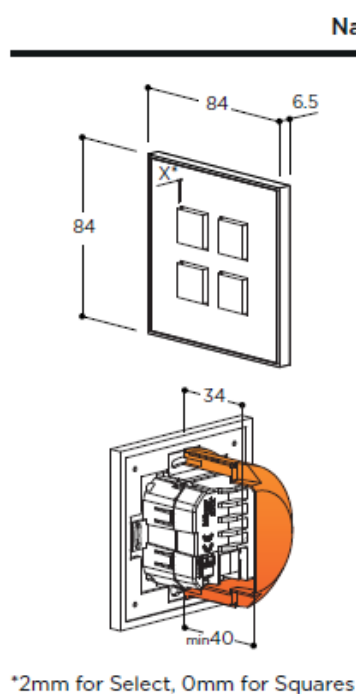


Lithoss “Sx NXT” PARAMETER HANDBOOK

Product range:

Name	Select KNX
Ref	<div> <div>Ni</div> <div>S1</div> <div></div> <div></div> <div></div> <div>01</div> </div>
	<div>PRODUCT</div> <div>MODULE (MAX 4 MODULES)</div> <div>COLOR</div>
EXAMPLE CODE NIS101: Select 1T KNX Stainless Steel	
<div> <div>Product</div> <div>Code</div> </div>	
Select Ni	
Square Sq	
Circum Select** CN	
Circum Square** CS	
<div> <div>Module</div> <div>Code</div> </div>	
KNX 1T S1	
KNX 2T S2	
KNX 4T S3	
<div> <div>Color</div> <div>Code</div> </div>	
Stainless Steel 01	
Matt White RAL9010 02	
Gunpowder Black 03	
Brushed Brass 06	
Chrome 08	
Nickel 09	
Textured White RAL9010 13	
Textured Black 14	
Bronze Antique 17	
Matt Black 18	
Tin Antique 19	
Brass Antique 20	
Copper 29	
<div> <div>Temperature probes (optional)</div> <div>ACC003 Type A (-20°/+100°C)</div> <div>ACC004 Type B (-50°/+60°)</div> </div>	
<div> <div>Specifications</div> <div>Max. power consumption 4mA</div> <div>Regulatory compliance EMC directive. Standards EN50428, EN50491</div> </div>	



*2mm for Select, 0mm for Squares

**Dimensions voor Lithoss Circum

Download latest versions on our website:

- KNX parameter handbook: http://www.lithoss.be/images/uploads/pdf/Lithoss_Sx_PARAMETER_HANDBOOK_2022.pdf
- ETS file 1 button: http://www.lithoss.be/images/uploads/pdf/Lithoss_S1_2022.zip
- ETS file 2 buttons: http://www.lithoss.be/images/uploads/pdf/Lithoss_S2_2022.zip
- ETS file 4 buttons: http://www.lithoss.be/images/uploads/pdf/Lithoss_S4_2022.zip

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1. General Introduction

This manual is intended to be used by installers and describes functions and parameters of the Lithoss S4 NXT switch and how is possible to change settings and configurations using ETS software tool.

2. Product overview

Lithoss S4 NXT switch is designed to be installed in Home and Building installations (i.e. offices, hotels, private houses, etc...).

The KNX® S4 NXT switch range consists of 1 - 2 - 4 channels buttons. Each button can be configured to manage on/off commands, dimming, shutters and venetians control, scene recall and control, objects sequences etc;

Device includes a 2 stage Room Temperature Controller with integrated PI to control heating and cooling equipments, valves, 2 and 4 pipes fan coils; etc..

Device has an embedded temperature sensor and a rear 2 poles connector configurable as digital or analog input; It's possible to connect an additional NTC temperature probe (Lithoss codes ACC003 or ACC004 - not included) to perform a direct temperature measurement.

S4 NXT range has 4 RGB leds on the front side in order to visualize feedbacks or other values available over the KNX bus.

Range:

The S4 NXT KNX® range is mounted in 2 module box and is compliant with main standards (British, German, Italian, etc).

Device is equipped with KNX communication interface.

Probe:

For NTC temperature probe the following Lithoss code accessories must be used:

ACC003 (from -20°C to +100°C)

ACC004 (from -50°C to +60°C)

Buttons 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 – in short and long press mode or in toggle mode
- Dimmer management (with single or double push-button)
- Blind / Roller Shutter management (with single or double push-button)

- Command sequences with 1 bit to manage row of lights in on/off
- RGB color setting with fixed (short press) or changing color (long press); 1 byte or 3 bytes datapoint available
- MUR/DND (Make Up Room / Do Not Disturb) function with embedded logic
- Loop among values function in order to send step by step a sequence of 1 byte values

Rear input:

For digital inputs Max. length of Connecting Cable: **≤ 10 m** (twisted cable)

For analog input: Max. length of Connecting Cable: **≤ 20 m** (twisted cable)

Room temperature controller main functions:

Configured as Temperature sensor - main functions:

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

Configured 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
- 2nd stage additional command object
- Window contact function
- Additional external temperature sensors (optional)

RGB main functions:

- Temporary function for button press with fixed color
- Classic RGB: color can be changed by bus and switched on / off
- KNX feedback: Up to 5 1 bit obj feedback can be received and associated to different colors, last received is shown
- Physical dimension: different values (from 1 byte to 4 bytes) can be received from the bus and the RGB color can be set to change color on the base of the received value
- Demo color loop: sequence of color changing, warm colors, cold colors, all colors.
- Step light mode: 1 bit object can trigger the RGB led to switch ON in a fixed color with max priority.

