INWALL 4 ANALOG IN / 4-8 DIGITAL IN / 4 LED OUT MODULE with 2 room temperature control

AD84A02KNX

Product Handbook

Product:
AD84A02KNX
Description:
INWALL 4 ANALOG IN / 4-8 DIGITAL IN / 4 LED OUT MODULE

Document
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Exclusion of liability:
Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this.
Any necessary corrections will be incorporated into newer versions of this manual.

Symbol for relevant information 

Symbol for warning 

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1. General Introduction

This manual is intended to be used by installers and describes functions and parameters of the device AD84A02KNX and how is possible to change settings and configurations using ETS software tool.

2. Product and functional overview

AD84A02KNX module IS designed to be installed in Home and Building installations (i.e. offices, hotels, private houses, etc...).
The module includes 4 digital inputs to interface free potential contacts; 4 analog / digital inputs for free potential contacts or temperature sensors and 4 led outputs.
Digital inputs can interface sensors, traditional buttons, etc; 4 led output channels at low voltage can drive LED for synoptics panels or switches
Inputs 5 ÷ 8, set as analog inputs, can enable up to 4 temperature probes (with On/Off threshold) and 2 of them can be thermostats to control heating and cooling equipments, valves, 2 and 4 pipes fan coils; etc..

- For NTC temperature probe eelectron code TS01A01ACC (from -20°C to +100°C) TS01B01ACC (from -50°C to +60°C)
- For LED eelectron code LD00A01ACC or LD00A11ACC

Digital inputs / led outputs main functions:

- 1 bit commands: load activation / deactivation commands (ON/OFF/TOGGLE) with short press or with differentiation of long and short press
- 1 byte commands (unsigned 0-255 or HVAC commands or value % commands).
- Sending of long action telegrams on the same address of short action or on a different group address
- Cyclic sending
- Sequences (3 commands mixing 1bit/1byte objects) with different group addresses
- Edges for 1 bit / 1 Byte / sequences
- Dimmer management (with single or double push-button)
- Blind / Roller Shutter management (with single or double push-button)
- Scene management
- LED driving as independent channel

- For inputs 1,2,3,4: Max. length of Connecting Cable: ≤ 30 m (twisted cable)
- For inputs 5,6,7,8: Max. length of Connecting Cable: ≤ 10 m (twisted cable)

Analog inputs 5,6,7,8 (as temperature sensor) main functions:

Temperature cyclical sending

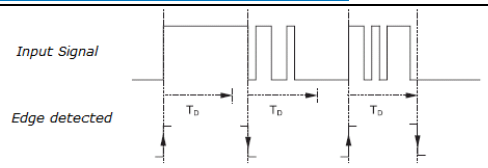
- 2 different temperature thresholds to trigger 1 bit telegrams alarm/warning
- Enable / disable of alarm/warnings via 1 bit object

Analog inputs 5,6 (as Thermostat) main functions:

- Different control algorithms: 2 point on/off; PWM; Continuous Control / Fan Coil Control
- Different setting modes: via HVAC automatic / via HVAC Manual / via Setpoint
- Window contact function
- Additional external temperature sensors (optional)

3. General Parameter Configuration

KNX PARAMETER	SETTINGS
Input debounce time	20 ms 80 ms 50 ms 40 ms 100 ms 200 ms
When a button connected to the input is pressed it is possible to have the contact opened or closed more than once before fixing into a stable position; this can be caused by a rapid succession of bounces between mechanicals contacts. For this reason it is important to determine a correct value of the parameter “debounce time” to avoid these bounces could be taken by the device as input switching. How this parameter works: after the device has detected a change of status for an input channel, it waits for a time equal to the time set as “debounce time” before updating the value of the corresponding data point. The input signal is not evaluated during this time. This parameters affects all 8 device input channels (where present)	



Delay on Power-up	5 ÷ 15 seconds

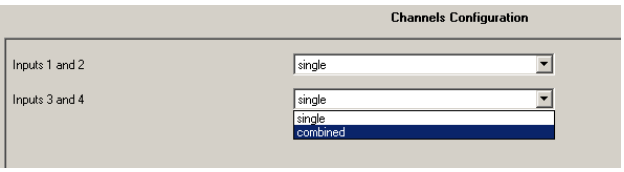
Through this parameter is possible to set the delay of transmission of telegrams after a power on by selecting the time by which the device is allowed to send telegrams.
In large systems after a power failure or shutdown this delay avoids to generate excessive traffic on the bus, causing slow performance or a transmission block.
If there are different devices requiring sending telegrams on the bus after a reset, these delays must be programmed to prevent traffic congestion during the initialization phase.
The input detection and the values of objects are updated at the end of the transmission delay time
At the end of ETS programming the device behaves like after a power on.

Minimum time long press input	0,3 sec 0,4 sec 0,5 sec 0,8 sec 1 sec 1,2 sec 1,5 sec 2 sec 3 sec 5 sec 8 sec 10 sec

Determines how long must be a press to be considered long; if shorter than the selected value the press will be considered short.

