Thermostat and Additional probe

USER MANUAL

Translation of the original instructions

Version: **1.1**

Date: **17/03/2023**

Index

VERSION	DATE	CHANGES
1.0	**12/10/2022**	-
1.1	**17/03/2023**	Added “Modify Absolute”

Any information inside this manual can be changed without advice.

This handbook can be download freely from the website: www.eelectron.com

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. Temperature

Communication objects involved:

“<Temperature NUMX> Actual Temperature”	2 Bytes	CRT
“<Temperature NUMX> Probe Temperature”	2 Bytes	CW

The “Temperature” page allows you to configure the temperature measurement source to be used. This page is visible only if the “thermostat” or the “control panel” or “temperature sensor” is selected.

KNX PARAMETER	SETTINGS
Temperature source	internal probe external probe mix internal/external probe KNX probe mix internal/KNX probe mix external/KNX probe
Internal probe: is the embedded sensor included in the device. **External probe:** is the additional probe that can be connected to the analog inputs poles terminal present on the product. The sensor shall be selected between eelectron codes TS001A01ACC, TS01B01ACC or TS01D01ACC and in page “Input” the input shall be set as “additional probe”. **KNX probe:** with KNX probe is intended a remote sensor that send cyclically the temperature measurement via bus. **Mix:** calculate the mean temperature from the selected sources.	
Temperature object	disabled/enabled
Allows you to enable the communication object “<Temperature> Actual Temperature”.	
Sending Interval	never/1,5,10,15,30 min/1,4,12,24 h
Defines the cyclical sending time interval of the object “<Temperature> Actual Temperature”	
Sending on variation	never/ 0.1 ÷ 1.5°C
With this parameter it is possible to set the ΔT minimum to send the value through the object “<Temperature> Actual Temperature”.	
Sensor code	TS01A01ACC TS01B01ACC TS01C01ACC TS01D01ACC
This parameter defines the probe connected to the analog input.	
Weight external/internal probe	10,20,30,40,50,60,70,80,90%
It defines the weight of the external/internal probe in the calculation of the mean temperature.	
Temperature sensor calibration (internal, external or KNX).	-100°C ÷ +100°C with resolution, 0,1°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.	
Surveillance time for KNX probe	0=disabled ÷ 255 min
Whenever the thermostat receive a valid data from KNX probe it consider this value in the calculation of the measured temperature and reset the internal time (monitoring time).	

If KNX 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.

It is strongly recommended to 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.

2. Thermostat Function

The temperature function 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.

Thermostat operates temperature in a range from -9.9 ° C to + 99.9 °C with 0.1°C resolution.

KNX PARAMETER	SETTINGS
Use Thermostat to control fan coils	no/yes
By clicking on the "no" option button, the thermostat will be used to generate telegrams on the bus when the set thresholds are changed, according to the settings on the page itself and other related ones; by clicking on “yes” the thermostat will show the typical options of a fan-coil controller, leaving the programmer the freedom to connect the addresses even between the communication objects of the device.	
Fan coil type	fancoil control on/off fan coil integral proportional control
Fancoil control on/off: The fan is driven by an engine that typically has 3 windings that can be enabled at 3 distinct speeds. **Fan coil integral proportional control:** the “<Fan Coil> Continuous control %” 1 byte object send a % control value to actuator.	
Fancoil valve	bit proportional
Bit: is the on/off valve **Proportional:** value for valve is 0-100%	
Enable 2nd stage control	disabled/enabled
Allows you to enable the 2nd stage objects for additional control for heating or cooling (ON/OFF or 0-100%).	
Thermostat control mode	HVAC mode (switched heat/cool) Setpoint mode HVAC mode (automatic heat/cool)

SETPOINT MODE
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 (switched heat/cool)
Using the HVAC MODE object (1 byte size), it is possible to set the thermostat in one of the following modes: OFF; ECONOMY; STAND-BY; COMFORT; each mode is associated with a setpoint set by an ETS parameter and by its own communication object. The OFF mode is associated with the antifreeze setpoint in heating mode and the high temperature protection set point in cooling mode.

HVAC MODE (automatic)
For this value of the “Thermostat control mode” parameter, the behaviour is the same as that described above but the changeover from heating to cooling mode (and vice-versa) is automatic. With this setting it is necessary to create an intermediate zone between heating and cooling whose amplitude is defined as “Dead band”.

Value of heat/cool object after download	0=cooling 1=heating
Only in HVAC mode switched, defines the value of object “<Thermostat > Heat/Cool Mode” after the download of the application.	
Value of HVAC mode object after download	comfort standby economy off (frost/high temperature protection)
It defines the value of object “<Thermostat> HVAC Mode” after the download of the application.	
Enable 1 bit comfort object	disabled/enabled
Only in HVAC mode, allows you to enable the communication object “<Thermostat > Comfort Mode”.	
Additional function	no function 1 bit comfort enable heat or cool lock actual heat/cool

Only in HVAC automatic mode it is possible to enable additional functions:

1 BIT COMFORT
The COMFORT object (1 bit size) is only visible when the “Thermostat control mode” parameter is selected with the HVAC MODE value.
When a telegram “1” is received, the thermostat switches to COMFORT mode (valid for both heating and cooling).
Upon receipt of a “0” telegram, the thermostat returns to the mode set by parameter.
The COMFORT mode can also be set in timed mode. After a time set by a parameter, the thermostat returns to the mode set by a parameter.

ENABLE HEAT OR COOL
This object is only present in automatic mode. If enabled, it is used to enable or disable the heating or cooling mode.

LOCK ACTUAL HEAT/COOL
This object is only present in automatic mode. If enabled, it is used to block the heating or cooling mode in the current state.

1 bit comfort object

Communication object involved:

“<Thermostat > Comfort Mode”	1 Bit	CW

KNX PARAMETER	SETTINGS
Control type when comfort ends	last value HVAC received economy standby
This parameter defines the mode HVAC when it receives a telegram “0” on the object “<Thermostat> Comfort Mode” or when the the “time limited” setting (if enabled) ends.	
Comfort object priority	no/yes
It defines the priority of the object “<Thermostat> Comfort Mode” on the object “<Thermostat > HVAC Mode”.	
Comfort object timing	time unlimited/time limited
“<Thermostat > Comfort Mode” can be set also with timing: after a time set by a parameter thermostat returns in the mode set by parameter.	
Comfort overwrite time [min]	1..255
It defines the time after whch the comfort mode ends.	