3. Installation instructions

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



WARNING

- Device must be installed keeping a minimum distance of 4 mm between electrical power line (mains) and input cables or red / black bus cable .
- 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 authorized 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.
- KNX bus allows you to remotely send commands to the system actuators. Always make sure that the execution of remote commands do not lead to hazardous situations, and that the user always has a warning about which commands can be activated remotely.

2 Connect KNX cable to the device and fix it to the metal frame using the included screws.



DISPOSAL: The crossed-out bin symbol on the equipment or packaging means the product must not be included with other general waste at the end of its working life. The user must take the warn product to a sorted waste center, or return it to the retailer when purchasing a new one. An efficient sorted waste collection for the environmentally friendly disposal of the used device, or its subsequent recycling, helps avoid the potential negative effects on the environment and people's health, and encourages the re-use and/or recycling of the construction materials.

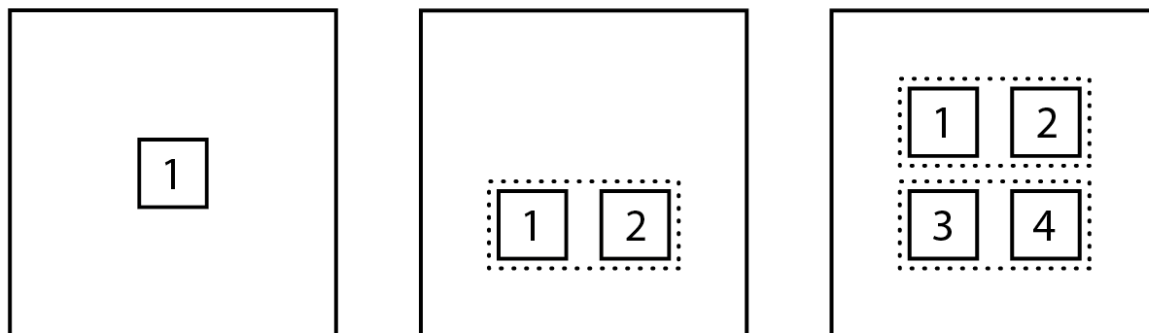
3 Apply the glass cover by attaching the top and then pushing the bottom, you must hear the click! to indicate the correct engagement

Wall mounting sequence

1 Fix the metal frame on the wall box using the included screws.

4 To release the glass cover, push the pivoting pin on the bottom of the plastic cover, then release the lower part first and then the top.

Button definition:



Channels configuration of buttons [1] & [2] can be single or combined (=coupled); same for buttons [3] & [4].

In parameter file:

[1] Button Upper Left, [2] Button Upper Right, [3] Button Lower Left, [4] Button Lower Right

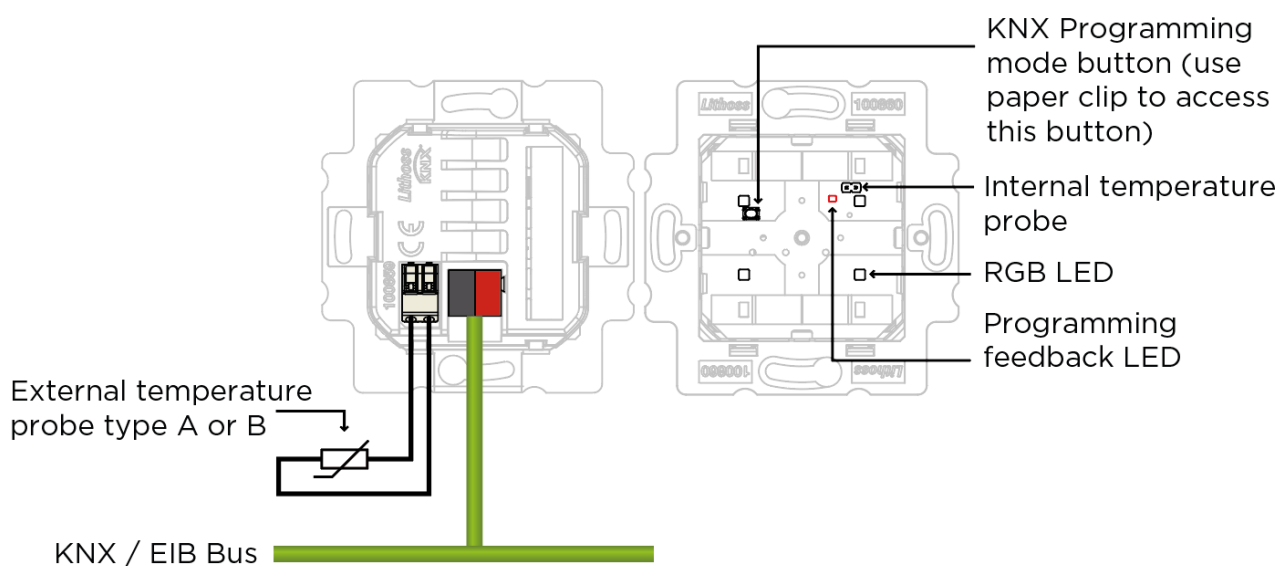
Temperature Probes:

-1 internal probe is pre-installed on board.

