAC mode feedback

This allows the device to notify the operating mode set by bus command.
The sending of such feedback occur spontaneously on HVAC mode variation and upon receiving a status read request.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *20.102 DPT_HVACMode*, the size of the object is *1 byte* and the commands it sends are *HVAC mode: Auto/Economy/Precomfort/Comfort/Off.*

3.2.7 Operating type feedback

This allows the device to notify the operating type set by bus command.
The sending of such feedback occur spontaneously on HVAC mode variation and upon receiving a status read request.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *1.100 DPT_Heat/Cool*, the size of the object is *1 bit* and the commands it sends are *operating type: Heating/Air conditioning*

3.2.8 Measured temperature output

The device uses this communication object to notify the measured temperature value, that is the one displayed on the screen measured by the internal sensor.
The sending of such feedback occur spontaneously every 15 minutes and upon receiving a status read request.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *9.001 DPT_Value_Temp*, the size of the object is *2 byte* and the commands it sends are *measured temperature values expressed in degrees centigrade (rounded off to a tenth of a degree)*.

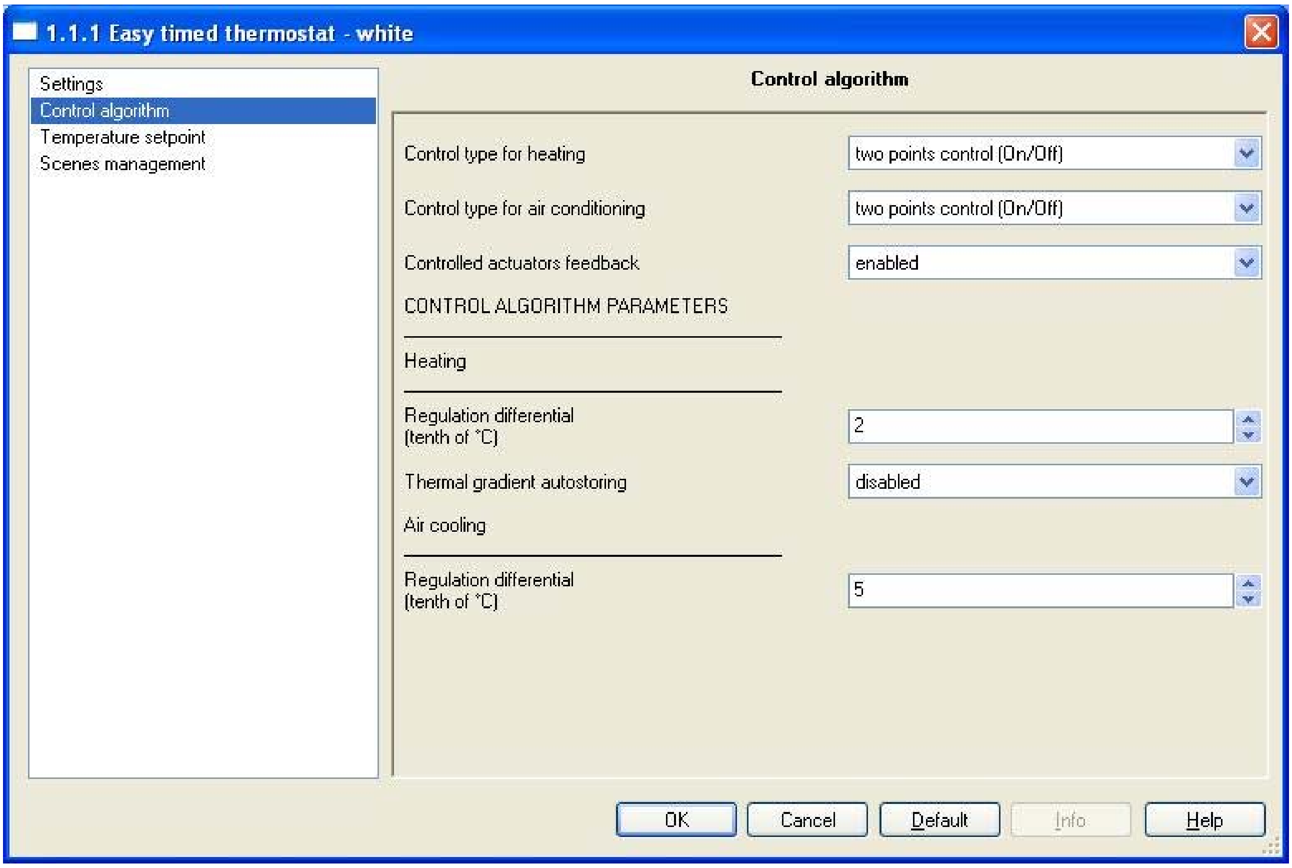
4 *“Control algorithm”* menu

The ***Control algorithm*** menu lists all the parameters used to set the control algorithms for the heating and air conditioning system; the structure and the options displayed in the ***Control algorithm*** menu change according to the settings for the ***Control type*** parameters.

4.1 Parameters

If the control type selected is ***two points control (On/Off)***, the menu is shown in diag.4.1.

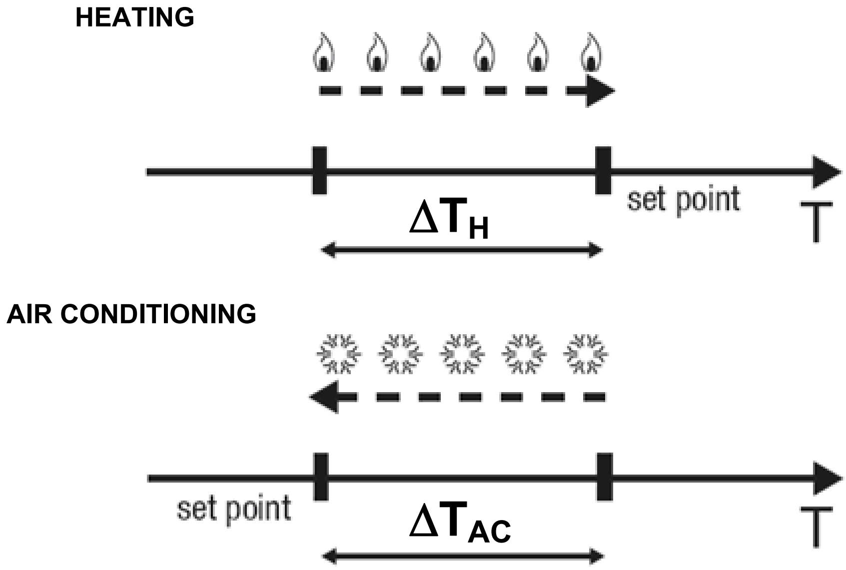
➢ *4.1.1 Control type: two points control (On/Off)*



Diag. 4.1

- ***two points control (On/Off)***