Enable heat or cool object

Communication objects involved:

“<Thermostat> Enable Cooling”	1 Bit	CW
“<Thermostat> Enable Heating”	1 Bit	CW

KNX PARAMETER	SETTINGS
Enable object	cool/heat.
It is used to select which mode can be enabled/disabled.	
State after download	disabled/enabled
It establishes whether after a download the mode selected in the previous parameter is enabled or disabled.	
Enable telegram	telegram “0”/”1”
When a telegram is received (“0” or “1”) on the communication object “<Thermostat> Enable cooling” or “<Thermostat> Enable heating” the thermostat enables or disables the heating or cooling mode.	

Lock heat/cool object

Communication object involved:

“<Thermostat> Lock Heat/Cool”	1 Bit	CW

KNX PARAMETER	SETTINGS
Lock telegram	telegram “0”/”1”
When a telegram is received (“0” or “1”) on the communication object “<Thermostat> Lock Heat/Cool”, the thermostat locks the heating or cooling mode in the current state.	

Window contact object

Communication object involved:

“<Thermostat> Window Contact”	1 Bit	CW

KNX PARAMETER	SETTINGS
Window contact	disabled/enabled
This parameter enables the object “<Thermostat> Window Contact” This object, if enabled, has higher priority than HVAC MODE, SETPOINT MODE, COMFORT objects.	

Window contact activation telegram	Telegram “0”/ Telegram “1”
When a telegram is received (“0” or “1”) on the communication object “<Thermostat> Window Contact”, the thermostat enters after 1 minute in power saving mode (Building protection).	

Thermostat off object

Communication object involved:

“<Thermostat> OFF Thermostat”	1 Bit	CRWT

KNX PARAMETER	SETTINGS
Thermostat OFF object	disabled/enabled
This parameter enables the object “<Thermostat> OFF Thermostat” to stop the temperature controller.	
Thermostat OFF activation telegram	telegram “0”/“1”
When a telegram is received (“0” or “1”) on the communication object “<Thermostat> OFF Thermostat”, the thermostat stops the temperature controller.	

Actual setpoint object

Communication object involved:

“<Thermostat> Actual Setpoint”	2 Bytes	RCT

The “<Thermostat> 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 on

3. Target Setpoint Settings

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

SETPOINT Mode
HVAC 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

Communication object involved:

“<Thermostat> Base Setpoint”	2 Bytes	CW

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 “<Thermostat> Base Setpoint” (2 byte size), it is used as setpoint for temperature control.

KNX PARAMETER	SETTINGS
Setpoint frost protection	2 ÷ 10°C
This parameter defines the value of the setpoint in protection mode for heating mode.	
Setpoint high temperature protection	30 ÷ 40°C
This parameter defines the value of the setpoint in protection mode for cooling mode.	
Value of base setpoint object after download	2 ÷ 40°C
This parameter defines the value of the setpoint after a download.	

HVAC MODE object (switched heat / cool)

Communication object involved:

“<Thermostat> Heat/Cool Mode”	1 Bit	CW
“<Thermostat> HVAC Mode”	1 Byte	CWR
“<Thermostat> HVAC Mode Status”	1 Byte	RCT
“<Thermostat> SP Economy Heating”	2 Bytes	CW
“<Thermostat> SP Standby Heating”	2 Bytes	CW
“<Thermostat> SP Comfort Heating”	2 Bytes	CW
“<Thermostat> SP Economy Cooling”	2 Bytes	CW
“<Thermostat> SP Standby Cooling”	2 Bytes	CW
“<Thermostat> SP Comfort Cooling”	2 Bytes	CW

HEAT

KNX PARAMETER	SETTINGS
Setpoint frost protection	2 ÷ 10°C
This parameter defines the value of the setpoint in protection mode for heating mode.	
Setpoint economy heating (Teh)	10 ÷ 35°C
This parameter defines the value of the setpoint in economy mode for heating mode.	
Setpoint standby heating (Tsh)	10 ÷ 35°C
This parameter defines the value of the setpoint in standby mode for heating mode.	
Setpoint comfort heating (Tch)	10 ÷ 35°C
This parameter defines the value of the setpoint in comfort mode for heating mode.	

COOL

KNX PARAMETER	SETTINGS
Setpoint high temperature protection	30 ÷ 40°C
This parameter defines the value of the setpoint in protection mode for cooling mode.	
Setpoint economy cooling (Tec)	10 ÷ 35°C
This parameter defines the value of the setpoint in economy mode for cooling mode.	
Setpoint standby cooling (Tsc)	10 ÷ 35°C

This parameter defines the value of the setpoint in standby mode for cooling mode.	
Setpoint comfort cooling (Tcc)	10 ÷ 35°C
This parameter defines the value of the setpoint in comfort mode for cooling mode.	

KNX PARAMETER	SETTINGS
Action to execute for setpoint	Modify relative/modify absolute
Setting this parameter on “modify relative”, the thermostat will take into consideration the new set value but will still consider the set point set in ETS as a reference to determine the permitted variation range (± 1, ± 2, ± 3, …); instead by choosing the “modify absolute” value, this interval will also be recalculated.	

The following table further explains the meaning of the settings for “Action to be performed for the setpoint”.

Action to execute for setpoint	
Modify relative	
Objects Setpoint 2 byte for mode	**Object Setpoint 2 byte for adjustment**
Upon receipt of a new setpoint on this object, the user adjustment is recalculated, always taking into account the limits set in the thermostat. If set in transmission, these objects send their current value upon their state change.	In this object it is possible to find the current value of the user adjustment set inside the thermostat. In order to reset the user forcing, simply send 0 on that object. If set in transmission, the object will notify any relative user variation on the bus.
Modify absolute	
Objects Setpoint 2 byte for mode	**Object Setpoint 2 byte for adjustment**
Upon receipt of a new setpoint on this object, the thermostat considers it as the new base setpoint (this means that the temperature limits that can be set in the thermostat are recalculated), also resetting the user variation.	In this mode, the User Adjustment object is used to send the thermostat a new current setpoint (written in absolute mode) of the current mode, always taking into account the limits set in the thermostat via the permitted regulation parameter. In transmission, this object will not send anything on the bus.