-Optionally 1 external probe can be installed with specs:

- NTC temperature probe
- Type A (from -20°C to +100°C)
- Type B (from -50°C to +60°C)
- Max. length of Connecting Cable: ≤ 10 m (twisted cable)
- Via Poke-in connector

Wiring diagram:



4. General Parameters

General settings

KNX PARAMETER	SETTINGS
Delay to send telegrams on power up [s]	5 ÷ 15 seconds
<p>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.</p> <p>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.</p> <p>The input detection and the values of objects are updated at the end of the transmission delay time</p> <p>At the end of ETS programming the device behaves like after a power on.</p>	
Temperature function	temp. func. disabled temperature sensor thermostat
<p><u>temp. func. disabled</u> no temperature function is active; device is only a switch</p> <p><u>temperature sensor</u> device can be used to measure the temperature with its internal or additional probe, mix it with values from the KNX bus, switch on and off other equipments using 1 bit obj (see: Temperature Sensor Function).</p> <p><u>thermostat</u> by selecting this option a full thermostat is enable (see: Thermostat Function).</p>	
Temperature alarm obj	disabled / enabled
<p>Setting this parameter a 1-bit communication object is shown, it is used to report a malfunction related to the temperature sensor.</p>	

5. Button <x> configuration

For each of the buttons on the device, the selections are made through a configuration page.

Every single button can be configured to perform one of the following functions:

- Activation on press
- Activation on press / release
- Activation on short and long press
- Dimming
- Shutter and blinds
- Scene
- Command sequences (short and long press)
- Command sequences (toggle function)
- Command sequences 1 bit
- Set RGB color
- MUR/DND function
- Loop among values

KNX PARAMETER	SETTINGS
Function	Activation on press Activation on press / release Activation short and long press Dimming Shutter and blinds Scene Command sequences (short and long press) Command sequences (toggle function) Command sequences 1 bit Set RGB color MUR/DND function Loop among values
See following paragraph: <u>Activation on press</u> <u>Activation on press / release</u> <u>Activation on short and long press</u> <u>Dimming</u> <u>Shutter and Blinds</u> <u>Scene</u> <u>Commands sequences</u> <u>Set RGB color</u> <u>MUR / DND</u> <u>Loop among values</u>	

Activation on press

“Activation on press” allows you to configure the sending of telegrams when the button is pressed; device can also be configured to send periodic messages with repetition period.

KNX PARAMETER	SETTINGS
Telegram Associated	1 bit / 1 byte
It is possible to send 1 bit or 1 byte objects	

Configurations for 1 bit object:

On
Off
Toggle

Configurations for 1 byte object:

Value 0-255 (generic signed int)
Value 0-100% (scaling value in steps of 5%)
HVAC Mode (DPT_HVACMode 20.102)

KNX PARAMETER	SETTINGS
Cyclic sending when button pressed	Never 0.3 sec. 0.4 sec. 0.5 sec. 0.8 sec. 1.0 sec. 1.2 sec. 1.5 sec. 2.0 sec. 3.0 sec. 5.0 sec. 8.0 sec. 10 sec.
As long as the button is pressed, the telegram with selected size and value is sent cyclically; this parameters defines the time interval between two sendings	

Activation on press / release

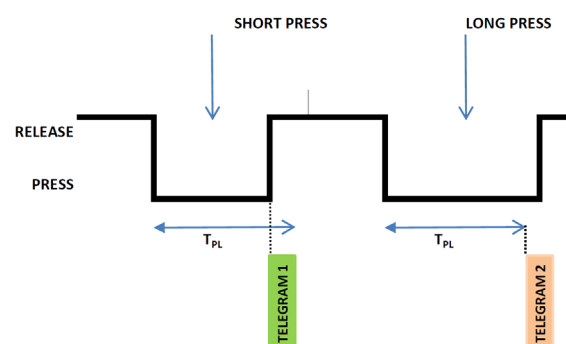
“Activation on press / release ” allows you to configure the sending of telegrams when the button is pressed and when it is released. Parameters are identical to the choice “activation on press”; one parameter is added:

KNX PARAMETER	SETTINGS
Communication object on release	disabled / enabled
if enabled, this parameter displays an additional communication object (<Button x> Release Action) that is transmitted on the release event, this object can be associated with a group address other than the one that sends the value associated with the pressure.	

Activation on short and long press

The different duration between short and long press is defined by the parameter "Minimum time long press button".

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 button is pressed then counting time starts; if the button is released 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 button is still pressed 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 / release " except for the function of cyclic sending that is not provided here.

Dimming

Through the dimming function it's possible to control a light dimmer using short and long press of the buttons.

Each button 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

Parameter "Minimum time long press button" can set the minimum duration of long press; "Dimming mode" and "Dimming step" can define brighter or darker behaviour and step of each long press action.

Shutter and Blinds

Through the Shutter and Blind function it's possible to control Roller Shutters or Blinds using short and long press of the buttons.

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

Parameter "Minimum time long press button" can set the minimum duration of long press; "Command drive shutter" can define up or down behaviour associated to long press action.

Scene

In this configuration page it's possible to set the button 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 the button.

Learn scene on long press action is enabled by a parameter; "Minimum time long press button" can set the minimum duration of long press.

KNX PARAMETER	SETTINGS
Scene Number	Number of the scene: 1 ÷ 64
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	disabled / enabled
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.	

Object enable scene learning from bus	disabled / enabled
If this parameter is enabled you have a communication object (size = 1 bit) in order to enable / disable runtime from bus the sending of the "learn scene telegram". 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.	

Commands sequences

This function allows you to associate to short and long press, sequences of different commands on the bus.

For each button this function is available for short and long press or as toggle function.

The sequence consists of 3 commands which can each be sized as 1 bit or 1 byte.

Once defined the number of elements in the sequence 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 defined by parameter "delay between comands" (0 – 255 s)

Each object communication can be connected to a different group address.

For example it is possible to define a sequence:

OBJ	DIMENSION	SHORT PRESS (OPERATION 1)	LONG PRESS (OPERATION 2)
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)

Commands in sequence (1 bit)

This function is used to send 1-bit command sequences on multiple objects. The sequence can be defined on 2 or 3 objects. Each time the button is pressed, the next step of the defined sequence is sent.

