

# Inwall Room Thermostat

**TM11A01KNX  
TM11A11KNX**

***Product Handbook***



Product: **Inwall Room Thermostat**

Order Code: **TM11A01KNX – TM11A11KNX**

Application Program ETS: **EEL\_RTH1\_10 Room Thermostat**

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## 1 General Introduction

Eelectron is an Italian company with a focus on designing and manufacturing electronic devices dedicated to building and home evolution and closely related software tools.

As of year 2005, Eelectron applies to KNX association, fulfilling his requirements with the main goal of giving a contribution to the diffusion of the world's only open Standard for home and building automation.

Eelectron philosophy of comprehensive aesthetic design and engagement in developing highly innovative devices, matched with KNX Interoperability and compliance with international requirements, has engendered Eelectron's distinct reputation.

Eelectron experience is devoted to end users, with a constant training activity, assistance on products and a continuous development that deserves particular attention to upcoming needs and applications, to energy saving and to solutions directed to make Users life easier and simpler.

## 2. Technical data

### Inwall Room Thermostat



Order Code :  
 TM11A01KNX – Varnished Light Grey  
 TM11A11KNX – Dark Grey

The Inwall Room Thermostat TM11A01KNX/TM11A11KNX is an EIB/KNX wall mounting device designed for HVAC applications in Home and Building installations (i.e. offices, hospitals, hotels, private houses, etc..).

The device is equipped with one binary input (potential free contact) that can be used, for instance, to control the HVAC units whether a window has been opened (or closed) or for a general purpose usage and one binary output relay to control fan coils or for any different purposes.

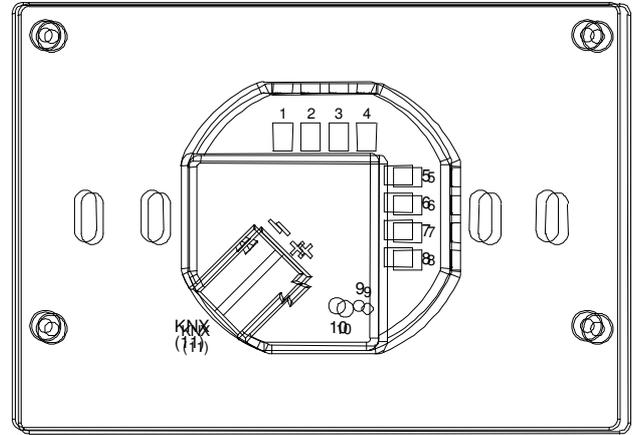
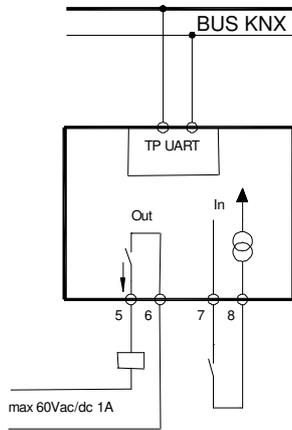
The LCD on the front side displays information about temperature, setpoint, fan coil speeds and operative status.

The control elements available on the front are four push buttons for setpoint and fan coil speed modification.

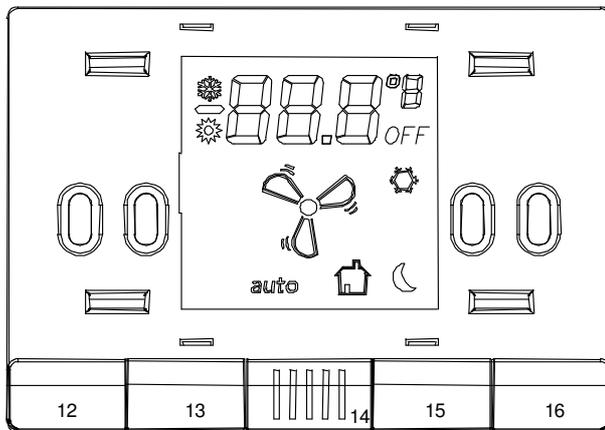
La configurazione dell'apparecchio, indirizzo fisico, parametri e oggetti di comunicazione, avviene mediante il software ETS (Engineering Tool Software).

<b>Power Supply</b>	Via bus EIB/KNX	<ul style="list-style-type: none"> <li>• 21..30 V DC available from the bus</li> </ul>
<b>Inputs</b>	Number Input Signal Voltage Input Signal Current (close contact)	<ul style="list-style-type: none"> <li>• 1 (potential free)</li> <li>• Un = 24V</li> <li>• In = 1ma</li> </ul>
<b>Outputs relays</b>	Number Output switching currents	<ul style="list-style-type: none"> <li>• 1</li> <li>• 48 VAC, 1A (AC1)</li> </ul>
<b>Control Elements</b>	1 programming push button (back side)  1 push button to increase temperature setpoint 1 push button to decrease temperature setpoint 1 push button to increase fan coil speed 1 push button to decrease fan coil speed	
<b>Display Elements</b>	1 LED red (back) for ETS programming 1 LCD display B/W, size 43,5X43,5 mm	
<b>Physical specifications and Dimensions</b>	Housing Colours  Dimensions Weight Installation	<ul style="list-style-type: none"> <li>• plastic</li> <li>• Light Grey Varnished (TM11A01KNX), Dark Grey (TM11A11KNX)</li> <li>• (WxHxD): 110 x 78 x 39,8mm</li> <li>• ca.65g</li> <li>• flash mounting in 2-3 modules or wall round box Ø60mm, 40mm deep</li> </ul>
<b>Electrical Safety</b>	Pollution degree Protection class Safety class Overvoltage category	<ul style="list-style-type: none"> <li>• 2 (according to EN 60664-1)</li> <li>• IP20 (according to EN 60529)</li> <li>• III (according to EN 61140)</li> <li>• III (according to EN 60664-1)</li> </ul>
<b>CE Mark and Certifications</b>	CE  EIB/KNX	<ul style="list-style-type: none"> <li>• In accordance with EMC and Low Voltage guidelines</li> <li>• According to EN 50090-1-2</li> </ul>

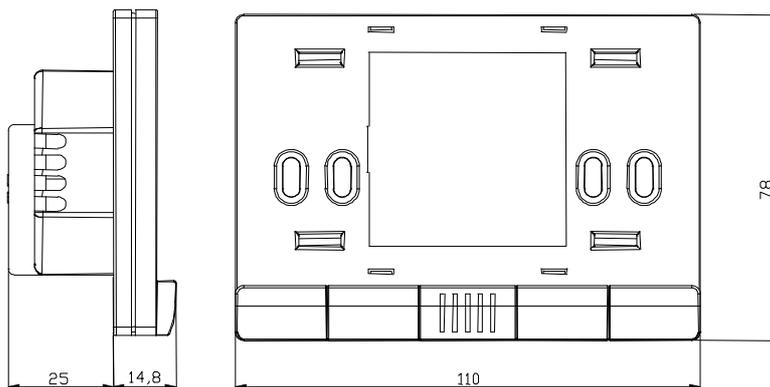
## 2.1 Wiring Diagram



## 2.2 Operating and display elements



## 2.3 Dimension drawing



## 2.4 Mounting and wiring hints

The device may be used for permanent indoor installations in dry locations within wall boxes.

### Requirements for installation

- The device must not be connected to 230V cables.
- The prevailing safety rules must be heeded.
- The device must be mounted and commissioned by an authorised installer.
- The applicable safety and accident prevention regulations must be observed.
- The device must not be opened. Any faulty devices should be returned to manufacturer.
- For planning and construction of electric installations, the relevant guidelines, regulations and standards of the respective country are to be considered.

### Requirements for commissioning

- Connect each single KNX/EIB bus core inside the bus connection terminal block observing bus polarity .
- Slip the bus connection block into the guide slot placed on the front side of this device and press the block down to the stop.
- In order to commission the device, a PC with ETS2 version V1.3 or higher is required as well as an interface to the bus, e.g. via an RS232 interface or via a USB interface.
- The device configuration (KNX physical address assignment) is done by pressing the programming push button located on the front of the housing.

### Supplied state

- The device is supplied with the physical address 15.15.255.
- It is therefore necessary to load parameters and group addresses during commissioning. However the complete application program can be reloaded if required.
- The bus connection terminal block is included in the package.
- The instruction sheet is included in the package.