The algorithm used to control the heating system is the classic algorithm defined as a two points control. This control type turns the heating system ON and OFF according to a hysteresis cycle, that is there is no single threshold that discriminates the ON and OFF command but two are identified (see Diag. 4.2).



Diag. 4.2

You can see in this diagram that there are two thresholds which control the ON and OFF commands for the heating system and two for air conditioning system; for heating system, the first threshold consists in the “setpoint-ΔT_H“ (where ΔT_H identifies the heating regulation differential value) value, below which the device switches the system ON, the second consists in the indicated setpoint value, over which the device switches the system OFF.
For air conditioning system, the first threshold consists in the “setpoint+ΔT_{AC}“ (where ΔT_{AC} identifies the air conditioning regulation differential value) value, over which the device switches the system ON, the second consists in the indicated setpoint value, below which the device switches the system OFF.
With this setting, the ***Regulation differential (tenth of °C)*** parameters for heating and air conditioning are visible.
In order to avoid continuous switchings that can damage the valves, the timed thermostat will wait for up to 2 minutes before sending the activation command to the actuator that controls the thermal regulation system.

➢ *4.1.2 Regulation differential (tenth of °C) - Heating*

Here you can set the heating regulation differential value which, subtracted from the indicated setpoint value, determines the threshold value below which the heating system is switched ON upon two points control.
The settings range from 2 (tenths of degrees centigrade) to 20 (tenths of degrees centigrade).

➢ *4.1.3 Regulation differential (tenth of °C) - Air cooling*

Here you can set the air conditioning regulation differential value which, added from the indicated setpoint value, determines the threshold value over which the air conditioning system is switched ON upon two points control.
The settings range from 2 (tenths of degrees centigrade) to 20 (tenths of degrees centigrade).