KNX PARAMETER	SETTINGS
Number of objects	2, 3
This parameter sets and defines the number of 1-bit objects that will be visible and that will send the values 0 or 1 on the bus	
Number of steps in the sequence	2 ÷ 4 if the number of objects is 2 2 ÷ 8 if the number of objects is 3
It indicates the number of steps that compose the sequence.	
Long press to restart sequence	disabled/enabled
It is used to associate to the long press of the input the action of restarting the sequence at step zero	
Restart function	Restart and send first step Send long press step and restart
Restart and send first step The long press determines the sending of step 1 Send long press step and restart The long press causes the next step to be sent and brings the sequence to the initial step.	
Value step long	<Different combinations of values of objects a, b, c>

It defines what happens when a long press is performed (it depends on the "Restart function" parameter)	
Send only changed objects if value changes	disabled/enabled
This parameter defines whether, in the passage from one step to the next, all the values associated with one-bit objects must always be sent or only those that change.	
Value step <x>	Combinations of on and off on 2 or 3 1-bit objects
It determines the combination associated with a step in the sequence using 2 or 3 1-bit objects.	

Set RGB color

This function allows you to associate a short press of the button to a command on the bus in order to set a RGB color. The "RGB object type" parameter defines whether the command is sent with a single 3-byte object or 3x1-byte objects. It is also possible to enable a feature associated with a long press that allows to change the color which is sent with a short press. During long press the RGB displays the color transition and at the time of release the selected color is stored; this means that from now every time a short press is performed the new color is sent on the bus. When the device is powered off and on the last selected color is kept in memory. The "Enable sending color during transitions" option allows you to send all color transitions during long press so that each color can be displayed on another device, not just on the RGB.

MUR / DND

This function allows you to configure a key to send 1-bit commands with DND (do not disturb), MUR (make up room) or reset both signals - according to the sequence described below.

Value of parameter "command associated" (column "cmd") defines which values are sent on the 2 x 1 bit objects

cmd	Action	DND	MUR	Note
MUR	enable	0	1	MUR co sends "1" DND co sends "0"
MUR	disable	-	0	MUR co sends "0"
MUR	toggle	MUR enable/disable alternate		
DND	enable	1	0	DND co sends "1" MUR co sends "0"
DND	disable	0	-	DND co sends "0"
DND	toggle	DND enable/disable alternate		
Loop		0	1	Loop among these 3 sets of values.
		1	0	
		0	0	

It is possible to associate a color to each of the 3 states (DND active, MUR active, MUR & DND not active); It's also possible to send the same color to another device using a 3Byte Object DPT 232.600 RGB value 3x(0..255)

Loop along values

With this function you can configure a button to send a 1-byte value in sequence. The sequence is composed of a number of values between 3 and 9. Each time a pressure (or release according to the "active edge" parameter) is done a value is sent following the order set in ETS: from the first (A) to the last (I).

Two objects are available:

<Button x> Loop value Output:

this object is for sending the step by step sequence

<Button x> Loop value feedback:

this object is to receive a value from the bus ; if it corresponds to any value set in the sequence then it synchronize to the related step.

6. RGB Led

RGB General

KNX PARAMETER	SETTINGS
Brightness limit	none day-night percentage

none:	no limit
day-night:	a default value for night and day can be set and 1 bit object can be addressed to switch from night to day and vice versa
percentage:	this option enables a 1-byte communication object to change the LED illumination value by using a command %

RGB Function

KNX PARAMETER	SETTINGS
RGB main function	nothing classic RGB KNX feedback physical dimension Internal sensor feedback [1] demo color loop

[1] visible only if thermostat function is enabled

nothing: no function

classic RGB: with this option you can change the color of the RGB led by 3x1byte obj or by a 3byte object. It is also possible to set the RGB LED in blink mode or turn it on / off by bus

KNX feedback: with this option you can display up to five 1-bit objects on which send on / off telegrams. When the "0" or "1" value (according to parameter setting) is received, you can bring the color of the RGB led to a defined - fixed or blinking - value. Receiving a new telegram on another object 1 bit of the KNX feedback function cause the RGB led to light a new color.

physical dimension: with this option, you can use the RGB led to display the value associated with a physical size. The color of the RGB led will change based on the received value to give a visual indication. You can choose a standard size (temperature, energy, etc.) or a generic datapoint (1,2 and 4 bytes available) and assign a color to the minimum value and another to the maximum value. The intermediate values between min and max will be displayed with colors between the selected ones, according to the color wheel - clockwise (CW) or counter clockwise (CCW). If the min and max values are exceeded the RGB led blink can be activated to indicate alarms or malfunctions.

demo color loop: this feature activates an automatic color change sequence; you can define the color range (warm / cold colors or all colors) and the transition time between two colors. With the CO object

<p>"<RGB> Stop Color Loop" it's possible to stop the loop with telegram "0" and then to start it again with telegram "1" (or viceversa). When the loop is stopped you can define a fixed color for this status. When it's needed to have more than one S4 NXT device with demo color loop running and keep them synchronized you can select one device as a "master" by setting "T" flag = 1 in object "<RGB> Stop Color Loop" and link them with all the other objects "<RGB> Stop Color Loop" of the others devices (slaves). Every time the master change color will keep the other device synchronized. Please check to set all the parameters "color led" and "time of color change" to the same value and to start them at the same time.</p>	
RGB temporary function	nothing button press
<p>[1] visible only if thermostat function is enabled</p> <p>This parameter sets the behaviour of the RGB in temporary mode; in this mode the RGB color change temporarily according to the parameters and after that it returns into the previous mode.</p> <p>nothing: no function button press: a color is displayed each time the key is pressed for a defined time.</p>	
RGB step light mode	disabled / enabled
<p>Enabling this function a 1 bit communication object is shown, it has the highest priority in the colour setting of the RGB. When an activation telegram is received on this object, the RGB assumes the colour set by parameter and this value does not change until it receives a deactivation telegram.</p>	

7. Input

The rear input can be configured as analogical or digital input. When configured as an analogical input can be connected to a temperature probe (code ACC003 or ACC004) and used to make a mix of the measurement with the front probe or to handle with on / off a load such as a towel heater etc.