HVAC MODE object (automatic heat / cool)

Communication object involved:

“<Thermostat> Heat/Cool Mode”	1 Bit	RCT
“<Thermostat> HVAC Mode”	1 Byte	CWR
“<Thermostat> HVAC Mode Status”	1 Byte	RCT
“<Thermostat> SP Economy	2 Bytes	CW
“<Thermostat> SP Standby”	2 Bytes	CW
“<Thermostat> SP Comfort”	2 Bytes	CW

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”.

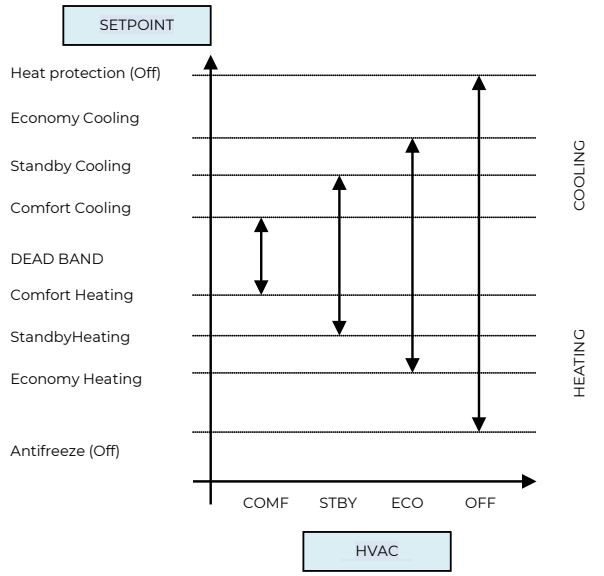
KNX PARAMETER	SETTINGS
Dead band	2 ÷ 5°C

This parameter defines the range of dead band.

KNX PARAMETER	SETTINGS
Comfort setpoint	setpoint H/C /dead band center

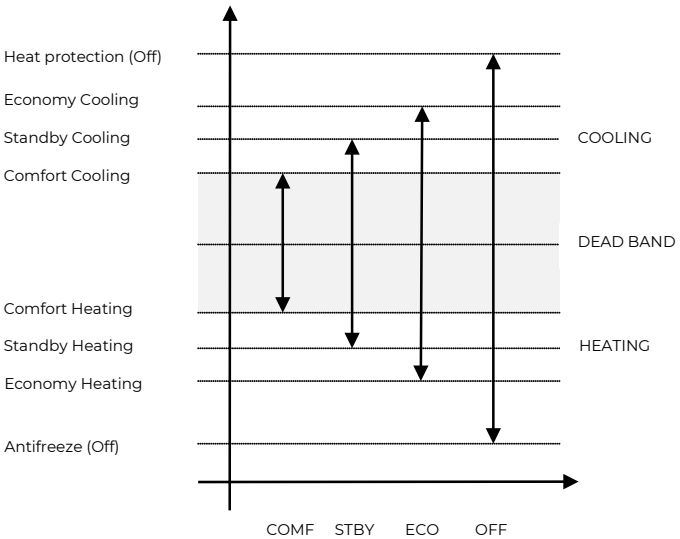
SETPOINT H/C

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.



DEAD BAND CENTER

It is possible to set the comfort setpoint as the centre of the dead band through the relative parameter; the comfort value is common to the heating and cooling modes.



4. Heating/Cooling control

KNX PARAMETER	SETTINGS
Control algorithm	2 points on/off control integral proportional control PWM integral proportional control continuous

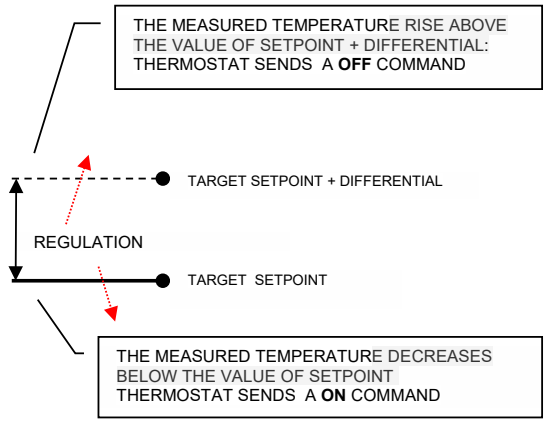
Two points on/off control

Communication objects involved:

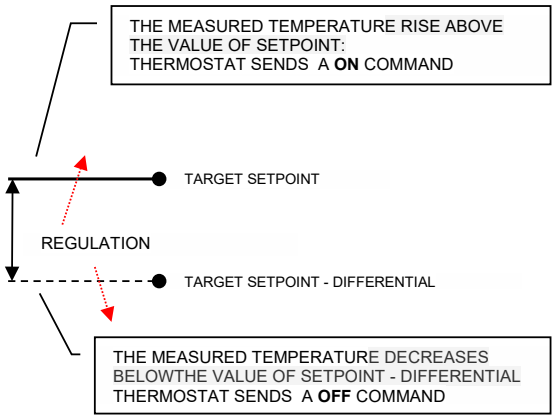
"<Thermostat> Heating"	1 Bit	RCT
"<Thermostat> Cooling"	1 Bit	RCT

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, under floor 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:



KNX PARAMETER	SETTINGS
Time period for on/off cyclic sending	no cyclic sending/5/10/30 min
It defines the time interval to send the on/off status.	
Regulation differential value-heating	0.2 ÷ 1.5°C
It defines the differential value to sum to heating setpoint for on/off control.	
Regulation differential value-cooling	0.2 ÷ 1.5°C
It defines the differential value to subtract to cooling setpoint for on/off control.	