4. Channels Configuration

It's possible to configure two channels or two inputs to work together by selecting the value "combined" in "Channel Configuration" page.



- Input 5 / 6 can be selected to be digital or analog; temperature sensor or thermostat
- Input 7 / 8 can be selected to be digital or analog (temperature sensor only)

- Parameter "**Minimum time long press input"** for input 5,6,7,8 remains visible even if those channel are configured as "**analog**"; in this case this setting is not considered.

KNX PARAMETER	SETTINGS
Analog input 5 **(Analog Input 6)**	Temperature sensor Thermostat
"Temperature Sensor": measures and sends temperature on the bus "Thermostat" : controls different types of actuators regulating heating and cooling	

5. Channel / Input <x> Configuration

For each of the 8 input channels, present on the device, the selections are made through a configuration page.

Every single channel or input can be configured to perform one of the following functions:

- Activation on press
- Activation on short and long press
- Dimming
- Shutter and blinds
- Scene
- Command in sequence (on short and long press)
- Command in sequence (on edge)

KNX PARAMETER	SETTINGS
Function	Activation on press Activation on short and long press Dimming Shutter and blinds Scene Command in sequence (short/long press) Command in sequence (on edge)

Activation on press
see par. 5.1 - Activation on press/edge
Activation on short and long press
see par. 5.2-Activation short/ long press
Dimming
see par. 5.3 - Dimming
Shutter and Blind
see par. 5.4 - Shutter and Blind
Scene
see par. 5.5 - Scene Management
Command in sequence (short /long press)
see par. 5.6 - Command in sequence
Command in sequence (edge)
see par. 5.6 - Command in sequence

5.1. Activation on press / edge

The "Activation on edge " allows you to configure the sending of telegrams when the state of the contact switch from open to close and vice versa.
You can set to send a telegram with different values associated with different edges, or decide to send commands only one of the two fronts

"Activation on press" is the same as "Activation on edge " ; it differs because on frontal push button only the press action is detected and not the release action.

With the "Activation of the edge" selection device can also be configured to send periodic messages with repetition period.

KNX PARAMETER	SETTINGS
Telegram sending	on contact open / close on contact open / close, cyclic if opened on contact open / close, cyclic if closed on contact open / close and always cyclic

Note 1:
When periodical sending is enabled for one only of the two edges, switching in the state where "no telegram" is associated causes the periodic sending stop.

Note 2:
If you want to handle both instant sending and periodic sending on only one of two fronts without performing an action on the other, for this you must select the option "no telegram".

Note 3:
If you connect an input to a wind, rain or frost sensor with dry contact output you should probably set the parameter "mode sending telegrams" as " Immediate & cyclic on open/close" in order to have the periodic sending of telegrams . (Check telegrams value and time expected from the actuator controlled by the sensor).

Feedback object	Enabled Disable

Can be used when push button is set as “1 bit – Toggle” in order to have always the status of actuator updated.

Send Telegram on power up	Enabled Disable

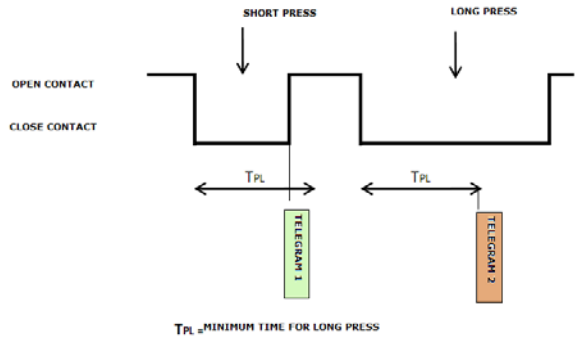
With this parameter it is enabled the sending of the status of the switch without having to wait for a change of front; a telegram is sent accordingly to the open / close state of the contact.

Note 5:
If you enable the sending of the telegram for an input where you have already set the cyclic sending ; then the cyclic sending will start automatically at power on; at the end of the first period.

Note 6:
If the command selected is “TOGGLE”, the first value sent is always 1 because the CO value on power on is 0.

5.2. Activation short/ long press

The difference duration between short and long press is defined by the generic parameter "Minimum time for long press input <x>”. You can set to send a telegrams with different values on short and long press or decide to send commands only on one of this events.



When contact is closed and the debounce time is over then counting time to contact closure starts; if the contact is opened again (note that debounce time is considered also in contact opening) before time exceeds TPL time, device executes the command associated with the event of "short press" and if, on the contrary, TPL timeout expires and contact is still closed then the command associated with the event of "long press" is executed.
The parameters and mode of transmission of telegrams can be managed through "activation on long and short press" are the same set with the configuration "Activation of press (edge)" to the exclusion of the function of cyclic sending that is not provided here.