### Maintenance

- The device is maintenance free.
- In case of damage during transportation or storage, no repairs may be carried out by external staff.
- When the device is opened the right to claim under guarantee expires.

### 3. Product and functional overview

The **Inwall Room Thermostat TM11A01KNX/TM11A11KNX** is an EIB/KNX wall mounting device designed for HVAC applications in Home and Building installations (i.e. offices, hospitals, hotels, private houses, etc.).

The device is equipped with one binary input (potential free contact) that can be used, for instance, to control the HVAC units whether a window has been opened (or closed) or for any other general purpose usage and one binary output relay to control fan coils or for any different purposes.

The temperature control is managed with an On/Off, Proportional, Integrative or PI algorithm and can be configured to control the following applications:

- Heating and Cooling with two tubes common to both fluids (Warm and Cold).
- Four circuits for heating and cooling
- 1, 2 or 3 fancoil speed in ON/OFF regulation
- Proportioned motorized valves regulation (continuous control).

In addition to the temperature regulation described, the thermostat allows the following operating modes:

- User inside the room (Comfort mode). The regulation follows the set point that is fixed from the control/supervision center or modified by the client.
- User outside the room (Standby mode). The regulation follows the set point fixed from the control/supervision center for this mode.
- Night Application (Economy Mode). The regulation follows the set point fixed from the control/supervision center for this mode.
- Antifreeze (frost protection).

The user, using dedicated push buttons placed in front of the thermostat, can modify the temperature setpoint and fancoil speeds.

In case user changes the fancoil speed via a front push button the thermostat pass from automatic to manual functioning. The automatic functioning mode is restored when the functioning scheme changes (Comfort, Standby or Economy).

In the thermostat the following parameters can be configured:

- Room Temperature Set Point (from 5,0 to 45.0°C or °F correspondent value). The set point is normally fixed from the control/supervision centre. The client can vary the set point trough dedicated buttons. The variation can be executed in between limits fixed from the control/supervision centre (minimum and maximum).
- Fan Coil Speed (OFF, 1, 2, 3). The fan coil speed is normally managed automatically from the thermostat. If the clients modify the speed set, the thermostat is forced in manual mode. The fan coil will get off when the temperature is reached.
- Comfort temperature set point (one for cooling and one for heating). This parameter is set from the control/supervision centre and used when the client is in the room.
- Stand by Temperature Set Point (one for cooling and one for heating). This parameter is set from the control/supervision centre and used when the client is not in the room.
- Economy Set Point (one for cooling and one for heating). This parameter is set from the control/supervision centre and used when the room is not assigned or by night to generate an energy saving.
- System Type: Two Tubes ON/OFF (only heating, only cooling or both), Four Tubes ON/OFF (heating and cooling with independent lines), Two Tubes with proportional command, Four Tubes with proportional command. The parameter is fixed while installing or testing the system, using ETS SW.
- Valves Type: ON/OFF Valves, or Motorized. The parameter is fixed while installing or testing the system, using ETS SW.

- Commutation Range between Heating and Cooling. Heating or Cooling action can be forced from the control/supervision centre and at each season change.

On the display the following information are visualized (see Fig. 1):

- Setpoint. The value is displayed in the LCD with XX.X°C format (or in the correspondent °F value to be selected while installing the system). Using the Set point variation buttons, the temperature is varied in a range fixed with ETS. Pushing continuously a button, the value will initially vary of 0,1°C and will proportionally accelerate the variation speed.
- Actual Temperature. In the LCD is displayed the real or actual temperature, in XX.X°C Format (or in the correspondent °F value to be selected while installing the system).
- Fan Coil Speed Visualisation. The value, from speed 1 to speed 3, is indicated by a specific icon on the display. This indication is visualised if the system is configured for fancoil usage.
- Some icons concerning actual operative status.

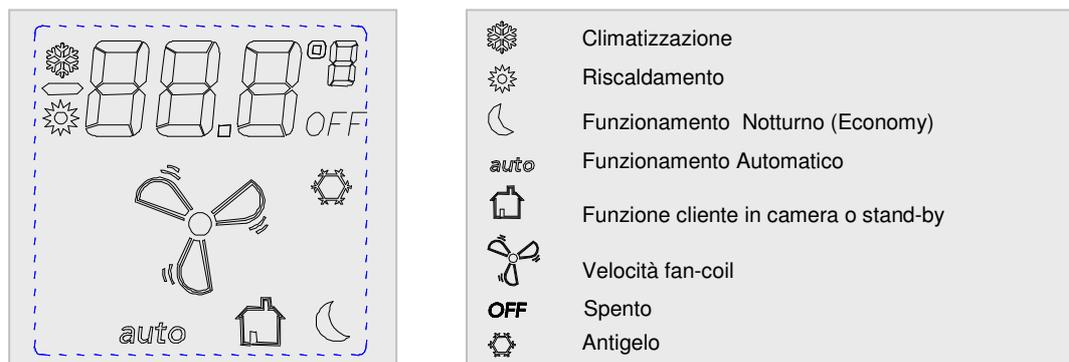


Fig. 1: Display and icons

The thermostat transmits to the KNX/EIB bus the following information:

- Real Setpoint Value (also cyclically sent with time period setting)
- Real Temperature (also cyclically sent with time period setting)
- Objects for actuator command (Fan coil and Valves)
- Power failure (and restore) alarm, if enabled.

This device provides also an alarm function by sending an “Alarm” object (1bit) to alarm, for instance, a centralized visualization software that a power failure has been occurred and then recovered next (this object is sent as the power supply is recovered).

The physical address, group address and parameters are assigned and programmed with the ETS tool software. In order to commission the device, a PC with ETS2 version V1.3 or higher is required as well as an interface to the bus, e.g. via an RS232 interface or via a USB interface.

The device **TM11A01KNX/TM11A11KNX** must be configured and loaded with the following application program: **EEL\_RTH1\_10 Room Thermostat**

With this application program the following functions can be parametrized and configured:

Application Program: EEL RTH1 10 Room Thermostat

- Max number of group addresses: 35
- Max number of group address associations: 32

<b>General Configuration</b>	<ul style="list-style-type: none"> <li>• Cyclical sending of actual temperature (environment)</li> <li>• Cyclical sending of actual setpoint temperature</li> <li>• Power failure and recovery alarm enable</li> </ul>
<b>Temperature Regulation Configuration</b>	<ul style="list-style-type: none"> <li>• Type of temperature regulation (ON/OFF, P, I, PI)</li> <li>• Type of HVAC plant (2/4 tubes ON/OFF, 2/4 tubes Proportional)</li> <li>• Fan Coil type (1,2,3 speeds or proportional regulation)</li> <li>• Temperature sensor adjustment (calibration)</li> <li>• Temperature coefficient regulation (hysteresis)</li> </ul>
<b>Setpoint Configuration</b>	<ul style="list-style-type: none"> <li>• Setpoint settings for Comfort, Stand-by, Economy modes in Summer/Winter conditions (Cooling/Heating)</li> <li>• Setpoint antifreeze winter (frost protection)</li> <li>• User's setpoint temperature range regulation setting</li> </ul>
<b>Input Configuration</b>	<ul style="list-style-type: none"> <li>• "Window Switch" or "General Purpose" functions setting</li> <li>• Window switch mode (normally opened or closed)</li> <li>• If "General Purpose" switching states ON or OFF can be set depending on input pulse edge evaluation (rising or falling edge).</li> <li>• Cyclical sending option at adjustable intervals</li> </ul>
<b>Configurazione Relay di uscita</b>	<ul style="list-style-type: none"> <li>• "General Purpose" or "Velocity V1 Fan Coil"</li> <li>• Normally open or closed contact setting</li> <li>• Timed OFF switching (e.g.: "Door lock timing release").</li> </ul>

Note: The default settings for the options are underlined (e.g. Options: no/yes)