As digital input it can have all the features that are listed for the front buttons.

8. Temperature

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	frontal probe rear probe mix frontal/rear probe KNX probe mix frontal/KNX probe mix rear/KNX probe										
<p>Frontal probe: is the embedded sensor included in the device</p> <p>Rear probe: is the additional probe that can be connected to the 2 poles terminal present on the back of the product. If the parameter "Rear input type", in the page "General Setting", is set to "analog" the sensor shall be selected between Lithoss codes ACC003 or ACC004.</p> <p>KNX probe: KNX probe is intended a remote sensor that send cyclically the temperature measurement via bus.</p>											
Temperature sensor calibration	-10°C ÷ +10°C with resolution, 0,1°C										
<p>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.</p>											
Sending interval	<table> <tr> <td>never</td><td>30 min</td></tr> <tr> <td>1 min</td><td>1 h</td></tr> <tr> <td>5 min</td><td>4 h</td></tr> <tr> <td>10 min</td><td>12 h</td></tr> <tr> <td>15 min</td><td>24 h</td></tr> </table>	never	30 min	1 min	1 h	5 min	4 h	10 min	12 h	15 min	24 h
never	30 min										
1 min	1 h										
5 min	4 h										
10 min	12 h										
15 min	24 h										
<p>If you enable the periodic sending the sending interval is set by this parameter.</p>											
Sending on variation	never / from 0.1 to 1.5°C										
<p>Sending of values can be set also by checking the difference between current and previous value.</p>											

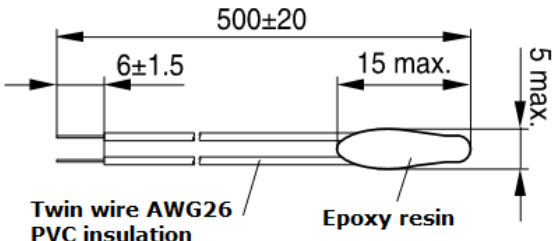
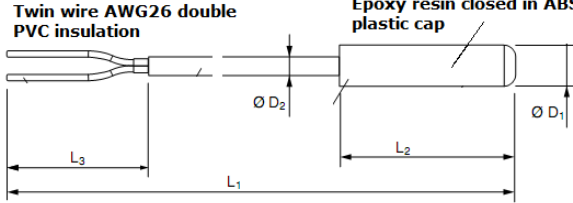
9. Temperature Probes

NTC temperature probe: Lithoss code ACC003 or ACC004.

ACC003 (from -20°C to +100°C)

ACC004 (from -50°C to +60°C)

Max. length of Connecting Cable: ≤ 20 m (twisted cable)

PROBE TYPE A (ACC003)	
 <p>Twin wire AWG26 PVC insulation</p> <p>Epoxy resin</p>	
<p>Dimensions in millimetres</p> <p>NTC resistance tolerance: ± 3%</p> <p>Measure range: -20°C ÷ +100°C</p> <p>Cable: 2 wire single insulation</p> <p>Cable colour: Black</p> <p>NTC colour: Black</p> <p>Warning: keep at least 6 mm from all live parts</p>	
PROBE TYPE B (ACC004)	
 <p>Twin wire AWG26 double PVC insulation</p> <p>Epoxy resin closed in ABS plastic cap</p> <p>Ø D₂</p> <p>Ø D₁</p> <p>L₃</p> <p>L₂</p> <p>L₁</p>	
<p>D1 = 9 mm D2 = 4 mm L2 = 49 mm L1 = 1250 mm</p> <p>NTC resistance tolerance: ± 2%</p> <p>Measure range: -50°C ÷ +60°C</p> <p>Cable: 2 wire double insulation</p> <p>Cable colour: White</p> <p>NTC colour: White</p> <p>Warning: keep at least 3 mm from all live parts</p>	

10. Temperature Sensor Function

KNX PARAMETER	SETTINGS
Activation telegram	Telegram 0 Telegram 1
It defines which telegram value enables the sending of threshold on/off telegrams.	
State after download	Disabled Enabled
It defines whether the sending of threshold on/off telegrams is enabled or disabled after the download.	
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 ACC003 -50°C ÷ +60°C ACC004
Lower setpoint value	-20°C ÷ +100°C ACC003 -50°C ÷ +60°C ACC004
Telegram when value is above setpoint	nothing/off/on
It is replicated, in the ETS page, for both the "Upper setpoint value" and "Lower setpoint value" settings; the settings are the same for both.	
Telegram when value is below setpoint	nothing/off/on
It is replicated, in the ETS page, for both the "Upper setpoint value" and "Lower setpoint value" settings; the settings are the same for both.	
Telegram when probe is disabled	nothing off on

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
	1 hour	30 min 2 hours

It is replicated, in the ETS page, for both the "Upper setpoint value" and "Lower setpoint value" settings; the settings are the same for both.

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.

11. Additional Probe

For function additional probe, the parameters are similar to function "Temperature Sensor". "Additional Probe" function is only available when rear input is set to analog.

The following parameters are also available.