5.3. Input: Dimming

Through the dimming function it's possible to control a light dimmer using short & long press of a push button connected to the input channel. Each channel uses 2 communication objects:

- 1 bit dimension for ON /OFF command associated to short press operation
- 4 bit dimension for brightness regulation associated to long press operation

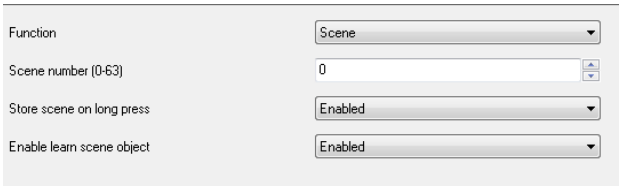
5.4. Input: Shutter and Blind

Through the Shutter and Blind function it's possible to control Roller Shutters or Blinds using short & long press of a push button connected to the input channel.

Each input uses 2 communication objects:

- 1 bit dimension for STEP /STOP command associated to short press operation
- 1 bit dimension for UP / DOWN command associated to long press operation

5.5. Input: Scene Management



In this configuration page it's possible to set the input channel for scene management: learn and recall scene commands.
These different behaviour (recall and learn) are performed through two different actions (short and long press) of a push button connected to the input channel.

Learn scene on long press action is enabled by a parameter.

KNX PARAMETER	SETTINGS
Scene Number	Number of the scene: 0 ÷ 63
This parameter sets the value of the scene you intend to learn / recall (one per channel). Remember that output devices (i.e. actuators, etc.) generally can manage several scenes, each identified by a value (that varies from 0 to 63); therefore is important to set this parameter correctly and matching the number set on the actuators.	
Store scene on long press	Disable Enable
If disable, long press action is ignored and no telegram is sent to the bus; if enable on long press action a learn scene telegram is sent to the bus.	
Enable learn scene object	Disable Enable
If this parameter is enabled you have a communication object (size = 1 bit). When this object receives a telegram "1" then the function associated to the long press of the button (send the telegram storage scenario) is enabled, when it receives a telegram "0" the command associated with the long press is not sent.	

5.6. Commands in sequence

The function allows you to associate to short and long press, sequences of different commands on the bus.
For inputs this function is available for short and long press or for edges evaluation.
The sequence consists of 2 or 3 commands which can each be sized as 1 bit or 1 byte.
Once defined the number of elements in the sequence (2 or 3) and their size (1-bit / 1 byte), you can associate different commands to each element of the sequence or decide to send commands only on one of the two events.
The waiting time between a command and the next is fixed in 1 second.
Each object communication can be connected to a different group address.

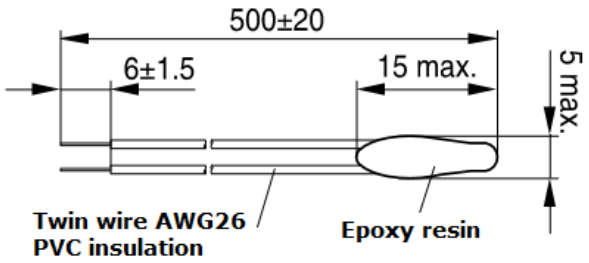
For example it is possible to define a sequence:

Com-mand	Dim.	Command on short press (edge)	Command on long press (edge)
A	1 bit	ON (to actuators)	OFF (to actuators)
B	1 byte	100% (to a dimmer)	0% (to a dimmer)
C	1 byte	COMFORT (to a thermostat)	ECONOMY (to a thermostat)

6. Temperature Probes

- NTC temperature probe eelectron code
  TS01A01ACC (from -20°C to +100°C)
  TS01B01ACC (from -50°C to +60°C)
- Max. length of Connecting Cable≤ 10 m (twisted cable)
- 6 poles terminal with screws.

TS01A01ACC

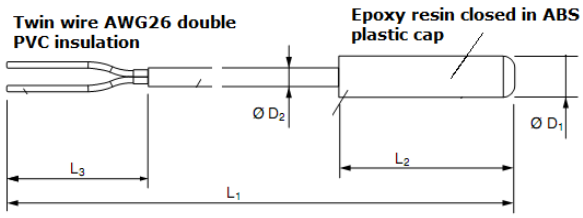


Dimensions in millimetres

NTC resistence tolerance: ± 3%
Measure range -20°C ÷ +100°C
Cable: 2 wire single insulation
Cable colour: Black
NTC colour: Black

Warning:
keep at least 6 mm from all live parts

TS01B01ACC



D1 = 9 mm D2 = 4 mm L2 = 49 mm L1 = 1250 mm

NTC resistence tolerance: ± 2%
Measure range -50°C ÷ +60°C
Cable: 2 wire double insulation
Cable colour: White
NTC colour: White

Warning:
keep at least 6 mm from all live parts

7. Temperature Sensor Function

The temperature probe allows a reading of the temperature in a range from -50 ° C to +100 ° C with resolution 0.1 ° C.