## 4. Parameters

### 4.1 Parameter window “ General Configuration”

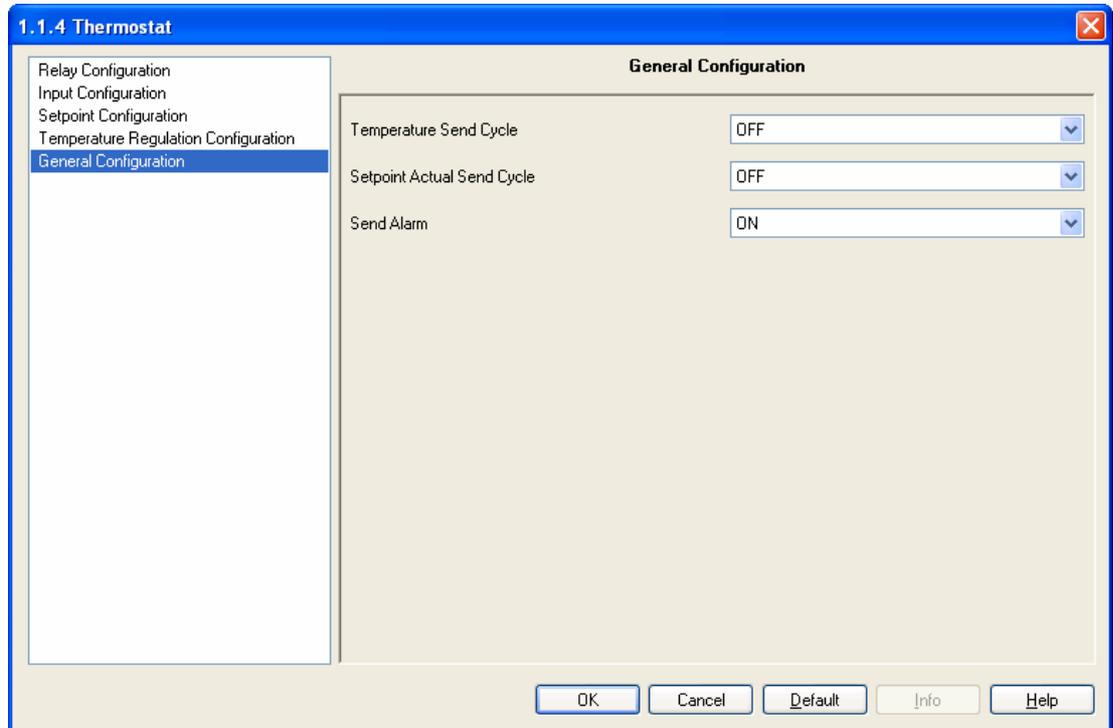


Fig. 2: Parameter window “General Configuration”

- **Temperature Send Cycle**

Options:            Off  
                           1 Min  
                           10 Min  
                           30 Min  
                           1 Hour

Option “Off”: cyclical sending disabled

Option “1Min”..”1Hour”: enable actual temperature value via object “Actual Temperature” to be sent cyclically every “1Min”...”1 Hour”.

- **Setpoint Actual Send Cylce**

Options:            Off  
                           1 Min  
                           10 Min  
                           30 Min  
                           1 Hour

Option “Off”: cyclical actual setpoint sending not enabled.

Option “1Min”..”1 Hour”:  
enable actual setpoint cyclical sending every 1Min”...”1 Hour” with the communication object “Actual SetPoint”.

The actual setpoint value is the base setpoint setting  $\pm$  last user’s variation via front push buttons.

- **Send Alarm**

Options:            OFF  
                          ON

Option “OFF”: the device does not send the object “Alarm”

Option “ON”: the device sends the object “Alarm” in case of power failure after the power supply has been recovered.

Note: this feature is useful to visualization software for instance to re-synchronize some information in the HBES installation.

## 4.2 Parameter Window “Temperature Regulation Configuration”

Parameters concerning the regulation algorithm and the type of HVAC plant system and the fancoil type are configured here.

This parameter window also provides the temperature adjustment for the temperature sensor calibration ( $\pm 1,5^{\circ}\text{C}$ ) and the hysteresis regulation range for the two step setpoint control (ON/OFF).

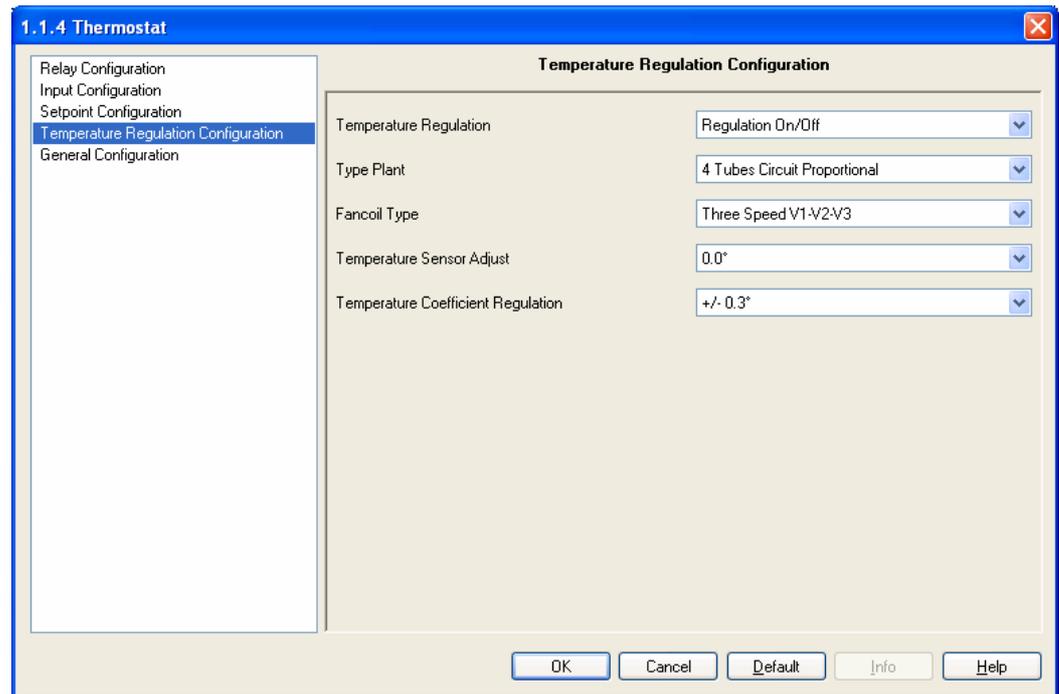


Fig. 3: Parameters Window “Temperature Regulation Configuration”.

- **Temperature Regulation**

This parameter is useful to set the regulation algorithm required.

Options:     *Regulation ON/OFF*  
                *Proportional Band*  
                *Integral Band*  
                *Proportional/Integral Band*

Option “*Regulation ON/OFF*”: with the switching ON/OFF control the control value is determined internally according to a two-step algorithm with an adjustable hysteresis set with the next parameter “Temperature Coefficient Regulation”.

The ON/OFF control is normally used in HVAC plants with small thermal inertia installed in small environments.

Option “*Proportional Band*”: with proportional regulation the actuator (valve) assumes positions proportional to deviation between the external measured temperature and the current setpoint (error). The output control command depends only to this deviation.

The proportional bandwidth is fixed and handled internally.

The P control is normally used in:

- i. plants where temperature doesn't change frequently and rapidly.
- ii. plants where a constant deviation between the temperature and the setpoint is acceptable (within a certain limited range)
- iii. plants with great volumes (accumulators) or with constant flow rate.

Option "*Integral Band*": the integral action acts on the actuator with a speed proportional to the deviation between the temperature and the setpoint. Here doesn't exist a direct relationship between the valve position and the deviation (error) as in case of a pure proportional regulation. The integral rate and time are fixed and handled by the thermostat internally.

A pure integral regulation can be used in case of HVAC plants with a fast reaction, without or with a small thermal inertia and with slow load variations.

Option "*Proportional/Integral Band*": the PI regulation provides both features of a pure proportional and integral controls, i.e. a fast response due to the proportional regulation at the start up and a quite "load independence" of the integral action at the end. Normally the proportional control acts immediately as the thermostat is activated in order to reduce the quite big deviation at first, then the integral regulation acts as the temperature move towards near the setpoint reducing completely the permanent deviation remained after the proportional control.

The PI control allows reaching immediately the setpoint reducing the permanent deviation left by the proportional action especially in wide environments and rooms with a big thermal inertia.

#### ▪ **Type Plant**

This parameter allow the selection of HVAC plant type installed inside the premises.