➢ *4.1.4 Controlled actuators feedback*

This allows you to enable the device so it can receive feedbacks from the actuators (loads) it controls; the settings are:

- ***disabled***

The device is not able to receive feedback from the actuators (loads) that the command sent has actually been performed.

- ***enabled***

The device is able to receive feedback from the actuators (loads) that the command sent has actually been performed; if within one minute from sending a command to a load, the latter does not send confirmation of execution of the command to the timed thermostat, it will send the command again every

minute until it receives due confirmation from the load; the heating/air conditioning system pilot light will blink to signal this anomaly.
The ***Heating status feedback*** and the ***Air cooling status feedback*** communication objects are visible.

➢ *4.1.5 Thermal gradient autostoring (only Heating)*

This enables the thermal gradient autostoring function so that the device which operates in AUTO mode can bring the ambient temperature to full capacity before the mode switch set by the daily timer profile is implemented. The settings are:

- ***disabled***

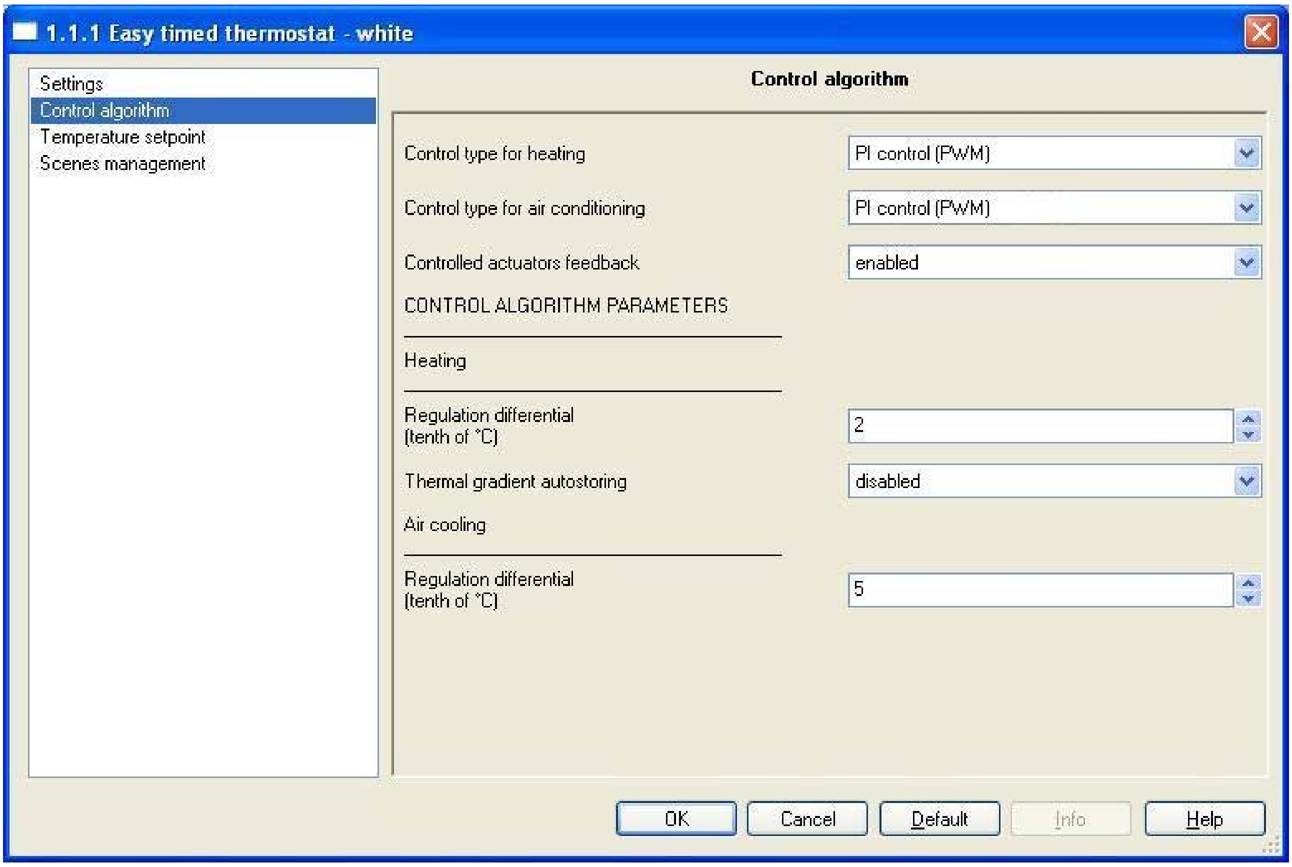
The device does not store the temperature in the room and consequently does not start the heating system to bring the temperature to full capacity before the HVAC mode is switched as set by the daily time profile on the device.