KNX PARAMETER	SETTINGS
Temperature sensor calibration	-1,5°C ÷ +1.5°C with resolution, 1°C
It's 'possible to add an offset to the temperature value measured by the probe before it is sent on the bus or made available for reading.	
Temperature cyclic sending	Disable Enable
It's 'possible to enable the periodic sending of measured temperature value, if this option is disabled, reading can be done only on read-request.	
Sending interval	1 min, 5 min, 10 min, 15 min, 45 min, 30 min, 1 h, 4 h, 12 h, 24 h
If you enable the periodic sending the sending interval is set by this parameter.	

KNX PARAMETER	SETTINGS
Enable threshold T1 (low)	Disable Enable
You can also enable two thresholds for temperature and, for each thresholds, send a telegram of attention (of size 1 bit) whenever the measured temperature exceeds or falls below the threshold. For each threshold can be set whether to send the telegram "1" when the measured temperature "T" exceeds the threshold temperature "Tx" and then send the telegram "0" when the measured temperature "T" becomes less than the threshold temperature "Tx "or vice versa	
Enable threshold T2 (high)	Disable Enable
See description of "***Enable threshold T1 (low)***".	
Value threshold T1	0°C ÷ +45°C
Value threshold T2	0°C ÷ +45°C
Telegram to send when T < T1	Telegram "0" Telegram "1"
Telegram to send when T > T2	Telegram "0" Telegram "1"
Object enable for Trigger 1 and 2	Hide Show
It's 'possible to enable/disable the remote temperature sensor with a communication object. When this object is enabled and receives a telegram "1" the temperature probe is active and sends trigger telegrams according to thresholds T1 and T2 values; otherwise only temperature value is periodically sent.	
Initial value enable object	0 1
Allows to initialize enable object as active (1) or inactive (0) after power on, reset or download.	

8. Thermostat Function

The temperature sensor can be configured as a thermostat to control the temperature of a room or area by driving heating or cooling equipment / air conditioning fan coils / valves or through commands on / off to heating /cooling elements such as radiators, heat pumps, split, etc. ..

- The thermostat operates temperature in a range from -20 °C to + 100 °C (TS01A01ACC) or from -50 °C to + 60 °C (TS01B01ACC) with 0.1 ° resolution.
- Setpoint values sent to the device on the bus are accepted in a range from 10°C to 35°C
- Setpoint accepted in SETPOINT MODE are in a range from 0°C to 35°C

9. Target Setpoint Settings

The control setpoint can be changed by bus in two different ways, via one of these objects:

- HVAC Mode
- SETPOINT Mode

The right policy to adopt depend from the device that acts as a master, a time thermostat, a control panel or a SW supervisor. Here the list of object for changing the active mode or setpoint value by bus.

SETPOINT MODE object

When "Thermostat control mode" parameter is selected with the value SETPOINT MODE, object HVAC Mode is no longer visible.

Each time the thermostat receives a value on object SETPOINT MODE (2 byte size), it is used as setpoint for temperature control.

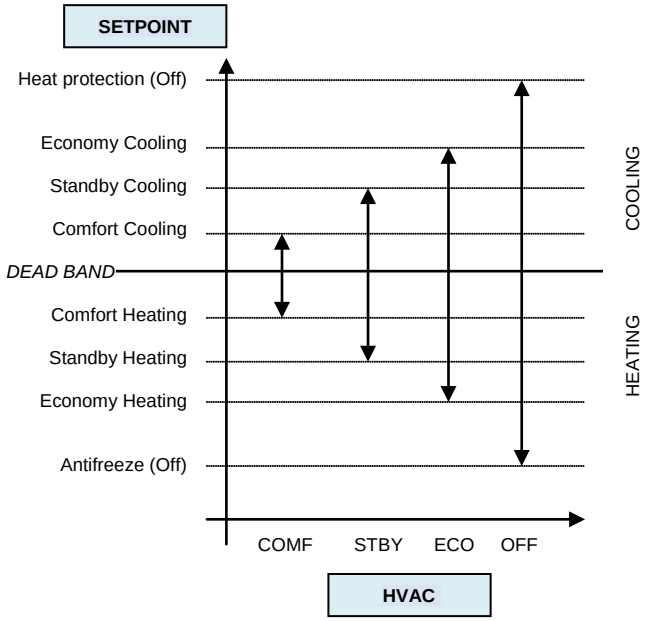
HVAC MODE object (switched heat / cool)

Using the object HVAC MODE (1 byte size), you can set the thermostat in one of the following modes: OFF; ECONOMY; STANDBY; COMFORT; each mode is associated with a setpoint set by a ETS parameter.
OFF mode is associate to setpoint antifreeze in heating mode and high temperature protection in cooling mode.

HVAC MODE object (automatic heat / cool)

Behaviour for this value of parameter "*Thermostat control mode*" is the same as above described but the switching from heating to cooling mode and vice versa is automatic. With this setting it is necessary to set an insensitive zone as in parameter "*Dead zone*".