Integral proportional control PWM

Communication object involved:

"<Thermostat> Heating"	1 Bit	RCT
"<Thermostat> Cooling"	1 Bit	RCT

Integral proportional control with PWM 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	10,20,30,60 min
It defines the time interval on which to implement the proportional control.	
Control type	proportional integral
It defines which control to use. If proportional, no integration time is considered. If integral, parameter "Heating system" or "Cooling system".	
Proportional band (Bp)	1,2,3,4,5°C
The proportional band Bp is a temperature interval between "Setpoint" and "Setpoint-Bp" in heating mode and between "Setpoint" and "Setpoint + Bp" in cooling mode. Within this interval the thermostat controls the temperature using the 'proportional algorithm; outside this band, the actuator is always commanded to ON or OFF. When the temperature is within this range, it will wait for the cycle time to finish before calculating the ON and OFF time of the next cycle. When the temperature is outside this range, i.e. below "Setpoint-Bp" in heating mode or above "Setpoint + Bp" in cooling mode, a new cycle starts as soon as the temperature returns to BP.	
Cooling system	ceiling cooling (5°C / 240 min) floor cooling (5°C / 240 min) air system (4°C / 90 min) split unit (4°C / 90 min) advanced setting
Only in integral control, this parameter suggests common values for setting "Proportional band [Bp]" and "Integration time [min] [Ti]" parameters. Use "advanced setting" to manually set values.	

Heating system	warm water (3°C / 150 min) floor heating (5°C / 240 min) electric heating (3°C / 100 min) air system (4°C / 90 min) split unit (4°C / 90 min) advanced setting
Only in integral control, this parameter suggests common values for setting “Proportional band [Bp]” and “Integration time [min] [Ti]” parameters. Use “advanced setting” to manually set values.	
Integration time (min) [Ti]	5 ÷ 250°C
Only in integral control, It defines the duration of the integration time.	

Integral proportional contr. continuous

Communication objects involved:

“<Thermostat> Heating”	1 Byte	RCT
“<Thermostat> Cooling”	1 Byte	RCT

This setting is very similar to “Integral proportional control with PWM” in terms of algorithm and parameters. This mode uses a 1 byte object (% value) to send the command on the bus. The parameter “Cycle time” is not available

5. Setpoint adjustment

Communication object involved:

“<Thermostat> Setpoint Adjustment”	2 Bytes	CW
“<Thermostat> Setpoint Adjustment”	1 Bit	CW

The object **“<Thermostat> 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 “<Thermostat> Setpoint Adjustment” until this value does not change, even in case of change of the active mode (Comfort and Standby); when device enters Economy mode this value can be reset or not according to the parameter “Reset delta setpoint on HVAC economy). Reset of the adjustment can be done also for heat/cool change according to relative parameter. Entering Building Protection mode the value of object “<Thermostat> 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.

KNX PARAMETER	SETTINGS
Reset SP adjustment on HEAT/COOL change	no reset / reset
This parameter defines whether reset or keep the value of setpoint in heat/cool change mode.	
Reset SP adjustment on HVAC economy	no reset / reset
This parameter defines whether reset or keep the value of setpoint in HVAC economy mode.	
Adjustment allowed	+/-1 ÷ +/-30°C
It defines the range of adjustment of the setpoint value.	
Setpoint adjustment value format	1 bit object - increase/decrease 2 bytes object - temperature value
1 bit object Use telegram “0”/“1” to increase/decrease value of setpoint. **2 bytes object** Adjustment is set by 2 byte temperature value.	
Increase setpoint adjustment with	Telegram “0”/ Telegram “1”
It defines the telegram to increase the setpoint adjustment.	
Resolution	0.5 °C / 1°C
It defines the value to sum or subtract through the object “<Thermostat> Setpoint Adjustment”.	
Keep SP adjustment on power up	disabled / enabled
It defines whether to keep the value after powering up the device.	

6. Fancoil valve

Communication objects involved:

“<Fan Coil> Heating/Cooling Valve”	1 Byte	RCT
“<Fan Coil> Heating/Cooling Valve”	1 Bit	RCT
“<Fan Coil> Heating Valve”	1 Byte	RCT
“<Fan Coil> Heating Valve”	1 Bit	RCT
“<Fan Coil> Cooling Valve”	1 Byte	RCT
“<Fan Coil> Cooling Valve	1 Bit	RCT

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.

7. Fan coil on/off control

Communication objects involved:

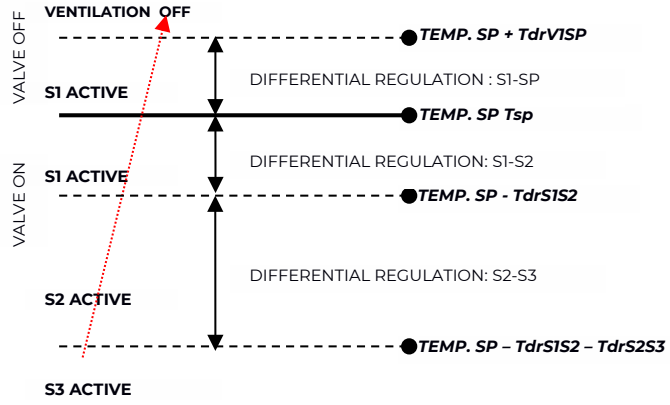
“<Fan Coil> Speed 1”	1 Bit	RCT
“<Fan Coil> Speed 2”	1 Bit	RCT
“<Fan Coil> Speed 3”	1 Bit	RCT

The fan is driven by an engine that typically has 3 windings that can be enabled at 3 distinct speeds.

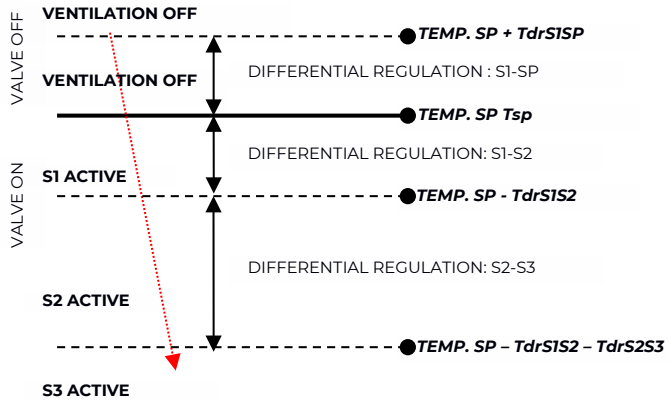
KNX PARAMETER	SETTINGS
Enable fancoil speeds on	cooling heating heating/cooling
With this parameter it’s possible to enable the fan coil speeds for the selected configuration (cooling, heating, heating/cooling).	
Regulation differential value S1-SP heat	-6 ÷ +5°C
With this parameter it’s possible to set the differential value between the **speed 1 setpoint (S1) and actual setpoint (SP)** to determine the switching **(S1/no speed)** in heating mode.	
Regulation differential value SP-S1 cool	-6 ÷ +5°C
With this parameter it’s possible to set the differential value between the **actual setpoint (SP) and speed 1 setpoint (S1)** to determine the switching **(S1/no speed)** in cooling mode.	