In case a 2 or 4 tubes ON/OFF is selected the thermostat sends a switching ON/OFF command via 1 bit object to the valves when the temperature cross the range of actual setpoint  $\pm$  temperature coefficient regulation (hysteresis)  $\Delta T$  in a two steps algorithm. It's therefore possible, for example, for electro thermal control valves to be addressed via switch actuators. In case a 2 or 4 tubes circuit proportional is used the control value is determined internally always according to a two-step algorithm with an adjustable hysteresis and output via 1 byte communication object. In this case the room thermostat **sends only values 0 (=0%=valve closed) or 255 (=100%=valve fully opened).**

The toggling between heating (winter) and cooling (summer) is not carried out neither manually nor automatically but the two control are completely independent.

Options:     2 Tubes Circuit ON/OFF  
              4 Tubes Circuit ON/OFF  
              2 Tubes Circuit Proportional  
              4 Tubes Circuit Proportional

Option "*2 Tubes Circuit ON/OFF*:" with this option the HVAC plan is composed of 2 circuits with ON/OFF switching valves. The thermostat provides only 1 bit

object (“Valve 0=Cold / 1 = Warm”) in order to open or close the valve connected to an actuator.

Option “4 Tubes Circuit ON/OFF”: with this option the HVAC plan is composed of 4 circuits with ON/OFF switching Cold and Warm valves. The thermostat provides two 1 bit object, one dedicated to control the Warm valve and the other to Cold valve via an external bus actuator.

Option “2 Tubes Circuit Proportional”: with this option the HVAC plan is composed of 2 circuits with proportional Cold and Warm valves. The thermostat provides here one 1 byte object (“Valve Proportional 0%=Cold / 100%=Warm”) with only two values: 0% (cold) and 100% (warm).

Option “4 Tubes Circuit Proportional”: with this option the HVAC plan is composed of 4 circuits with proportional Cold and Warm valves. The thermostat provides here two 1 byte object (“Warm Valve Proportional” and “Cold Valve Proportional”) with only two values: 0% (valve completely closed) and 100% (valve completely opened).

#### ▪ Fancoil Type

Options:     Single Speed V1  
                  Double Speed V1-V2  
                  Three Speed V1-V2-V3  
                  Proportional Regulation

Option “Single Speed V1”: the fan coil has only 1 speed and is so controlled with a 1 bit object (“Fancoil Speed V1”) via an external bus actuator.

Option “Double Speed V1-V2”: the fan coil has two speeds V1 and V2. With this option the device provides two 1 bit objects to control the two speeds (“Fancoil Speed V1” and “Fancoil Speed V2”) via an external bus actuator.

Option “Three Speeds V1-V2-V3” the fan coil has three speeds V1,V2, V3. With this option the device provides three 1 bit objects to control the three speeds (“Fancoil Speed V1”, “Fancoil Speed V2”, “Fancoil Speed V3”) via an external bus actuator.

Option “Proportional Regulation”: the fan coil is controlled by proportional actuator that allows fan coil speed proportional control between da 0 a 100%.

#### ▪ Temperature Sensor Adjust

Options:     -1,5 °C....0,0.....+1,5 °C

This parameter can be useful when a temperature adjustment is required by the internal sensor (e.g. due to wrong or difficult installation). The adjustment should be set using an external professional temperature sensor in order to check the temperature variance that occurred.

- **Temperature Coefficient Regulation**

Options:  $\pm 0,1\text{ }^{\circ}\text{C} \dots \pm 0,3 \dots \dots \pm 1,0\text{ }^{\circ}\text{C}$

With this parameter is possible to select a level for the hysteresis ( $\pm\Delta T$ ) by which the setpoint fluctuates.

The HVAC plant is switched ON in case of an ON/OFF control when temperature falls outside the hysteresis (see next fig. 4).

The hysteresis is based on how quickly the heating system can warm up the room or how quickly the cooling system can lower the temperature in the room as well as the customer's sensitivity to temperature levels. The hysteresis should not be set too low as otherwise the valve drive continually opens and closes. It should be also not be set too high as the temperature fluctuations in the room are then fairly considerable.

The correct hysteresis setting avoid continuous switching ON and OFF the HVAC system around the setpoint threshold.

Next figure shows how the hysteresis works in a 2 step controlling.

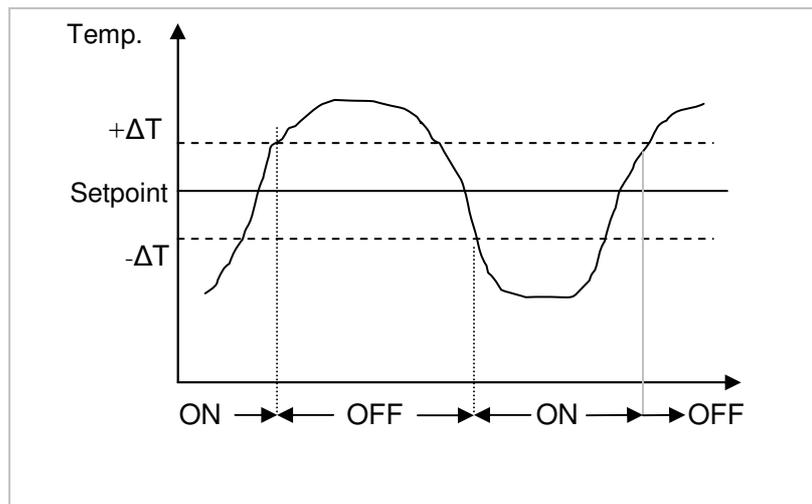


Fig. 4: Example of a 2 Step control with hysteresis

### 4.3 Parameter Window “Setpoint Configuration”

This window allows parameter settings for all setpoints associated to every mode (Comfort, Standby, Economy) and also for Heating (Winter) and Cooling (Summer) operation.

The setpoint values can be modified also via bus in run time by a centralized unit (e.g. visualization and management software).

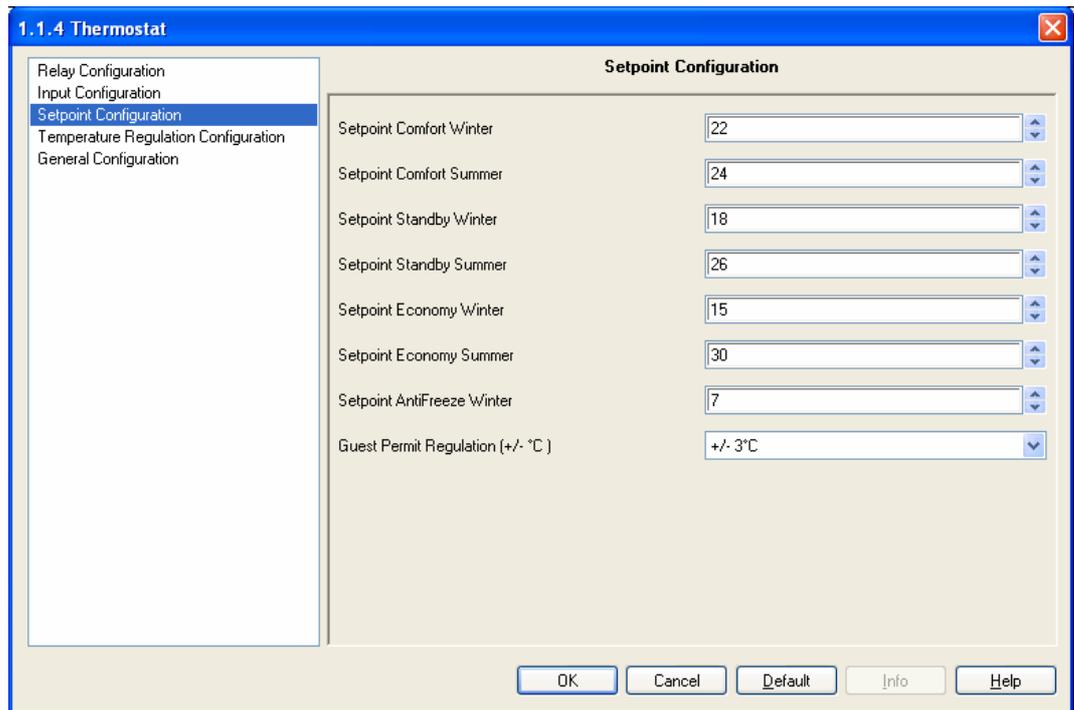


Fig. 5: Parameter Window “Setpoint Configuration”

- **Setpoint Comfort Winter**

Options: +5 °C....+22 °C.....+45 °C

Comfort mode setpoint in Winter (Heating)

- **Setpoint Comfort Summer**

Options: +5 °C....+24 °C.....+45 °C

Comfort mode setpoint in Summer (Cooling)

- **Setpoint Standby Winter**

Options: +5 °C....+18 °C.....+45 °C

Standby mode setpoint in Winter (Heating)

- **Setpoint Standby Summer**

Options: +5 °C....+26 °C.....+45 °C

Standby mode setpoint in Summer (Cooling)

- **Setpoint Economy Winter**

Options: +5 °C....+15 °C.....+45 °C

Economy mode setpoint in Winter (Heating)

- **Setpoint Economy Summer**

Options: +5 °C....+30 °C.....+45 °C

Economy mode setpoint in Summer (Cooling)

Next figure shows the setpoints settings in Summer/Winter (Heating/Cooling) mode.