Whenever temperature becomes greater than :
Setpoint comfort heating + (Dead Band / 2) active control is cooling; when temperature becomes less than: ***Setpoint comfort cooling - (Dead Band / 2)*** active control is heating.



SETPOINT COMFORT object
SETPOINT STANDBY object
SETPOINT ECONOMY object

These 2 byte objects are used to set the setpoint values for COMFORT, STAND-BY, ECONOMY mode.
When changed the setpoint in saved in memory.

After download these setpoint are reset to values according to ETS parameter; on power up these object are set according to last values before power down.

- Use these communication objects to change current setpoint for every HVAC Mode according to the current active control (heating or cooling)

Heating Mode Active	
Telegram received on:	**Setpoint changed:**
SETPOINT COMFORT	Setpoint comfort heating
SETPOINT STANDBY	Setpoint stanbdby heating
SETPOINT ECONOMY	Setpoint economy heating

Cooling Mode Active	
Telegram received on:	**Setpoint changed:**
SETPOINT COMFORT	Setpoint comfort cooling
SETPOINT STANDBY	Setpoint stanbdby cooling
SETPOINT ECONOMY	Setpoint economy cooling

COMFORT object

COMFORT object (1 bit size) is visible only when "Thermostat control mode" parameter is selected with the value HVAC MODE.
When a telegram "1" is received thermostat goes in COMFORT mode (it applies for both heating and cooling), on receipt of a telegram "0", thermostat returns to the mode set by HVAC MODE object.

WINDOW CONTACT object

This object, if enabled, has higher priority than HVAC MODE, SETPOINT MODE, COMFORT objects.
When a telegram is received ("0" or "1") on the communication object WINDOW CONTACT thermostat enters a power saving mode:

- OFF (if running in HVAC MODE)

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- Setpoint antifreeze / high temperature protection (if running in SETPOINT MODE)

If the telegram received indicates that the window is opened thermostat change its mode or setpoint after 1 minute from the reception of the telegram.
When it receive a telegram corresponding to state “window closed” it restores the previous mode, always with a delay of 1 minute . The value of SETPOINT ADJUSTMENT (if enabled) is always restored.

If changing of the setpoint is not relevant for the application (Setpoint objects = disabled) , it is possible to enable other 2 communication object:

SETPOINT ADJUSTMENT object

The object SETPOINT ADJUSTMENT allows you to temporarily change the setpoint value used by the thermostat applying an offset to the current value.
If the thermostat is operating in "HVAC MODE" the offset value is applied from the time of receipt of a valid telegram on object SETPOINT ADJUSTMENT until this value does not change, even in case of change of the active mode (Comfort and Standby only); this does not happen with regard to Economy mode and Building Protection: in this modes the value of object SETPOINT ADJUSTMENT is forced to 0.
Similarly, if the thermostat is operating in SETPOINT MODE the offset value is applied also when the setpoint value received on this object changes.

ADDITIONAL TEMPERATURE object

The temperature measurement is carried out by the probe connected on input 5 for thermostat 1 and on input 6 for thermostat 2; is possible to enable the reading of a second external probe which sends the measurement data to the thermostat via the communication object ADDITIONAL TEMPERATURE of size 2 bytes.

The external probe can also be the channel INPUT7 or INPUT8 appropriately configured as external probe.

KNX PARAMETER	SETTINGS
Ratio between internal and additional sensor	90 % interna – 10 % esterna 80 % interna – 20 % esterna 70 % interna – 30 % esterna 60 % interna – 40 % esterna 50 % interna – 50 % esterna 40 % interna – 60 % esterna 30 % interna – 70 % esterna 20 % interna – 80 % esterna 10 % interna – 90 % esterna Additional sensor only
This parameter set the “weight” to assign to internal and additional temperature;	

Surveillance time for additional sensor (min)	10..255
Whenever the thermostats receive a valid data from additional temperature sensor they consider this value in the calculation of the measured temperature and reset the internal time (monitoring time), if the surveillance time expires without receiving any valid data the thermostat start considering only the internal probe (at 100%) until it receives a new valid data. (see paragraph 11 “ Temperature probe failure / out of range measurement “)	

- If external probe is enabled the monitoring time is used to check if the additional temperature sensor periodically sends valid data to the thermostat. This mechanism avoids to consider as valid some data which can be old hours or days, for example if the additional sensor should fail or the thermostat could not receive data for long time.

- Set a value for surveillance time of the additional sensor more than twice of the period set for the cyclical sending of the additional sensor.