- ***enabled***

The device learns the temperature in the room and consequently starts the heating system to bring the temperature to full capacity before the HVAC mode is switched as set by the daily time profile on the device. The learning phase is performed every day, when the device is running in AUTO mode, during the first mode switch that foresees an increase in the setpoint set in the timer profile.
This function is only and exclusively applied when the device is running in AUTO mode and operating in HEATING mode); once the device is in these condition, before the moment that has been set for the change mode in the daily timer with an increase of the setpoint, the device checks the measured temperature and applies the two point control algorithm; if, at a certain time, the daily timer is set to switch mode, for instance from ECONOMY to COMFORT, before the switch mode actually takes place, the device starts the system so that when the switch is made the temperature is already at the setpoint value set for COMFORT mode.

If the control type selected is ***PI control (PWM)***, the menu is shown in Diag. 4.3.

➢ *4.1.6 Control type: PI control (PWM)*



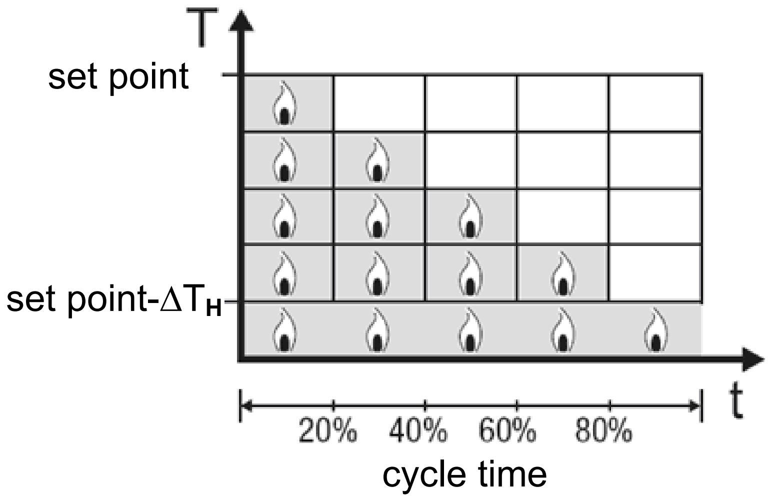
Diag. 4.3

- ***PI control (PWM)***

The algorithm used to control the heating system is the algorithm which allows you to reduce heat inertia times caused by a two points control, called a PMW control. This control type foresees the modulation of the pulse duty-cycle, represented by the heating (or air conditioning) system activation time, according to the difference between the indicated setpoint and the detected temperature (see Diag. 6.4 and Diag. 6.5).