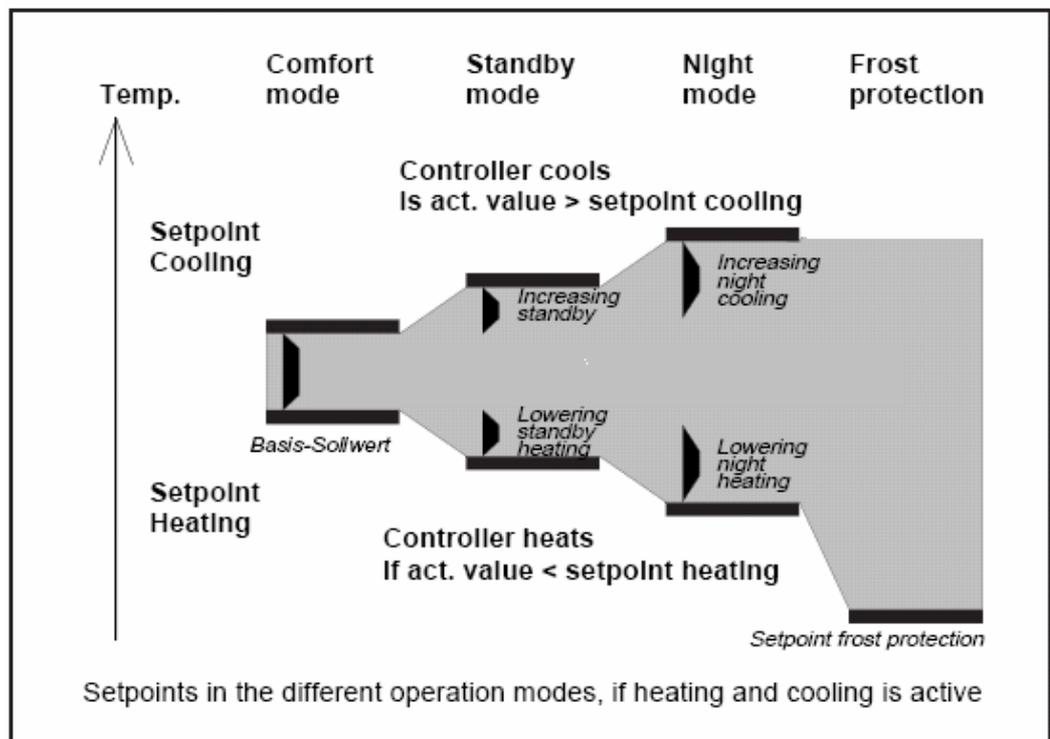


Fig. 6: Heating and Cooling (Summer/Winter) setpoints settings.

- **Setpoint Antifreeze Winter**

Options:      +4 °C....+7°C.....+10 °C

Setpoint for frost protection (in Winter/Heating mode).

The frost protection is activated via bus with the 1 bit object “Antifreeze” or in case the function “Window Switch” is associated to the binary input available. If a window is opened and this status is detected through the binary input channel interfaced with a window contact so the HVAC system is switched OFF immediately.

In “Antifreeze” mode the thermostat refers to this setpoint switching OFF the HVAC plant in order to avoid energy and heating waste.

The Heat protection for cooling function is not handled in this product version.

- **Guest Permit Regulation (+/- °C)**

Options:      No Variation, ±1 °C....±3.....±5 °C

With this parameter the setpoint range of variation allowed to the user, using the front push buttons, can be limited to a maximum of ±5 °C.

Note: the user setpoint variation is stored and maintained inside in case of change from Comfort to Standby mode and vice versa. In case the thermostat pass from Comfort mode to Economy or Antifreeze mode or the setpoint is changed via bus with the specific object than the user modification is cancelled (i.e. the Comfort setpoint is restored to value before user modification).

## 4.4 Parameter Window “Input Configuration”

This window allows setting parameters for binary input operating functions.

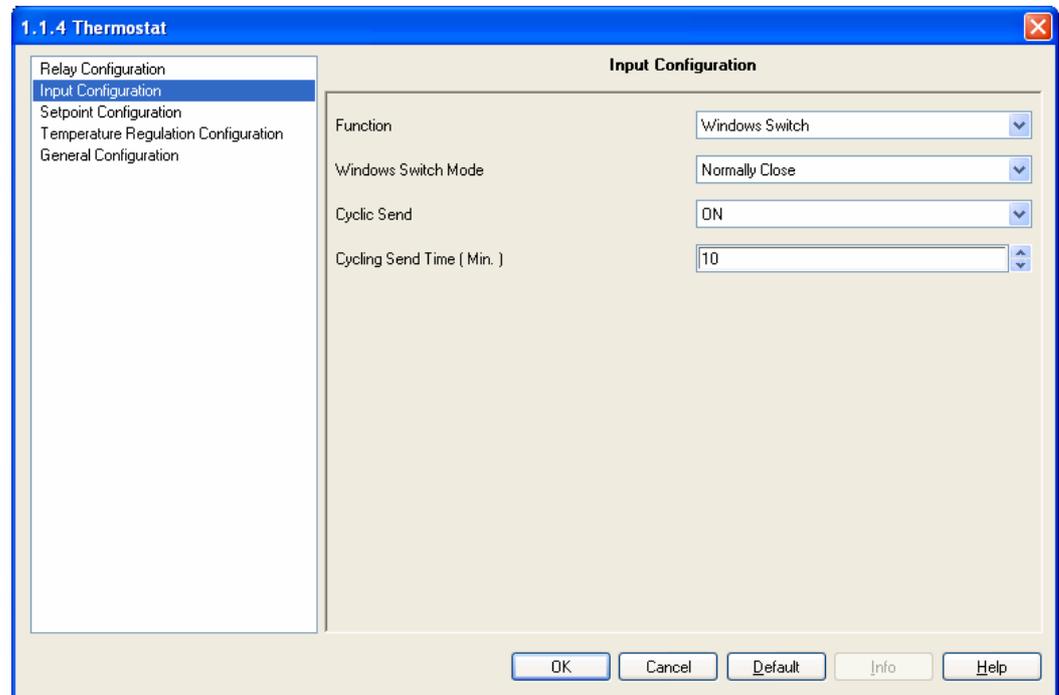


Fig. 7: Parameter window for “Input Configuration” with Function = “Windows Switch” and “Cyclic Send” = “ON” settings.

- **Function**

This parameter allows setting of function associated to the binary input channel as “Window Switch” or as “General Purpose”.

Options:     Windows Switch  
                   General Purpose

Option “*Windows Switch*”: the thermostat detects when the input contact is closed in case a window has been opened. The next parameter “Window Switch Mode” allows setting of “Normally Close” or “Normally Open” contact.

As the contact has been closed by an external window switch connected to the binary input the thermostat start up the “Antifreeze” frost protection function switching OFF the heating/cooling system and sending the 1 bit object “Window Switch” to the bus just signalling the event to a centralized unit or to a supervision system.

Option “*General Purpose*”: with this option the input channel can be used as a standard binary input where the input signal detection based on rising or falling edge or toggle ON/OFF can be selected with the parameter next.

If the input is associated to “Windows Switch” function the following parameters are visible and enabled.

- **Windows Switch Mode**

This parameter allows the input contact usage setting if normally opened or closed.

Options:        *Normally Open*  
                  *Normally Close*

Option “*Normally Open*”:

Window Close = contact open  
Window Open = contact closed.