Regulation differential value S1-S2 heat	0 ÷ +5°C
With this parameter it's possible to set the differential value between the **speed 1 setpoint (S1) and speed 2 setpoint (S2)** to determine the switching **(S1/S2)** in heating mode.	
Regulation differential value S2-S1 cool	0 ÷ +5°C
With this parameter it's possible to set the differential value between the **speed 2 setpoint (S2) and speed 1 setpoint (S1)** to determine the switching **(S1/S2)** in cooling mode.	
Regulation differential value S2-S3 heat	0 ÷ +5°C
With this parameter it's possible to set the differential value between the **speed 2 setpoint (S2) and speed 3 setpoint (S3)** to determine the switching **(S3/S2)** in cooling mode.	
Regulation differential value S3-S2 cool	0 ÷ +5°C
With this parameter it's possible to set the differential value between the **speed 3 setpoint (S3) and speed 2 setpoint (S2)** to determine the switching **(S2/S3)** in cooling mode.	

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

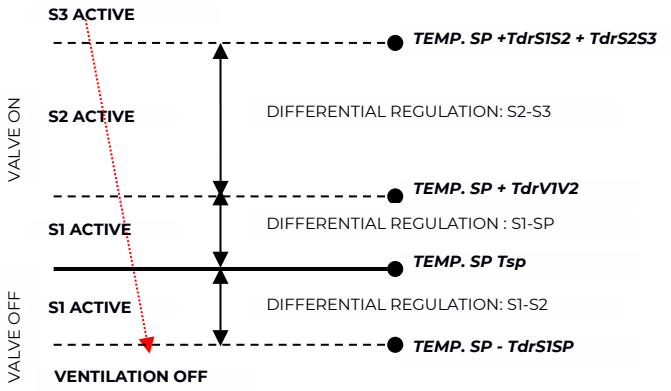


When temperature decreasing.

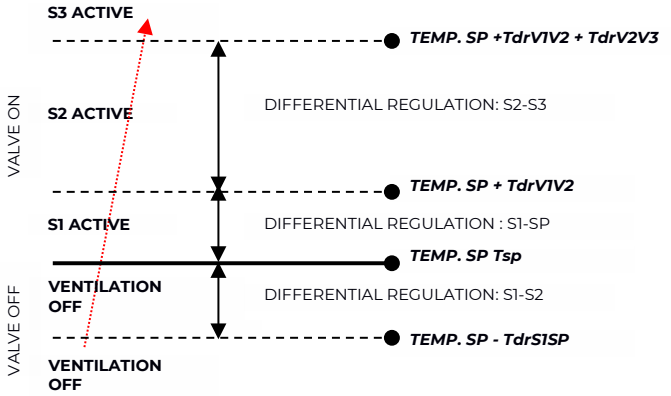


Where:
Tsp: Target setpoint temperature
TdrS1SP : regulation differential heating for S1-SP
TdrS1S2 : regulation differential heating for S1-S2
TdrS2S3 : regulation differential heating for S2-S3

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



When temperature increasing.



Where:
Tsp:Target setpoint temperature
TdrS1SP : regulation differential cooling for S1-SP
TdrS1S2 : regulation differential cooling for S1-S2
TdrS2S3 : regulation differential cooling for S2-S3

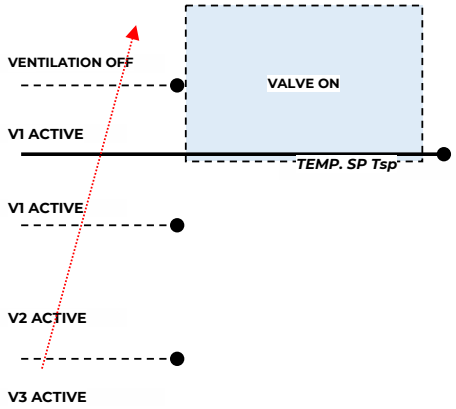
By setting the valve in **"proportional mode" (Thermostat settings),** it is possible to set the valve bandgap either for cool or heat valve.

KNX PARAMETER	SETTINGS
(Heat/Cool) Valve bandgap	-12°C ÷ +25°C
This parameter defines the shift to apply to the actual setpoint to get the valve setpoint which determines when the valve is closed (0%).	
(Heat/Cool) Valve proportional band [Bp]	0.5°C ÷ 6°C
This parameter defines the value of the proportional band. In heating control, the limits of the band are: • heat valve setpoint • difference of heat valve setpoint and proportional band In cooling control, the limits of the band are: • cool valve setpoint • sum of cool valve setpoint and proportional band If the value of temperature is included between the limits, a percentage control from 0% to 100% is set on the relative valve object.	
Initial value MAN(0)/AUTO (1) object	0/1
It defines the initial value of the communication object <Fan coil > Set Man/Auto Mode".	

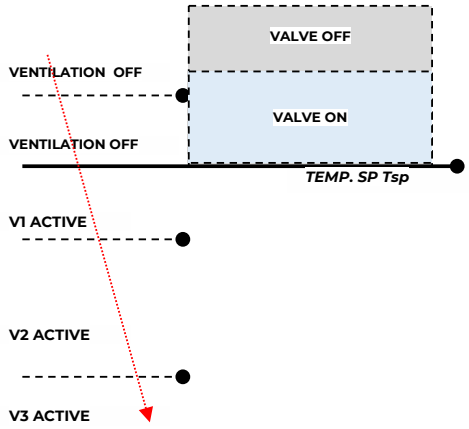
Enable ventilation object on/off	disabled/enabled
Allows you to enable the communication object "<Fan coil > Ventilation Off/On".	
Ventilation after download	off/on
It defines the value of the ventilation object after the download.	