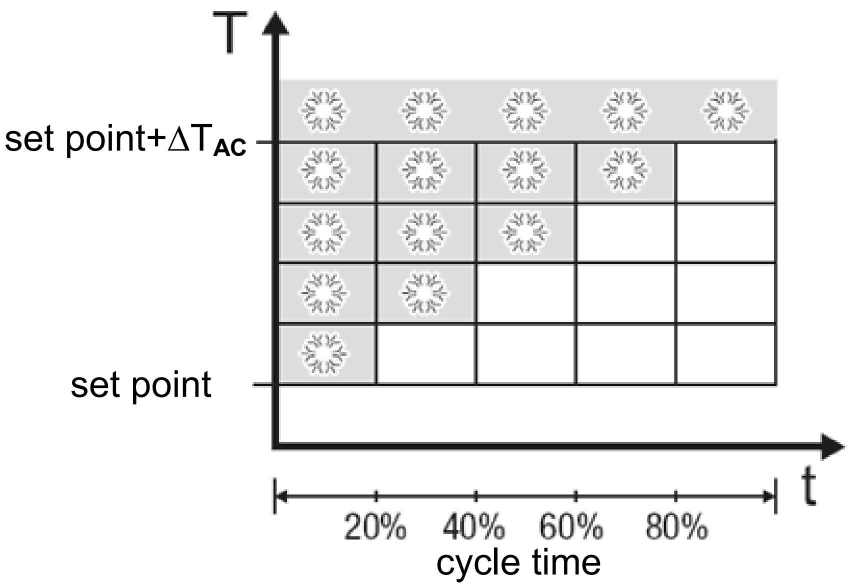
The device keeps the heating (or air cooling) system ON for a percentage of time that depends on the difference between the measured temperature and the indicated setpoint; the setpoint and “setpoint-ΔT_H“ values (for heating system) and “setpoint+ΔT_{AC}“ and setpoint values (for air conditioning system) are indicated on the ordinate axis, that determines the proportional band limits within which the device constantly regulates the heating (or air conditioning) system, modulating the system’s ON and OFF times. With this type of algorithm there is no hysteresis cycle on the heating element and therefore the inertia time (system heating and cooling time) introduced by the two points control is eliminated. This also leads to energy savings as the system does not stay ON for no reason and, once the desired temperature has been reached, it continues to supply amounts of heat just to compensate any dispersion of heat in the environment.

HEATING



Diag. 4.4

AIR CONDITIONING



Diag. 4.5

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With this setting, the ***Cycle time*** and ***PWM regulation differential*** parameters for heating and air conditioning are visible.

➢ *4.1.7 Cycle time - Heating*

Here it is possible to set the time within which the device must perform PWM modulation. The settings are provided in the drop-down menu (an interval of from 5 to 60 minutes).
The settings are all multiples of 5 because, as you can see in Diag. 4.4, the duration of the heating system activation time is expressed as a percentage compared to the cycle time with a step of 20%. This means that, should the result of the control algorithm lead to a system activation time equal to 40% of the cycle time, if the value of the latter is 20 minutes, the device will activate the system for 8 minutes and then deactivate it until the end of the cycle time; at this point the PMW control algorithm is applied again and the activation time will be duly modified.

➢ *4.1.8 Cycle time - Air conditioning*

As the air conditioning parameter has the same characteristics and functions, with the only difference being that it refers to the AIR CONDITIONING operating mode, please refer to the paragraph *4.1.7* for further information.

➢ *4.1.9 PWM regulation differential - Heating*

Here you can set the heating PMW regulation differential value which, subtracted from the indicated setpoint value, determines the lowest limit of the proportional band limits used to modulate the time when the heating system is switched ON upon PWM proportional control. The settings are provided in the drop-down menu (an interval of from 0.4°C to 3.2°C).
The settings are all multiples of 0.4 because, as you can see in Diag. 4.4, the proportional band is divided into four zones and the minimum resolution for the device is 0.1 °C. This value set for this option, divided by 4, determines the width of the proportional sub-band within which the device determines the system ON and OFF times.

➢ *4.1.10 PWM regulation differential - Air conditioning*

As the air conditioning parameter has the same characteristics and functions, with the only difference being that it refers to the AIR CONDITIONING operating mode, please refer to the paragraph *4.1.9* for further information.

➢ *4.1.11 Controlled actuators feedback*

See chapter *4.1.4*.

4.2 Communication objects

The ***Control algorithm*** menu makes the following communication objects visible (see Diag. 4.6.):

Number	Name	Object Function	Length	C	R	W	T	U	Data Type	Priority
0	Heating status feedback	On/Off status	1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
1	Heating switching	On/Off	1 bit	C	R	-	T	-	1 bit DPT_Switch	Low
2	Air cooling status feedback	On/Off status	1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
3	Air cooling switching	On/Off	1 bit	C	R	-	T	-	1 bit DPT_Switch	Low

Diag. 4.6

➢ 4.2.1 Heating status feedback

This allows the device to be informed on the status of the actuator that manages the heating system controlled by the timed thermostat; once the command has been sent to this actuator, if the device does not receive confirmation within one minute that the load has executed the command by bus telegram to the communication object in question, it will instantly send the command again every minute until it receives due confirmation from the load. The heating/air conditioning system pilot light will blink to signal this anomaly (according to which is displayed on the screen). If a feedback is received by the actuator that does not copy the command sent, the device will instantly send another command and trigger the above described control.
The enabled flags are C (communication), W (written by bus) .
The standard format of the object is *1.001 DPT_Switch*, the size of the object is *1 bit* and the commands it receives are the *heating system actuator status On/Off*.