Option “*Normally Close*”:

Window Close = contact close  
Window Open = contact open.

- **Cyclic Send**

Options:                *ON*  
                              *OFF*

This parameter enable the cyclical sending of current value of the binary Input to the bus at a set interval.

- **Cycling send time (min)**

Options:        *1...10...200*

The cyclic time for sending telegrams repeatedly on the bus with Input current value is specified here. The time units are minutes.

**Note:** *please see Input timing diagrams in “Application Notes”.*

In case the binary input function selected is “General Purpose” so the following parameter appears to allow planner to set the input signal handle based on rising/falling edges or toggle ON/OFF.

- **Mode**

This parameter determines which switching values is written into the memory location of the communication object when the signal state changes at the input. A rising edge is when the signal state at the input changes from logic “0” to “1” while a falling edge is a change from logic “1” to “0”.

Options:

Rising ON

Rising OFF

Falling ON

Falling OFF

Rising ON / Falling OFF

Rising OFF / Falling ON

Toggle ON/OFF

Toggle OFF/ON

With this parameter we can program which status we need to send to the bus (ON/OFF; TOGGLE) when a rising or falling edge is detected in the input signal.

Behaviour:

“Rising On”: A rising edge causes a logic “1” to be transferred to the communication object. A falling edge does not alter the object value.

“Rising Off”: A rising edge causes a logic “0” to be transferred to the communication object. A falling edge does not alter the object value.

“Falling On”: A falling edge causes a logic “1” to be transferred to the communication object. A rising edge does not alter the object value.

“Falling Off”: A falling edge causes a logic “0” to be sent to the communication object. A rising edge does not alter the object value.

“Rising On, Falling Off”: A rising edge causes a logic “1” to be transferred to the communication object. A falling edge causes a logic “0” to be sent.

“Rising Off, Falling On”: A rising edge causes a logic “0” to be transferred to the communication object. A falling edge causes a logic “1” to be sent.

“Toggle ON/OFF”: Each rising edge causes the object value to be inverted. This means that a logic “1” is sent to the communication object after the first rising edge. The next one sends a logic “0” and so on. A falling edge does not alter the object value.

“Toggle OFF/ON”: Each falling edge causes the object value to be inverted. This means that a logic “1” is transferred to the communication object after the first falling edge. The next one sends a logic “0” and so on. A rising edge does not alter the object value.

The two parameters next remain the same as explained before (in this case the cyclical sending is concerned the 1 bit object “Digital Input”).

- **Cyclic Send**

Options:            ON  
                         OFF

This parameter enable the cyclical sending of current value of the binary Input to the bus at a set interval with the object “Digital Input”.

- **Cycling send time (min)**

Options:            1...10...200

The cyclic time for sending telegrams repeatedly on the bus with Input current value is specified here. The time units are minutes.

**Note:** please see *Input timing diagrams* in “Application Notes”.

## 4.5 Parameter Window “Relay Configuration”

The output relay configuration is provided within this window.

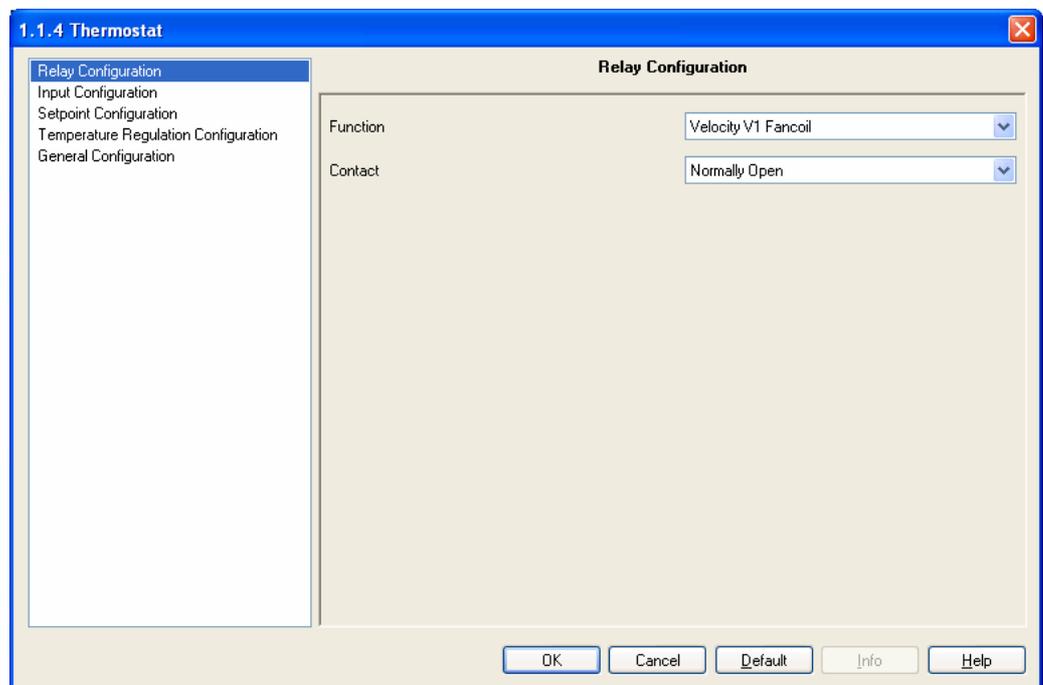


Fig. 8: Parameter Window “Relay Configuration” with Function = “Velocity V1 Fancoil”.

- **Function**

Options:     Velocity V1 Fancoil  
              General Purpose

Option “*Velocity V1 Fancoil*”: the output relay can be used to control the velocity V1 of a fan coil in case a fan coil is used.

The type of fan coil can be selected with the parameter “Fancoil Type” in the “Temperature Regulation Configuration” parameter window.

Option “*General Purpose*”: the output relay can be used as a normal binary output relay controlled by the 1 bit object “Relay OnBoard”. In case of “General Purpose” selection the output can be controlled in normal or timing mode.

- **Contact**

Options:     Normally Open  
              Normally Close

Option “*Normally Open*”:

Off telegram = contact open

On telegram = contact closed.

Option “*Normally Close*”:

Off telegram = contact closed

On telegram = contact open.

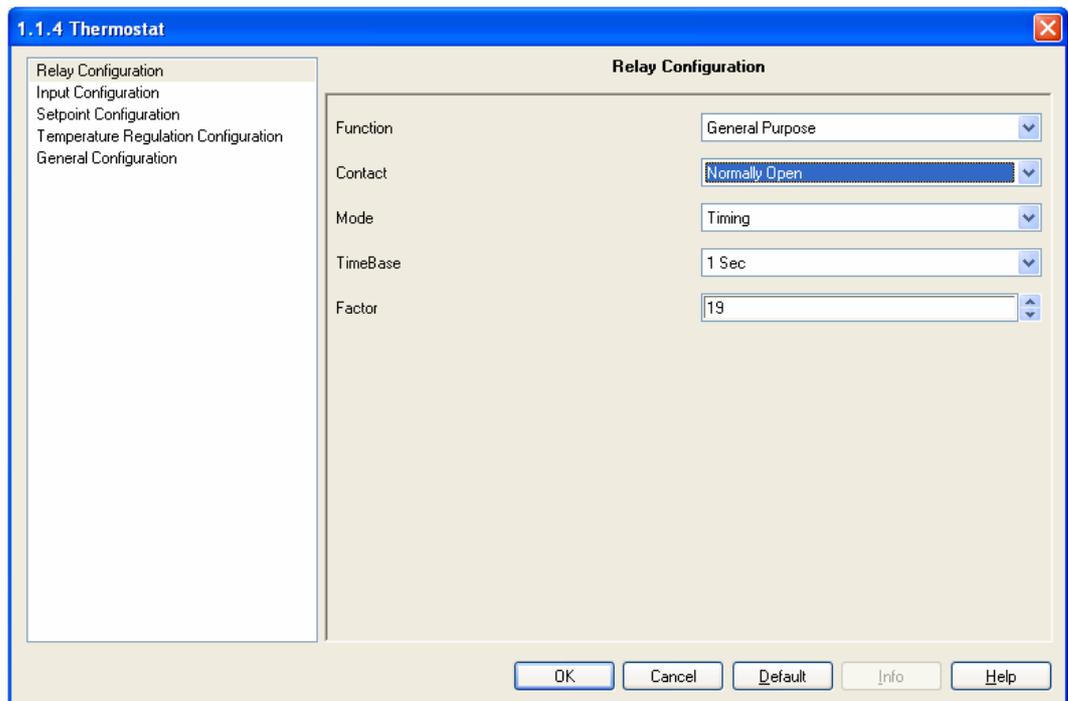


Fig. 9: Parameter Window “Relay Configuration” with the “General Purpose” function associated to the output.