Manage valve independently

In Fan coil on / off mode by setting the valve in "**bit mode" (Thermostat settings),** it is possible to have the opening or closing of the valve independent from switching on or off the speeds by setting the parameter **"manage valve independently".** This makes valve adjustment differentials visible and can be set different from those set for speeds. The valve can therefore be kept open even when the fans are stopped.



The shaded area represents the temperature range defined by the **"heating control differential ON"** parameter in case of increasing temperature.
When the temperature decreases, the "heating control differential ON" parameter defines the valve hysteresis.



8. Fan coil integral proportional control

Communication object involved:

"<Fan Coil> Continuous Control %"	1 Byte	RCT

Logic and parameters are the same used in **"integral proportional control continuous"** mode and it is used to manage the fan speed as 1 byte object with 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.

9. Additional valve

Communication object involved:

"<Additional Valve> Percentage"	1 Byte	RCT
"<Additional Valve> PWM"	1 Bit	RCT

In fan coil mode it is possible, in 4 pipes systems to enable an additional valve object.
This object is used when the thermostat has to manage 2 different system , one in heating and one in cooling.
Suppose to have a system when floor heating is required in heating mode and a 3 speed fan coil system is required in cooling mode.
To manage this system it is necessary to :

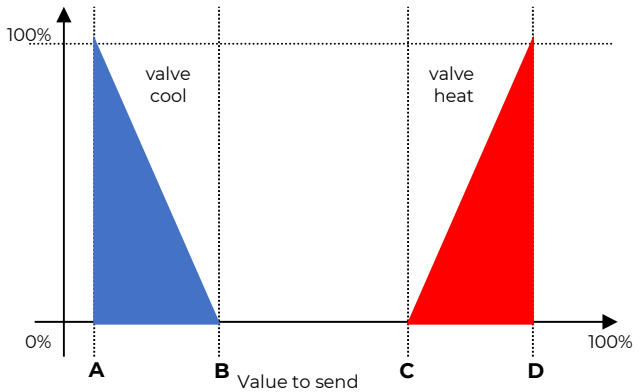
- Set parameter "Thermostat option > use thermostat to control fan coil" = yes
- Set parameter "Fan coil ON – OFF control>Enable fan speed on" or "Fan coil continuous control > Enable fan speed on" =cooling
- Set parameter "Fan coil ON – OFF control > System type" or "Fan coil continuous control > System type" = 4 pipes
- Set parameter "Enable additional valve"=enabled
- Set parameter "Additional valve>Enable valve when"=heating
- Set parameter "Additional valve>Control algorithm" = *according to your system request.*

Additional valve 6 ways

Communication object involved:

"<Additional Valve> Valve 6 Ways"	1 Byte	RCT

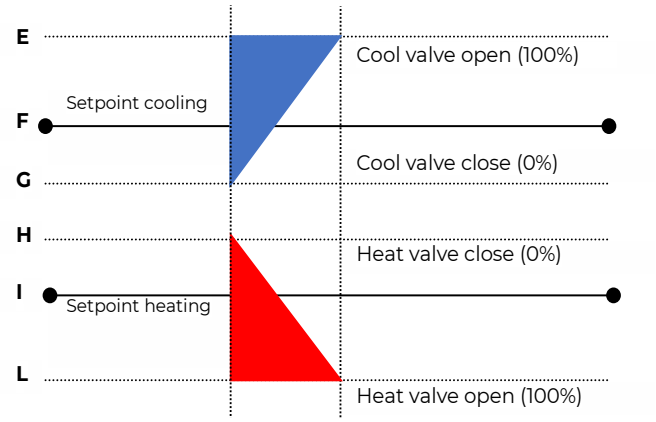
The additional valve also manages commands for 6-way valves in which the control value from 0% to 100% defines both the percentage of valve opening and the passage of hot or cold fluid.



KNX PARAMETER	SETTINGS
Percentage 100% cool	0% ÷ 30%
Value to be sent to bring the cold valve to 100% open position [point A on the diagram]	

Percentage 0% cool	23% ÷ 53%
Value to be sent to bring the cold valve in closed position (0% open) [point B of the diagram]	
Percentage 0% heat	47% ÷ 77%
Value to be sent to set the hot valve to the closed position (0% open) [point C of the diagram]	
Percentage 100% heat	70% ÷ 100%
Value to be sent to bring the hot valve to 100% open position [point D on the diagram]	
Value to send for valve fully closed	36% ÷ 66%
Value to be sent to bring both the cold and hot valves to the fully closed position. [area of the diagram between B and C]	

For the additional valve, in 6-way mode, it is possible to define different control differentials around the setpoint value as shown below:



This makes it possible to adjust the opening and closing of the additional valve independently of the speed control (for example, once the setpoint has been exceeded, a maintenance action can be taken keeping the valve open again without activating the speeds).

KNX PARAMETER	SETTINGS
Regulation differential valve 0%	0°C ÷ 5 °C
Defines the width of the **F-G** bands for cooling and **H-I** for heating	
Regulation differential valve 100%	0°C ÷ 5 °C
Defines the width of the **E-F** bands for cooling and **I-L** for heating	

Force fan coil speed

Communication objects involved:

"<Fan Coil> Set Man/Auto Mode"	1 Bit	CW
"<Fan Coil> Force Speed Control in Man Mode"	1 Byte	CW
"<Fan Coil > Force Value in Man Mode Speed 1"	1 Bit	CW
"<Fan Coil> Force Value in Man Mode Speed 2"	1 Bit	CW
"<Fan Coil> Force Value in Man Mode Speed 3"	1 Bit	CW

In fan coil operation (in 1-bit or 1-byte mode), you can force the use of just one speed and bypass the automatic speed selection. This mode is useful, for example, in small rooms such as hotel rooms, or in any case where the fan speed may bring noise. To activate forcing, you must act on the 1-bit object that selects AUTO / MAN and then on the object that activates the desired speed (3x1 1-bit object or 1 object at 1-byte in% mode)

Ventilation mode

Communication object involved:

"<Fan Coil> Ventilation Off/On"	1 Bit	CW

When using fan coil, you can also activate "fan" or "ventilation" mode. In this mode, the fan coil will never turn off the fan even when, after reaching the desired setpoint, the heat / cool valve closes. To select the fan speed used in ventilation mode the "force fan speed object" must be set, in fact in AUTO mode the ventilation stops when setpoint is reached. It is also possible to make the "ventilation" mode always active without having to turn it on / off via a communication object.