- If the external probe is weighted at 100% (Parameter Ratio between internal and external = external sensor only) then when the monitoring time expires the thermostat switch off all controlled loads until the reception of a valid telegram

- If additional temperature sensor object is not visible (due to the fact the application need to use the setpoint setting via bus, it is possible anyway to mediate the main sensor with another value but only using channel 7 or 8 configured as “temperature sensor” (see. Parameter “**Enable additional temperature (internal-without CO**”)

- If the additional sensor is considered by setting the parameter (“**Enable additional temperature (internal-without CO**”) then it is necessary to set that channel (7 or 8) as “analog”; if those channel are set as ”digital”, all the setting of this channels as digital are ignored by the device.

ACTUAL SETPOINT object

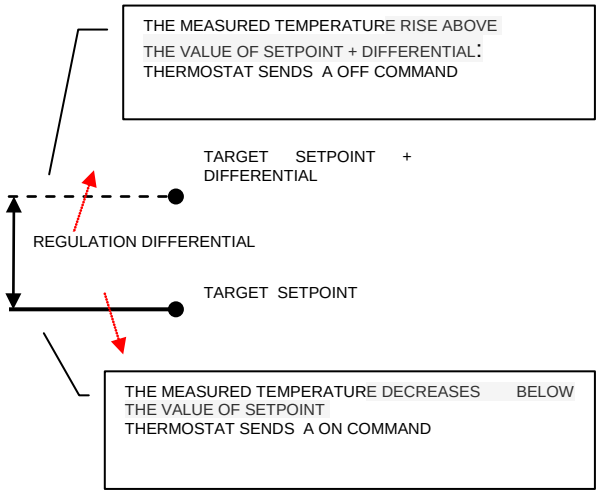
The ACTUAL SETPOINT object send the setpoint in use and is sent every time:

- The value of HVAC mode object changes
- The value BASE SETPOINT changes
- The value of SETPOINT ADJUSTMENT object changes
- After download
- One minute after power one

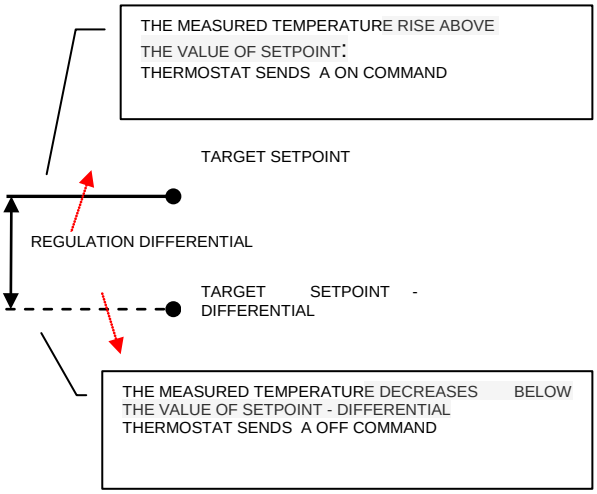
9.2. Two points on/off

Control algorithm “2 points on / off” is used to control heating or cooling elements that can be controlled by switching on and off of the same elements, radiators, underfloor heating with on-off valves, boilers, etc. ..
When the thermostat switches to "winter mode" (heat mode) sends a off command on object ON/OFF COOLING and operates the control only through the object ON/OFF HEATING (the object ON/OFF COOLING is therefore not updated anymore until it returns in "cooling mode").
Therefore in the transition from " winter" to "summer” mode sends a off command on ON/OFF HEATING commands and activates the control through the object ON/OFF COOLING.

on/off control in heating mode:



on/off control in cooling mode:

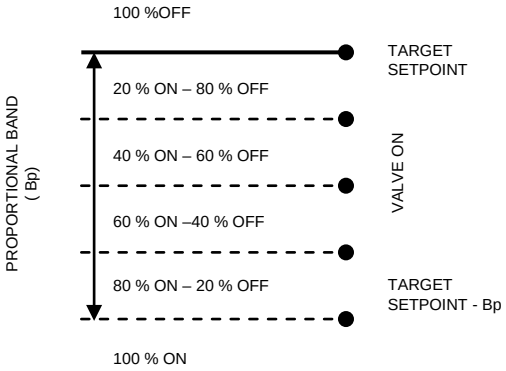


9.3. On/off with PWM control

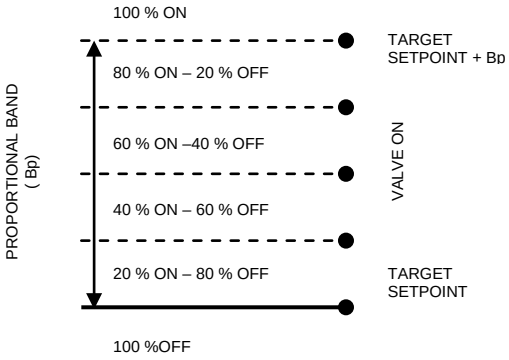
On/off with PWM control is an algorithm that reduces the effects of hysteresis around the set point value by adjusting the controls on the values ranging from 0% to 100% where 0% means “control off” and 100% means “maximum control action”.
Once a cycle time is defined the thermostat sets the actuator to ON for a fraction of the cycle time and OFF for the remaining part. Driving the actuator with the control value of 80% means that it is active (i.e., ON) for 80% of cycle time and OFF for the remaining 20%.