- **Mode**

Option: Normal  
Timing

Option “*On-Off*” : the output relay will be switched ON by sending an ON command and will be switched OFF by sending an OFF command within the associated object “Relay OnBoard”.

The status of the relay contact is inverted by the parameter setting “Contact”= “Normally Close”.

Option “*Timing*”: enable the time switch function (e.g. staircase lighting function). When an On telegram is received via the output object, it is routed directly to the relay. The Off delay that has been assigned starts at the same time. Every further “1” (ON) that is received before the timer has elapsed, resets the delay and restarts it. Once the period has elapsed, a “0” is passed to the output. An Off telegram deletes the Off delay and is immediately routed to the output.

The time for the Off delay is set here. This is calculated from the selected base “TimeBase” multiplied by the factor “Factor” that is entered here:

$$T_{ON} = \text{TimeBase} \times \text{Factor}$$

Note: An attempt should always be made to set the required time with the smallest possible base as the base that is selected here also simultaneously specifies the maximum timing error.

- **Time Base**

Options: 250ms, 500ms, 1sec, 1min, 1hour

- **Factor**

Options: 0...2...255

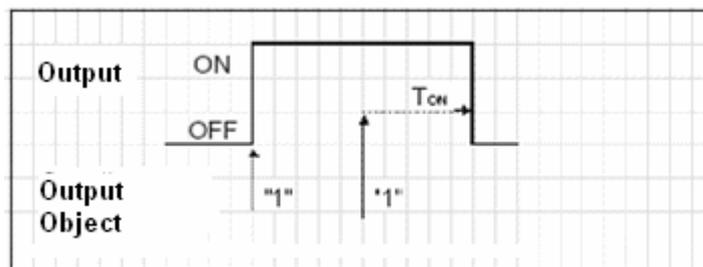


Fig. 10: Timing switching function (e.g. “Staircase Lighting”)

**Note:** please see Outputs timing diagrams in “Application Notes”.

## 5 Communication Objects

The EIB/KNX communication objects provided within the application program “EEL\_RTH1\_10 Room Thermostat” are the following:

Num...	Name	Object Function	D...	G.	Length	C	R	W	T	U	D
0	0=StandBy / 1=Comfort	1.001 DPT_Switch			1 bit	C	R	W	T	-	
1	Economy	1.001 DPT_Switch			1 bit	C	R	W	T	-	
2	AntiFreeze	1.001 DPT_Switch			1 bit	C	R	W	T	-	
3	0=Summer / 1=Winter	1.001 DPT_Switch			1 bit	C	R	W	T	-	
4	Actual SetPoint	9.001 DPT_Value_Temp			2 Byte	C	R	W	T	-	
5	SetPoint Base Comfort	9.001 DPT_Value_Temp			2 Byte	C	R	W	T	-	
6	SetPoint Base StandBy	9.001 DPT_Value_Temp			2 Byte	C	R	W	T	-	
7	SetPoint Base Economy	9.001 DPT_Value_Temp			2 Byte	C	R	W	T	-	
8	Actual Temperature	9.001 DPT_Value_Temp			2 Byte	C	R	W	T	-	
9	Relay OnBoard	1.001 DPT_Switch			1 bit	C	R	W	T	-	
10	Windows Switch	1.001 DPT_Switch			1 bit	C	R	W	T	-	
11	Fancoil Speed V1	1.001 DPT_Switch			1 bit	C	R	W	T	-	
12	Fancoil Speed V2	1.001 DPT_Switch			1 bit	C	R	W	T	-	
13	Fancoil Speed V3	1.001 DPT_Switch			1 bit	C	R	W	T	-	
17	Warm Valve Proportional	5.001 DPT_Scaling			1 Byte	C	R	W	T	-	
18	Cold Valve Proportional	5.001 DPT_Scaling			1 Byte	C	R	W	T	-	
19	Allarm	1.003_DPT_Alarm			1 bit	C	R	W	T	-	
20	Thermostat OFF	1.001 DPT_Switch			1 bit	C	R	W	T	-	

Fig. 11: Communication Objects EIB/KNX provided with the application program (NB: some objects are visible only if enabled by specific parameter setting).

Nr.	Funzione	Nome	Tipo	Flag
0	On/Off	0=Standby / 1=Comfort	EIS1, 1bit DPT 1.001	C,R,W,T
<p>After receiving the object from the bus, the thermostat goes to standby mode (when receiving 0) or in Comfort mode (when receiving 1). The fixed temperature Set point is used when passing from Comfort mode to Standby mode and vice versa. When changing mode, a thermostat that was working in manual gets to automatic mode.</p>				
1	On/Off	Economy	EIS1, 1bit DPT 1.001	C,R,W,T
<p>After receiving the object from the bus, the thermostat goes in Economy mode (e.g. “Night mode”). The fixed temperature Set point is used when passing to this mode. When changing mode, a thermostat that was working in manual gets to automatic mode.</p>				
2	On/Off	AntiFreeze	EIS1, 1bit DPT 1.001	C,R,W,T
<p>After receiving the object from the bus, the thermostat goes in Antifreeze mode. The fixed temperature Set point is used when passing to this mode. When changing mode, a thermostat that was working in manual gets to automatic mode. In case the input has been enabled with the function “Windows Switch” as the antifreeze object is received the thermostat switches OFF the heating/cooling system.</p>				

<b>Nr.</b>	<b>Funzione</b>	<b>Nome</b>	<b>Tipo</b>	<b>Flag</b>
3	On/Off	0 = Summer / 1=Winter	EIS1, 1 bit DPT 1.001	C,R,W,T
<p>After receiving the object from the bus, the thermostat goes in Winter mode (when receiving 1) or in Summer mode (when receiving 0).            The fixed temperature Set point is used when passing from Winter mode to Summer mode and vice versa.            Note: the thermostat TM11A01KNX (TM11A11KNX) doesn't toggle automatically between Summer (Cooling) and Winter (Heating) mode but only by receiving this object from the bus.</p>				
4	Real actual setpoint	Actual SetPoint	EIS5, 2 byte DPT 9.001	C,R,W,T
<p>With this object the real last setpoint value, concerning the actual operating mode (summer/winter and comfort, economy or standby) is sent to the bus.            The real actual value is calculated from the base setpoint <math>\pm</math> the user variation introduced with the front push buttons.            This object is sent cyclically (if enabled with specific parameter) or at any changes or after ETS download.</p>				
5	Comfort setpoint value setting	Setpoint Base Comfort	EIS5, 2 byte DPT 9.001	C,R,W,T
<p>This object is used to set the Comfort base setpoint via bus, normally by a centralized unit. This value is stored in a non volatile memory.</p>				
6	Standby setpoint value setting	Setpoint Base StandBy	EIS5, 2 byte DPT 9.001	C,R,W,T
<p>This object is used to set the Standby base setpoint via bus, normally by a centralized unit. This value is stored in a non volatile memory.</p>				
7	Economy setpoint value setting	Setpoint Base Economy	EIS5, 2 byte DPT 9.001	C,R,W,T
<p>This object is used to set the Economy base setpoint via bus, normally by a centralized unit. This value is stored in a non volatile memory.</p>				
8	Actual temperature value	Actual Temperature	EIS5, 2 byte DPT 9.001	C,R,W,T
<p>Actual temperature is transmitted to the bus with this object. The temperature value is sent in case of temperature variation or, if enabled by the parameter, cyclically.</p>				