KNX PARAMETER	SETTINGS
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.	
Cyclic sending time of temperature	No periodic send 1, 2, 5, 10, 30 minutes 1, 2 hours
It defines the time for cyclic sending of the temperature	
Sending on variation	Never 0.5°C 1°C 1.5°C

12. Thermostat Function

The temperature function can be configured as a thermostat to control the temperature of a room or area by activating the heating or air conditioning, the fan coils, the air conditioning valves or via the on/off controls for the heating/cooling elements such as radiators, heat pumps, split, etc.

The thermostat works at temperatures between -9.9 and + 99.9°C with a resolution of 0.1°C.

The setpoint values (including the SETPOINT MODE) from the bus are accepted in the range from 10°C to 50°C.

Setpoint Settings

The control setpoint can be changed from the bus in two different ways, using one of these objects:

HVAC Mode (manual or automatic)

SETPOINT Mode

The choice depends on the device that works as the master: a timer-thermostat, a control panel or a SW supervisor. Listed here is the list of objects to change the active mode or setpoint value via bus.

SETPOINT Object

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

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

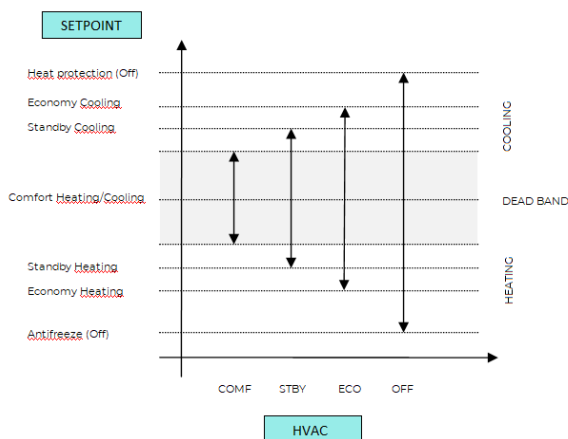
HVAC Object (manual)

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

HVAC Object (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”.

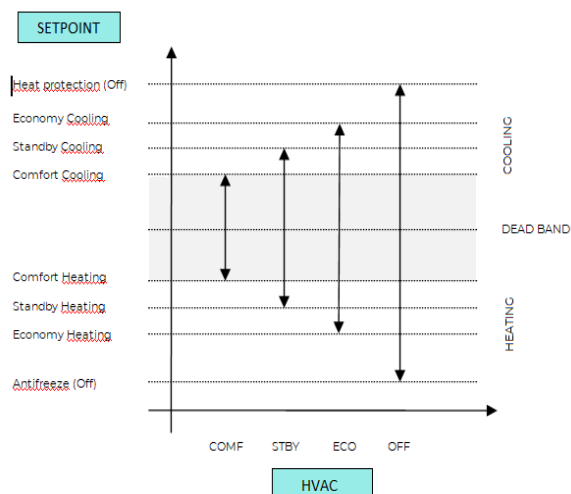
Whenever the temperature becomes greater than: **Heating comfort setpoint + (Dead band/2)** cooling control is active; when the temperature is lower than



Cooling comfort setpoint - (Dead band/2) the heating control is active.

The following image clarifies the concept.

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.



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

COMFORT, STANDBY, ECONOMY setpoint

These 2-byte objects are used to set the setpoint values for the COMFORT, STANDBY and ECONOMY mode. At each variation, the setpoint is saved in memory. After downloading these setpoints are reset to the values defined by the ETS parameter; when turned on, these objects are returned to the last value before they were turned off.

Use these communication objects to change the current setpoint for each HVAC mode based on the currently active control (heating or cooling).

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	In this object it is possible to find the current value of the user adjustment set inside the thermostat.

taking into account the limits set in the thermostat.	In order to reset the user forcing, simply send 0 on that object.
If set in transmission, these objects send their current value upon their state change.	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.

COMFORT object

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 the HVAC MODE object.
The COMFORT mode can also be set in timed mode. After a time set by a parameter, the thermostat returns to the selected mode.

KNX PARAMETER	SETTINGS
Comfort object timing	time unlimited time limited
Comfort overwrite time [min]	1.. 255

Object ENABLE HEATING/COOLING

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

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.	
Activation telegram	telegram "0" / "1"
Telegram to enable the mode.	

Object LOCK 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.

Lock telegram	telegram "0"/"1"
Telegram to lock the mode.	

Object WINDOW CONTACT

This object, if enabled, has a higher priority than HVAC MODE, SETPOINT MODE, COMFORT.
When a telegram ("0" or "1") is received on the "Window Contact" communication object, the thermostat enters an energy saving mode: PROTECTION mode (if running in HVAC MODE) or Setpoint anti-frost/high temperature protection (if running in SETPOINT MODE).

If the received telegram indicates that the window is open, the thermostat changes mode or setpoint 1 minute after receiving the telegram.

When it receives a telegram corresponding to the "window closed" state, it restores the previous mode, again with a 1 minute delay. The SETPOINT VARIATION value (if activated) is always reset.

THERMOSTAT OFF Object

The Thermostat OFF object is used to stop the Temperature Controller from the Bus with a 1-bit telegram.

SETPOINT ADJUSTMENT Object

The SETPOINT ADJUSTMENT object is used to temporarily change the setpoint value used by the thermostat, applying an offset to the current value.

If the thermostat works in HVAC MODE, the offset value is applied from the moment a valid telegram is received on the SETPOINT REGULATION object until this value changes, even in the event of a change in the active mode (Comfort and Standby). When the device enters Economy mode, this value can be reset or not based on the "Reset SP adjustmen on HVAC economy" parameter. Entering the PROTECTION mode the value of the SETPOINT CHANGE object is forced to 0.