KNX PARAMETER	SETTINGS
Cycle time (TCp)	10, 20, 30, 60 min
It defines the time interval.	
Proportional band (Bp)	0.8, 1.2, 1.6, 2.0 °C
The proportional band BP is a range of temperatures between “Setpoint” and “Setpoint-Bp” in heating mode and between “Setpoint” and “Setpoint+Bp” in cooling mode, within this interval thermostat controls the temperature using the proportional algorithm; outside It drives actuator always in ON or OFF. When temperature is inside this range device wait the end of the cycle time before calculating the duty cycle of the next cycle. When temperature is outside of this range : below “Setpoint-Bp” in heating mode or above “Setpoint+Bp” in cooling mode it starts a new cycle as soon as temperature enters the Bp	

PWM control in heating mode:



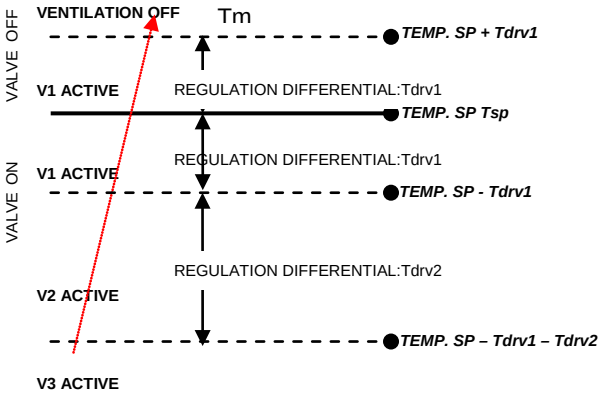
PWM control in cooling mode :



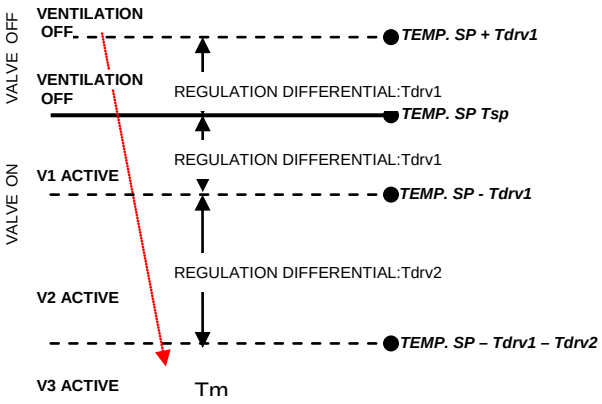
9.4. Fan coil on/off

Fan coil is a device that controls the flow of cooling / heating liquid driving a valve (2-pipe fan coil) or two valves (4-pipe fan coil).
Liquid exchanges heat/cool with the environment through a ventilation system controlled by a fan. The fan is driven by an engine that typically has 3 windings that can be enabled at 3 distinct speeds.

Control logic for a 3 speed fan coil in heating:
When temperature increasing



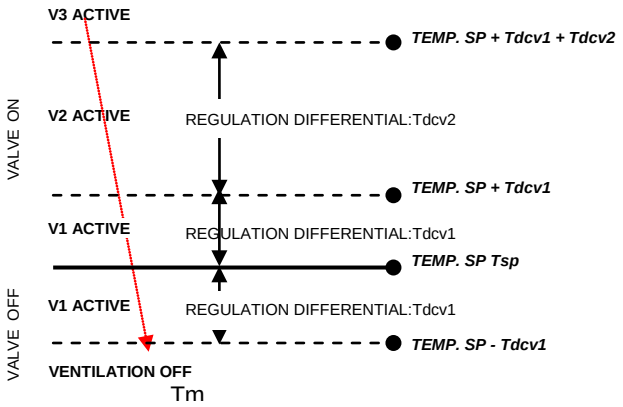
When temperature decreasing



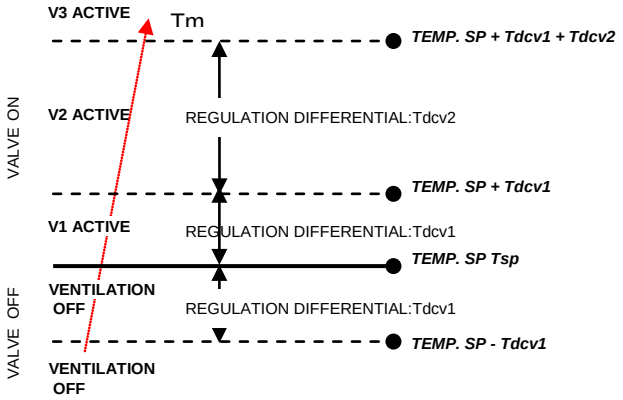
Where:

T_{sp} : Target setpoint temperature
T_{drv1} : regulation differential in heating for V1 Speed
T_{drv2} : regulation differential in heating for V2 Speed
T_m : Actual measured temperature

Control logic for a 3 speed fan coil in cooling:
When temperature decreasing



When temperature increasing



Where:

T_{sp} : Target setpoint temperature
T_{dcv1} : regulation differential in cooling for V1 Speed
T_{dcv2} : regulation differential in cooling for V2 Speed
T_m : Actual measured temperature

9.5. Fan coil control % (or generic continuous control)

Logic and parameters are the same used in On/off with PWM control mode; the difference is that now the proportional value is sent to the bus via a 1 byte object format as a % value from 0% to 100%.