<b>Nr.</b>	<b>Funzione</b>	<b>Nome</b>	<b>Tipo</b>	<b>Flag</b>
9	Binary Output object	Relay OnBoard	EIS1, 1bit DPT 1.001	C,R,W,T
<p>If the output is configured with “General Purpose” function this object is visible and is used to control the output relay from the bus (e.g. from an external KNX sensor or push button) as a normal binary output channel.</p> <p>If the function “Velocity V1 Fancoil” is assigned this object is not enabled (i.e. the relay is used only to control the speed V1 of a fan and so not free for different usage).</p>				
10	Binary Input	Windows Switch Digital Input	EIS1, 1bit DPT 1.001	C,R,W,T
<p>In case of window sensor configuration, the device controls the automatic fancoil stop when the window is opened (internally changes into antifreeze mode) and sends the value to the bus.</p> <p>In case the input is configured for general purpose usage the “Digital Input” object is visible and transmits an ON/OFF signal regarding the input state to an external actuator (and/or to a visualization software).</p>				
11	Speed V1 command to fan coil	Fancoil Speed V1	EIS1, 1bit DPT 1.001	C,R,W,T
<p>It transmits on the bus the V1 speed command directed to an external actuator.</p>				
12	Speed V2 command to fan coil	Fancoil Speed V2	EIS1, 1bit DPT 1.001	C,R,W,T
<p>It transmits on the bus the V2 speed command directed to an external actuator.</p>				
13	Speed V3 command to fan coil	Fancoil Speed V3	EIS1, 1bit DPT 1.001	C,R,W,T
<p>It transmits on the bus the V3 speed command directed to an external actuator.</p>				
14	Fan coil proportional speed regulation	Fancoil Speed Proportional	EIS6, 1 byte DPT 5.001	C,R,W,T
<p>In case with the parameter “Fancoil Type” the “Proportional Regulation” is selected this 1 byte object is used to send fan coil speed values between 0% and 100% to proportional fan coil actuator.</p>				

Nr.	Funzione	Nome	Tipo	Flag
15	Switching ON/OFF cold/warm valves	Valve 0=Cold/1=Warm Warm Valve	EIS1, 1bit DPT 1.001	C,R,W,T
<p>This object controls a 2 or 4 circuits in the HVAC system.            In case the HVAC plant type parameter is set to "2 tubes circuits ON/OFF" than the object is used to switch the valve between Cold and Warm and vice versa (value 0=Cold and 1=Warm).            In case the HVAC plant type parameter is set to "4 tubes circuits ON/OFF" than this object is used only to switch the Warm valve while the next object n.16 is dedicated to control the Cold circuit.</p>				
16	Switching control Cold Valve	Cold Valve	EIS1, 1bit DPT 1.001	C,R,W,T
<p>If the HVAC plant type is set to "4 Tubes Circuit ON/OFF" than this object is visible and is used to control the cold valve.</p>				
17	Proportional cold/warm valve control	Valve Proportional 0%=Cold/100%=Warm Warm Valve Proportional	EIS6, 1 byte DPT 5.001	C,R,W,T
<p>In case the HVAC plant type selected is composed of "2 Tubes circuit proportional" than this object is used to control proportionally the cold/warm valve where 0%=Cold and 100% = Warm.            In case the HVAC plant type is composed of "4 Tubes circuit proportional" than this object is used to control proportionally only the Warm Valve while the next object n.18 is also visible and enabled to control the Cold Valve.</p>				
18	Proportional control of Cold Valve	Cold Valve Proportional	EIS6, 1 byte DPT 5.001	C,R,W,T
<p>In case the HVAC plant type is composed of "4 Tubes circuit proportional" than this object is used to control proportionally only the Cold Valve together with the object n.17 dedicated to Warm Valve.</p>				
19	Power Failure alarm	Alarm	EIS1, 1bit DPT 1.005	C,R,W,T
<p>In case the parameter "Send Alarm" is set to "ON" than this object is shown.            This object are sent ("ON") in case of device power failure as the power supply has been recovered.            This alarm can be useful to a visualization and access control software to re-synchronized data end time into all transponder readers (and holders) after a power failure or for different purposes.</p>				
20	ON/OFF	Thermostat OFF	EIS1, 1bit DPT 1.001	C,R,W,T
<p>This object is used to switch OFF the thermostat control (value 1 = OFF).            In case a value "0" is received the thermostat returns to the previous status and mode before the OFF command.</p>				

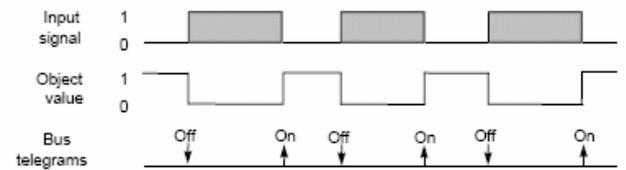
## 6 Application Notes

### Examples of timing diagrams for Input

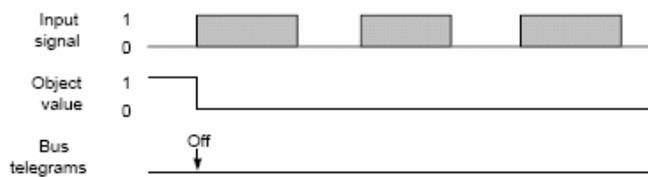
#### 1. Configured with edge evaluation: "rising On"



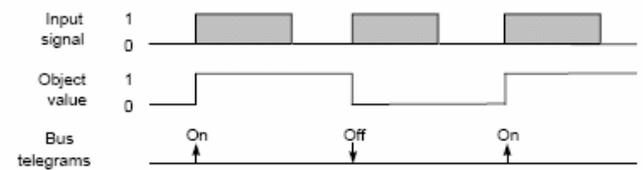
#### 6. Configured with edge evaluation: "rising Off, falling On"



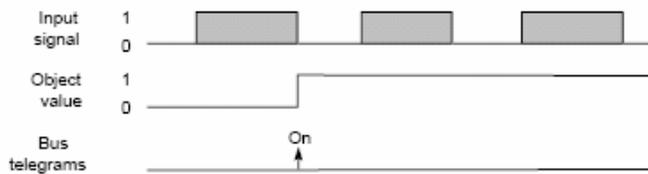
#### 2. Configured with edge evaluation: "rising Off"



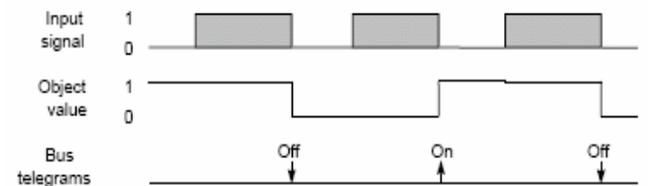
#### 7. Configured with edge evaluation: "Toggle On Off"



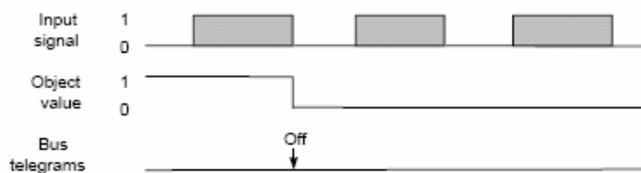
#### 3. Configured with edge evaluation: "falling On"



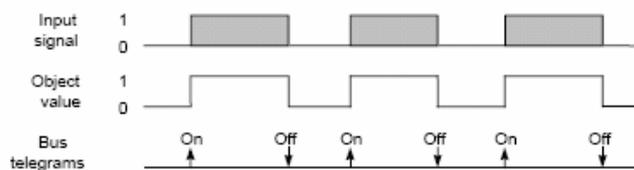
#### 8. Configured with edge evaluation: "Toggle Off/On"



#### 4. Configured with edge evaluation: "falling Off"

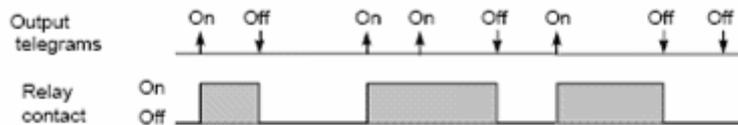


#### 5. Configured with edge evaluation: "rising On, falling Off"

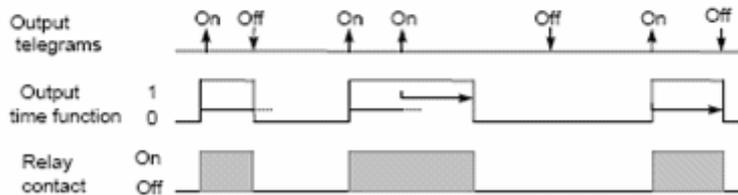


## Examples of timing diagrams for Output

### 1. Switching



### 2. Switching with a time switch function



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