➢ 4.2.2 Air cooling status feedback

The same applies as indicated in the previous paragraph, but in relation to the air conditioning system actuator (please refer to ***4.2.1*** for further details).

➢ 4.2.3 Heating switching

This allows the device to send ON/OFF commands to the actuator that manages the heating system controlled by the timed thermostat; according to the control algorithm set, the device calculates when it has to intervene on the heating system to regulate the ambient temperature and therefore sends a telegram with a “1” logic value to activate the system, and “0” logic value to deactivate the same system.
The enabled flags are C (communication), R (read by bus) and T (transmission) .
The standard format of the object is *1.001 DPT_Switch*, the size of the object is *1 bit* and the commands it sends are *heating system On/Off*.

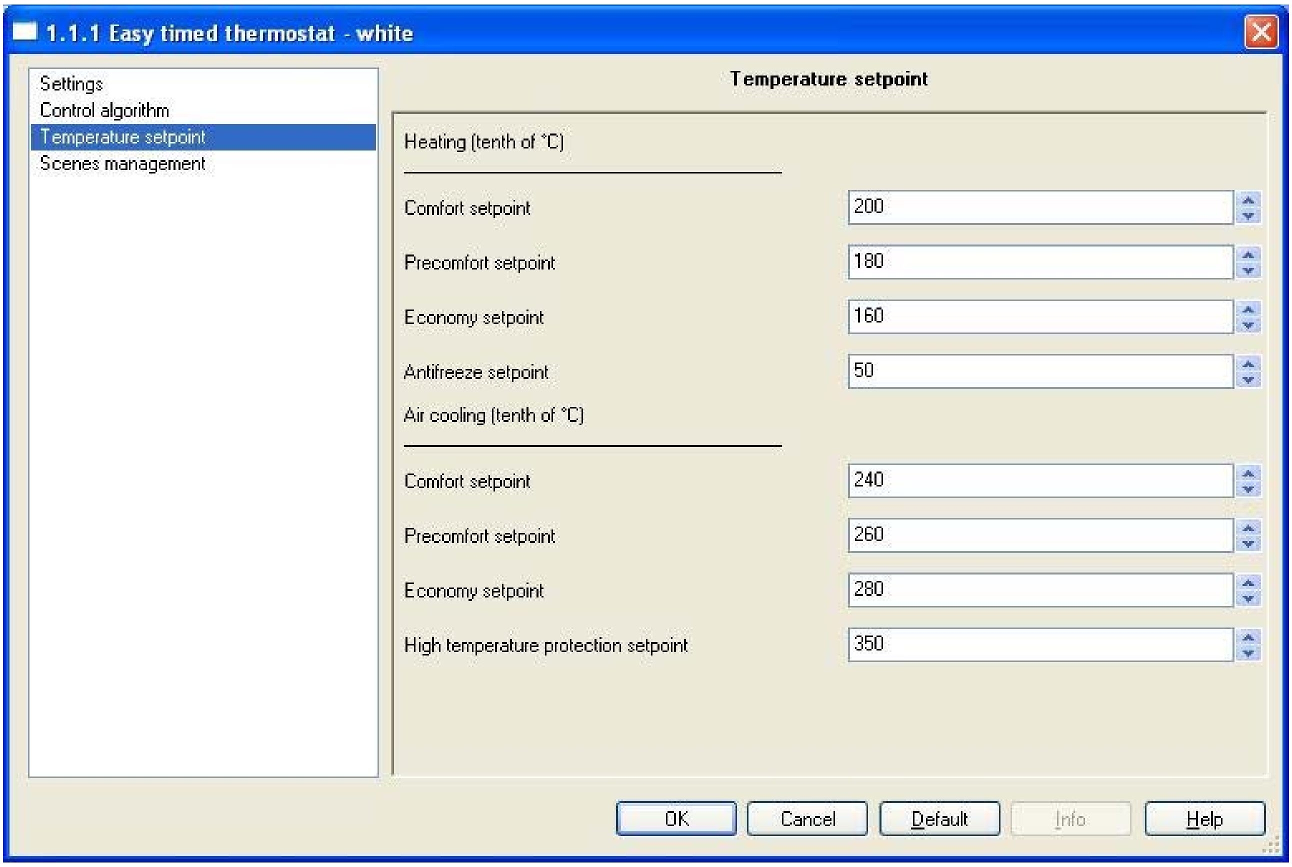
➢ 4.2.4 Cooling switching

The same applies as indicated in the previous paragraph, but in relation to the air conditioning system actuator (please refer to ***4.2.3*** for further details).

5 “Temperature setpoint” menu

The ***Temperature setpoint*** menu lists all the parameters needed to configure the setpoint values for the various HVAC modes and the two different operating types (see diag. 5.1).
Please remember that among the various setpoints belonging to the same function type, there is a setting value threshold determined from what seen below:

- $T_{antifreeze} \leq T_{economy} \leq T_{precomfort} \leq T_{comfort}$ in heating (“T” indicates the standard mode setpoint value)
- $T_{comfort} \leq T_{precomfort} \leq T_{economy} \leq T_{high\ temp.\ protect.}$ in air conditioning (“T” indicates the standard mode setpoint value)



Diag. 5.1

5.1 Parameters

➢ 5.1.1 Antifreeze setpoint - Heating