Similarly, if the thermostat is operating in SETPOINT MODE the offset value is also applied when the setpoint value received on this object changes.

ACTUAL SETPOINT Object

The ACTUAL SETPOINT object sends the setpoint in use and is sent each time:

- the HVAC mode object changes;
- the SETPOINT object changes;
- the SETPOINT CHANGE object changes;
- after a download;
- one minute after power on.

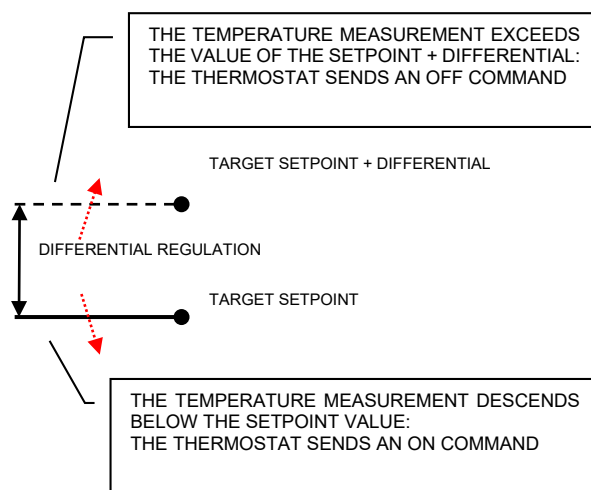
Two-points on/off control

The "2 points on/off" control algorithm is used to control the heating or cooling elements by turning on and off the same elements such as radiators, underfloor heating with shut-off valves, boilers, etc.

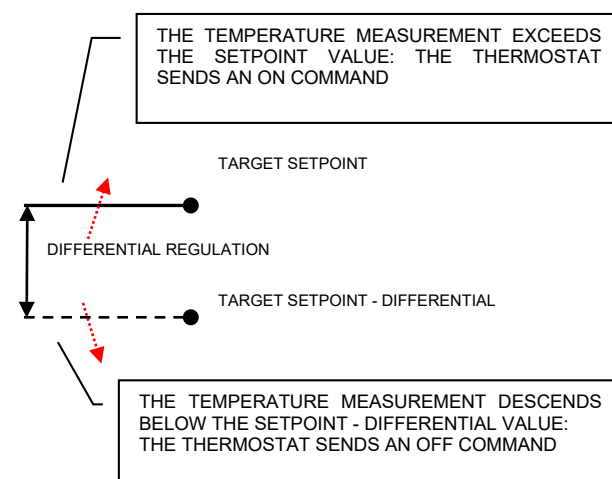
When the thermostat switches to "winter mode" (heating), it sends a shutdown command to the COOLING ON/OFF object and activates the control only via the HEATING ON/OFF object (the COOLING ON/OFF object is therefore no longer updated until it returns to "cooling mode").

Therefore, in the transition from "winter" to "summer" mode, it sends a shutdown command on the HEATING ON/OFF commands and activates the control through the COOLING ON/OFF object.

The following image shows the conceptual scheme of the on/off control in heating.



The following image instead shows the operation of the on/off control in cooling.



Integral proportional control PWM

The integral proportional control with PWM is an algorithm that reduces the effects of the hysteresis around the setpoint value by adjusting the control in values between 0% and 100% where 0% means "off – no action" and 100% means "maximum control action". Once a cycle time has been defined, the thermostat sets the actuator to ON for a fraction of the cycle time and OFF for the remaining part. Piloting the actuator with a control value of 80% means making it active (i.e. ON) for 80% of the 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" suggests common values for setting "Proportional band [Bp]" and "Integration time [min] [Ti]" parameters. Use "advanced setting" to manually set values.	
Proportional band [Bp]	1, 2, 3, 4, 5 °C
<p>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.</p> <p>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.</p>	
Integration time [min] [Ti]	5 .. 250 min
It defines the duration of the integration time	

Integral proportional control continuous

This control mode is very similar to "Integral proportional control PWM" in terms of algorithm and parameters, but it uses a 1 byte object (% value) to send the command on the bus which will no longer determine the duty-cycle (period duration/time ON) but a control signal for solenoid valves type 0 - 10V.

Fan Coil - ON/OFF Control

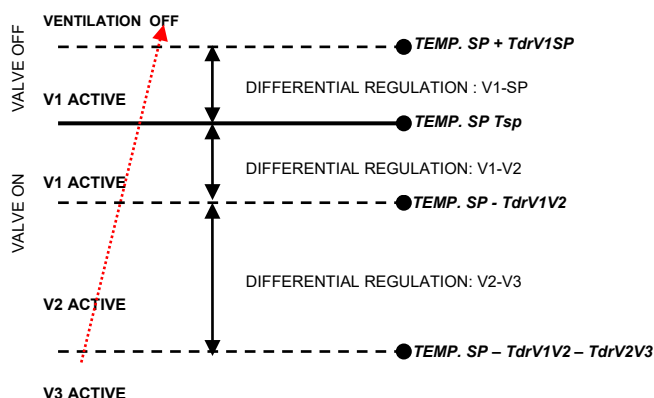
The Fan Coil is a heating/cooling device based on the emission of air pushed by a fan through a heat exchanger in which a fluid, respectively cooling or heating, circulates; the flow of the fluid is controlled by a solenoid valve (2-pipe model) if there is only one circuit for the fluid used in heating or cooling or two valves (4-pipe model) if the equipment can manage two distinct and independent circuits.

In cooling, the fluid absorbs heat from the ambient air brought to the exchanger by the fan, while in heating it transfers heat.