2nd Stage Object

Communication objects involved:

"<Thermostat> 0-100% 2nd Stage Heating"	1 Byte	RCT
"<Thermostat> Off/On 2nd Stage Heating"	1 Bit	RCT
"<Thermostat> 0-100% 2nd Stage Cooling"	1 Byte	RCT
"<Thermostat> Off/On 2nd Stage Cooling"	1 Bit	RCT

The 2nd Stage object is an additional control object for the regulation of a second heating or cooling equipment; a 1-bit or 1-byte control can be set for this object.

KNX PARAMETER	SETTINGS
2nd stage heating (or cooling)	disabled/enabled
This parameter enables the function 2nd stage for heating or cooling control. Heating and cooling controls are independent.	
2nd stage heating (or cooling) telegram	1 bit / 1 byte
1 bit: to set on/off objects "<Thermostat> Off/On 2nd Stage Heating" or "Thermostat> Off/On 2nd Stage Cooling". **1 byte:** to set 0-100% objects "<Thermostat> 0-100% 2nd Stage Heating" or "<Thermostat> 0-100% 2nd Stage Cooling".	
Activation telegram 2nd stage heating (or cooling)	telegram "0"/"1"
It defines the telegram to activate the 2nd stage heating (or cooling).	
Bandgap	-12..+25°C
It defines how much the actual setpoint is shifted to manage the switching on and off of the equipment controlled by the 2nd stage object. For example, if the setpoint is 20 ° C and "Bandwidth" is set = 1 ° C then the setpoint for the part controlled by the 2nd stage object will be 20-1 = 19 ° C; vice versa if "Bandwidth" is = -1 then the 2nd stage setpoint will be 20 - (- 1) = 20 + 1 = 21 ° C.	
Control type	proportional / integral
Only for 1 byte control It defines which control to use. If proportional, no integration time is considered. If integral, parameter "Heating system" or "Cooling system".	
Proportional band [BP]	0.5..6°C

The proportional band Bp is a temperature interval between “2nd stage setpoint” and “2nd stage setpoint - Bp” in heating mode and between “2nd stage setpoint” and “2nd stage setpoint + Bp” in cooling mode. Within this interval the thermostat controls the temperature using the ‘proportional algorithm; outside this band, the actuator is always commanded to ON or OFF. When the temperature is within this range, it will wait for the cycle time to finish before calculating the ON and OFF time of the next cycle. When the temperature is outside this range, i.e. below “2nd stage setpoint - Bp” in heating mode or above “2nd stage setpoint + Bp” in cooling mode, a new cycle starts as soon as the temperature returns to BP.

Time period for on/off cyclic sending	no cyclic sending/5/10/30 min
It defines the time interval to send the on/off status.	

If the equipment controlled by 2nd Stage is a 1,2 or 3-speed fan coil it is suggested to set the 2nd stage as 1 Byte and to send the control value % in the logic called “proportional speed/fancoil conversion” to have 1 bit output objects for the 3 speeds.

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 0x7FFF °C (according to KNX DPT_Value_Temp 9.001).

<General> ALARM object

In event of temperature probe failure / out of range measurement a telegram from 1 bit communication object - “<Temperature> Alarm” - is sent on the bus with value 1. As soon the temperature sensor works good again a value “0” is transmitted.
To correctly manage the use of internal / external / KNX probe refers to the following possible configuration modes:

CONFIGURATION MODE 1
Internal probe
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: “<Thermostat> Actual temperature” is not sent “<Thermostat> Alarm” transmits “1”

CONFIGURATION MODE 2
External probe only
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: “<Thermostat> Actual temperature” is not sent “<Thermostat> Alarm” transmits “1”

CONFIGURATION MODE 3
KNX probe only
The KNX probe is read by considering last value received on “<Thermostat> KNX probe temperature”. If the KNX probe value 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 KNX probe; in this case the additional value is taken in count again. “<Thermostat> Alarm” transmits “1” until the KNX probe is received again

CONFIGURATION MODE 4
Mix of internal and external probe
The value of temperature sent on the bus is the pounded average between frontal and rear probe values. If one of the 2 probes is not working (probe disconnection / short circuit / out of range measurement) thermostat start considering only the other probe. “<Thermostat> Alarm” transmits “1”

CONFIGURATION MODE 5
Mix of internal and KNX probe
Mix of external and KNX probe
The KNX probe is read by considering last value received on “<Thermostat> KNX probe temperature”. The value of temperature sent on the bus is the pounded average between frontal and KNX probe values. If the KNX probe value is out of range or the surveillance time expires without any message received, thermostat start considering only the other probe until it receives a new valid value from the KNX probe; in this case the additional value is taken in count again.

10.Temperature Sensor

Communication objects involved:

“<T.Sensor> Enable Input”	1 Bit	CW
“<T.Sensor> Setpoint Upper”	2 Bytes	CW
“<T.Sensor> Telegram Upper”	1 Bit	RCT
“<T.Sensor> Setpoint Lower”	2 Bytes	CW
“<T.Sensor> Telegram Lower”	1 Bit	RCT

The “temperature sensor” function is enabled by selecting the option for the parameter “Temperature function” in the general parameter of the device.

KNX PARAMETER	SETTINGS
Activation telegram	Telegram 0 Telegram 1
It defines which telegram value enables the sending of threshold on/off telegrams through object “<T. Sensor> Enable Input”.	
State after download	Disabled Enabled
It defines whether the sending of threshold on/off telegrams is enabled or disabled after the download.	

Probe adjustment	-4°C, -3°C, -2°C, -1°C, 0°C, +1°C, +2°C, +3°C
It is used to set a temperature offset to correct an impractical reading due, for example, to the location of the probe in a warmer or colder place than the environment to be monitored.	
Hysteresis	0.5°C 1.0°C 2.0°C 5.0°C
It defines the hysteresis value to be applied on the high and low thresholds.	
Upper setpoint value	-20°C ÷ +100°C TS01A01ACC -50°C ÷ +60°C TS01B01ACC -55°C ÷ +200°C TS01D01ACC
It defines the value for upper setpoint.	
Lower setpoint value	-20°C ÷ +100°C TS01A01ACC -50°C ÷ +60°C TS01B01ACC -5°C ÷ +45°C TS01D01ACC
It defines the value for lower setpoint.	