Here you can set the setpoint value for the OFF mode when it is HEATING operating mode; the values range from 20 (2 degrees centigrade) to 70 (7 degrees centigrade).
The restrictions listed before must be complied with when setting this value.
This value can in any case be modified by the operator using the setting in the local navigation menu on the device.

➢ 5.1.2 Comfort setpoint - Heating

Here you can set the setpoint value for the COMFORT mode when it is HEATING operating mode; the values range from 50 (5 degrees centigrade) to 400 (40 degrees centigrade).
The restrictions listed before must be complied with when setting this value.
This value can in any case be modified by the operator using the setting in the local navigation menu on the device.

The features, functions and restrictions listed above also apply to the ***Precomfort setpoint*** and ***Economy setpoint*** parameters for the HEATING operating type.

➢ *5.1.3 High temperature protection setpoint - Air conditioning*

Here you can set the setpoint value for the OFF mode when it is AIR CONDITIONING operating mode; the values range from 300 (30 degrees centigrade) to 400 (40 degrees centigrade).
The restrictions listed before must be complied with when setting this value.
This value can in any case be modified by the operator using the setting in the local navigation menu on the device.

➢ *5.1.4 Comfort setpoint - Air conditioning*

Here you can set the setpoint value for the COMFORT mode when it is AIR CONDITIONING operating mode; the values range from 50 (5 degrees centigrade) to 400 (40 degrees centigrade).
The restrictions listed before must be complied with when setting this value.
This value can in any case be modified by the operator using the setting in the local navigation menu on the device.