This mode is useful to control fan coils (selecting 2 or 4 pipes) or generic proportional actuators as valve drivers only linking the 1 byte communication object and avoiding to link the valve objects.

CONTINUOUS CONTROL object

This 1 Byte object send % control value to actuator.

SET MAN/AUTO MODE object

SET MAN/AUTO MODE Objects is a CO for changing the calculation mode for CONTINUOUS CONTROL object; in AUTO Mode the calculation is carried out via a proportional algorithm (Δ temperature between actual temp. and Setpoint Temp) and a integral correction (Cycle Time); in MAN mode the output value control is set by the value send to the object FORCE VALUE IN MANUAL MODE object.

10. Behavior on voltage failure, recovery and commissioning.

Behavior on bus voltage failure

On failure of bus voltage no actions are executed by the device; behavior of controlled actuators must be set using their own parameters.

Behavior on bus voltage recovery

On bus voltage recovery all the communication objects are set to 0 except for objects for which a parameter is defined for the initial value.
Thermostat keeps these values in memory and restore them after recovery:

- Heat / Cool mode (if enabled)
- HVAC Mode (if enabled)
- Base Setpoint (if enabled)
- Force value in manual mode (if enabled)

Control values (i.e. commands to actuators) are calculated on the base of actual setpoint and measured temperature.

- After power on device recalculates the commands to actuators and switch them on, if necessary, otherwise does not carry out any action; you are recommended to set the behavior of actuator in order to switch the heating / cooling equipment off after bus power on.

Behaviour on commissioning (ETS Download)

After download it is possible to set initial value of:

- Heat / Cool mode (if enabled)
- HVAC Mode (if enabled)

For other communications objects the behavior is identical to bus voltage recovery.

Wrong application download

If the wrong ETS application is downloaded then KNX/EIB led starts blinking and device is not operative on the bus. A power reset must be done and the correct ETS application must be downloaded.

11. Temperature probe failure / out of range measurement

- If the temperature probe is disconnected or in short circuit the control action is interrupted and the controlled actuators are switched off.

- **The value of temperature sent on the bus in case of probe disconnection or short circuit or for out of range measured value is 0 °C (according to KNX DPT_Value_Temp 9.001)**

CONFIGURATION MODE 1	
Internal probe	Connected
Additional probe	Disabled
Ratio between probes	NA. (100% internal)

Measure of temperature is performed every 30 seconds; if the temperature probe is disconnected or in short circuit the control action is interrupted and the controlled actuators are switched off.
Probe disconnection / short circuit / out of range measurement.

For analog input 5 – T1 :

Obj #32 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

For analog input 6 – T2 :

Obj #33 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

CONFIGURATION MODE 2	
Internal probe	Connected
Additional probe	Connected or by bus
Ratio between probes	10 % to 90%

Measure of internal temperature is performed every 30 seconds; the additional temperature is read every 30 seconds if is enabled by internal reading of input 7 or 8, if it read by bus the last value received is considered.
The value of temperature sent on the bus is the pounded average between internal and additional probes value.

If the additional temperature is out of range or the surveillance time expires without any message received, thermostat start considering only the internal probe until it receives a new valid value from the additional probe.
If the internal temperature is out of range then the control action is interrupted and the controlled actuators are switched off:

For analog input 5 – T1 :
Obj #32 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

For analog input 6 – T2 :
Obj #33 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

When internal probe begin to measure a “in-range” value thermostat start again its control action and Obj #52 “Temperature sensor alarm transmits “0”

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CONFIGURATION MODE 3	
Internal probe	Not connected
Additional probe	Connected or by bus
Ratio between probes	100% external

If the additional temperature is out of range or the surveillance time expires without any message received, thermostat stops the control action and the controlled actuators are switched off.

If internal probe is anyway connected (but not used until additional probe is working good) the in event of failure of the additional probe the internal probe is used.
If internal probe is not connected or it is in fault as well then:

For analog input 5 – T1 :
Obj #32 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

For analog input 6 – T2 :
Obj #33 “Actual temperature” transmits 0 °C
Obj #52 “Temperature sensor alarm transmits “1”

When additional probe begin to measure a “in-range” or simply in range values are received again thermostat start again its control action and Obj #52 “Temperature sensor alarm transmits “0”