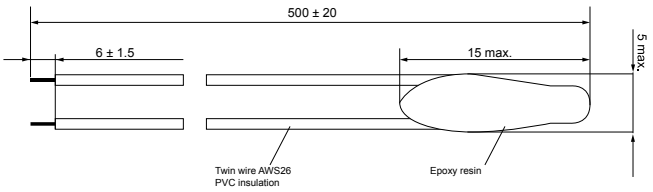
For the “Upper setpoint value” and “Lower setpoint value” settings; the following settings are the same.

KNX PARAMETER	SETTINGS
Telegram when value is above setpoint	nothing/off/on
It defines the value to send when temperature value is above setpoint value.	
Telegram when value is below setpoint	nothing/off/on
It defines the value to send when temperature value is below setpoint value.	
Telegram when probe is disabled	
It is used to send a telegram on the bus if the associated NTC probe is disabled, for example in order to deactivate a solenoid valve or a heater controlled by an output object of the local or remote device, until the new activation. **Nothing** No telegram is transmitted. **Off** It sends an off telegram to the target device, which can be used to turn off probe-related functions. **On** It sends an on telegram to the target device, which can be used to activate probe-related functions.	
Cyclic sending time of telegrams	No of cyclic sending / 30 min / 1 hour / 2 hours
It defines the cyclical sending time interval of the telegram.	

11. Additional probe

When the dispositive has inputs, when configured as analog for temperature probe, the eelectron code NTC probes must be used:
TS01A01ACC (from -20°C to +100°C)
TS01B01ACC (from -50°C to +60°C).
TS01D01ACC (from -5°C to +45°C).
Maximum length of connection cables: ≤ 20 m (braided cable).

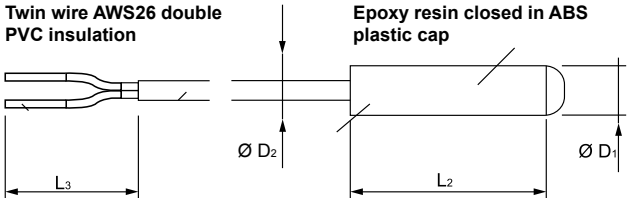
TS01A01ACC



Dimensions in millimetres	
NTC resistance tolerance:	± 3%
Measurement range	-20°C ÷ +100°C
Cable:	2 wire single insulation
Cable colour:	Black
Probe colour:	Black

ATTENTION:
Always keep a distance of at least 6 mm from live parts

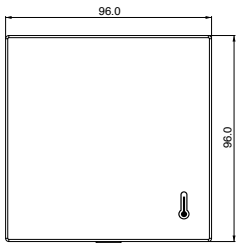
TS01B01ACC



D1 = 9 mm D2 = 4 mm	L2 = 49 mm L1 = 1250 mm
NTC resistance tolerance:	± 2%
Measurement range	-50°C ÷ +60°C
Cable:	2 wire double insulation
Cable colour:	White
Probe colour:	White

ATTENTION:
Always keep a distance of at least 3 mm from live parts

TS01D01ACC



(W x H x D):	96 x 96 x 36 mm
NTC resistance tolerance:	± 2%
Measurement range	-5°C ÷ +45°C
Cable:	2 wire double insulation
Cable colour:	White
Probe colour:	White/ Black

Additional probe – description

When one of the analog inputs is set in “General parameters”, the “additional probe” module is activated, through which it is possible (by connecting the NTC probe) to measure the temperature and to send simple ON/OFF commands when certain thermal events occur. The objects available are the following:

“<Additional Probe x> Temperature”	**1 bit**	**CRT**

Send temperature measurement in °C on variation and/or cyclically.		
"<Additional Probe x> Upper Threshold"	**1 bit**	**CRT**
Sends On, Off or nothing when the upper threshold set is exceeded in ascent or descent.		
"<Additional Probe x> Lower Threshold"	**1 bit**	**CRT**
Sends On, Off or nothing when the lower threshold set is exceeded in ascent or descent.		
"<Additional Probe x> Enable Thresholds"	**1 bit**	**CW**
Enables or disables the sending of on/off telegrams.		

Additional probe is activated regardless of the selection made in the analog input menu.

Additional probe – parameters

The "Additional Probe" module is similar to the "Temperature Sensor" module to which it adds the following parameters:

KNX PARAMETER	SETTINGS
Sending on variation	Never 0.5°C 1°C 1.5°C
It defines whether the device will send telegrams on the bus when the deviation occurs, i.e. the indicated temperature variation. **Never** No sending of telegrams. **0.5°C ÷1.5°C** Deviation value from the current temperature that will determine the sending of telegrams: for example 0.5°C means that if the temperature currently detected is 20°C, the telegram will be sent at 19.5 or 20.5°C.	

12.Thermostat behaviour on power failure, reset and download

Behaviour on voltage drop

In case of bus voltage failure, no action is performed by the device; the behaviour of the controlled actuators must be set using the parameters of the actuators themselves.

Behaviour on voltage recovery

When the bus voltage is restored, all communication objects are set to "0" except those for which a parameter is defined for the initial value; the thermostat keeps these values in memory and retrieves them when the voltage is restored:

- Heat / Cool mode
- HVAC Mode
- Base Setpoint
- Setpoint Adjustment
- Force value in manual mode
- Ventilation

Control values (i.e. commands for actuators) are calculated using the actual setpoint and temperature.

After switching on, the device recalculates the commands to the actuators and turns them on, if necessary, otherwise it does not perform any action; it is advisable to set the actuator behaviour to shut down the heating/cooling equipment after bus reset.

Behaviour upon ETS download

After the download it is possible to set the initial value of:

- Heat / Cool mode
- HVAC Mode
- Ventilation

For other communication objects, the behaviour is identical to bus voltage recovery.

Incorrect application download

If an incorrect ETS application is downloaded, the KNX/EIB LED starts flashing and the device does not become operational on the bus. It is necessary to reset the device by removing and applying the power again, then to download the correct ETS application.