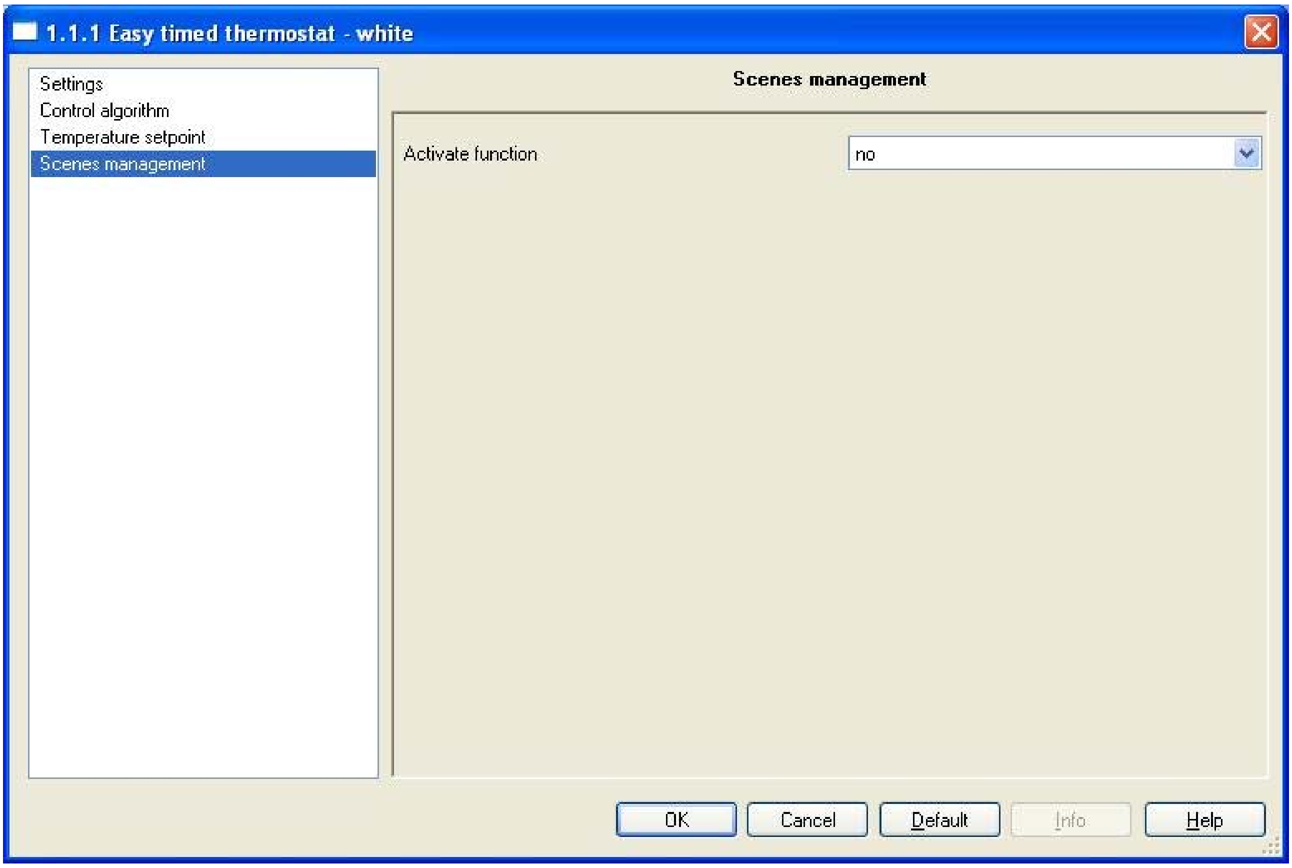
The features, functions and restrictions listed above also apply to the ***Precomfort setpoint*** and ***Economy setpoint*** parameters for the AIR CONDITIONING operating type.

5.2 Communication objects

There are no communication objects enabled by the ***Temperature setpoint*** menu.

6 *“Scenes management”* menu

Here is possible to enable the scene functions used by the device (see Diag. 6.1).



Diag. 6.1

6.1 Parameters

➢ ***6.1.1 Activate function***

This is to enable the scene function and make the relative ***Scene*** communication object visible. The scene function sends two possible commands to the device:

- execute scene, that is a command to create a specific condition
- store scene, that is a command to memorise the current status (at the moment the command is received) of the HVAC mode, operating type and any indicated setpoint temporary forced positioning.

This function foresees 8 different scenes, so the device can memorise /reproduce 8 different operating modes and types. The settings are:

- ***no***

The scene function is not enabled and consequently the communication object is not visible.

- ***yes***

The scene function is enabled and is managed by the ***Scene*** communication object.

6.2 Communication objects

The ***Scenes management*** menu makes the following communication objects visible (see Diag. 6.2.):

Number	Name	Object Function	Length	C	R	W	T	U	Data Type	Priority
8	Scene	Execute/Store	1 Byte	C	-	W	-	-		Low

Diag. 6.2

➢ *6.2.1 Scene*

Using this communication object, the device is able to receive the execute and store scene commands from the bus.

On receiving a store scene command, through a bus telegram to the communication object in question, please remember that the device memorises the HVAC mode, operating type and any temporary forced setpoint.

The enabled flags are C (communication), W (written by bus).

The standard format of the object is *18.001 DPT_SceneControl*, the size of the object is *1 byte* and the commands it receives are *execute/store scene*.