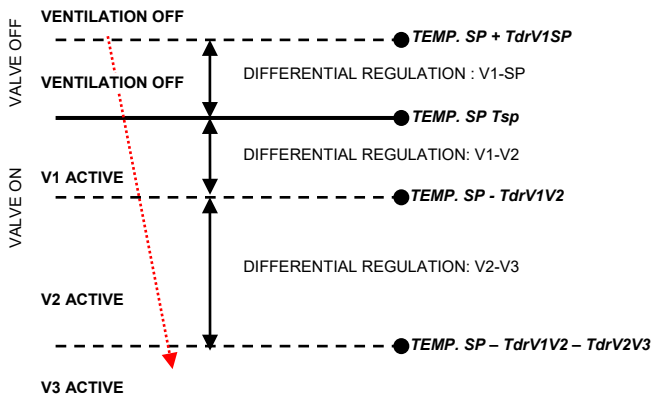
The electric fan is driven by an electric motor which is generally in alternating current and has 3 windings, each of which corresponds to a speed.

The control logic for a 3-speed Fan-coil in heating mode is shown below.

When the temperature rises, the following scheme applies:



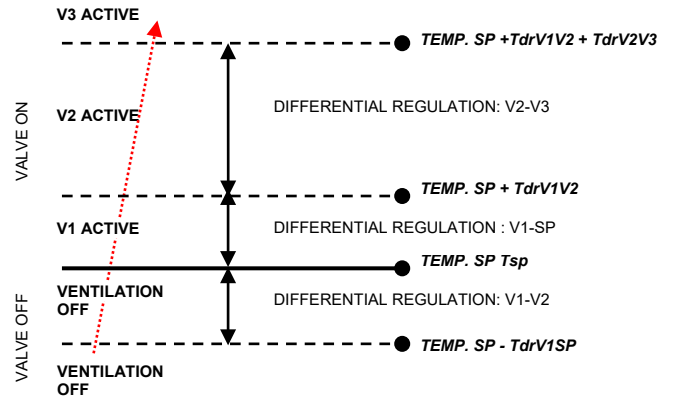
When, instead, the temperature decreases, what is shown in the following image takes place.



Where:

- T_{sp} = Setpoint temperature;
- T_{drV1SP} = HEAT. regulation differential for V1-SP;
- T_{drV1V2} = HEAT. regulation differential for V1-V2;
- T_{drV2V3} = HEAT. regulation differential for V2-V3.

When the temperature increases:

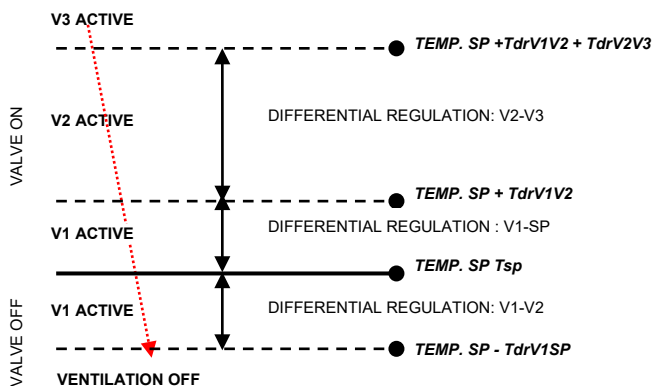


Where:

- T_{sp} = Setpoint temperature;
- T_{drV1SP} = COOL. regulation differential for V1-SP;
- T_{drV1V2} = COOL. regulation differential for V1-V2;
- T_{drV2V3} = COOL. regulation differential for V2-V3.

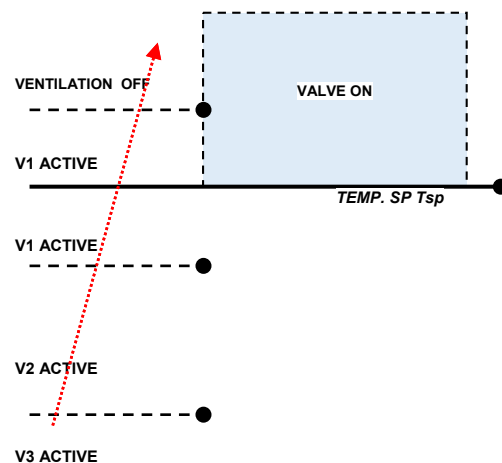
The control logic for 3-speed Fan-coil in cooling is schematised below.

When the temperature decreases, the following scheme applies:



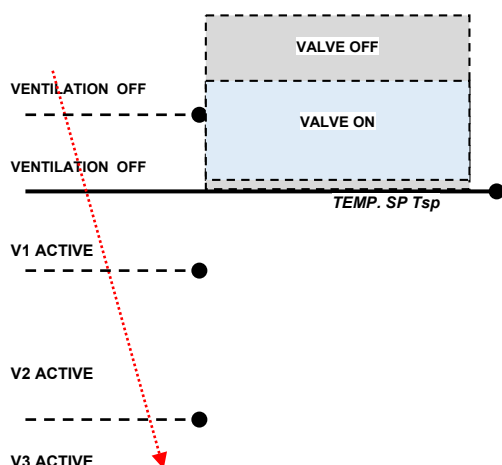
Independent speed valve management

In Fan-coil on/off mode it is possible to make the opening or closing of the valve independent from the switching on or off of the speeds by setting the option **yes** for the parameter **Manage valves independently**. This makes the drop-down menus from which to set the valve regulation differentials visible on the ETS page, which will therefore be distinct from those set for the speeds. The valve can therefore be kept open even when the fans are stopped.



The dashed line area represents the temperature range defined by the "heating regulation differential ON" parameter in case of increasing temperature.

When the temperature decreases, the "heating regulation differential ON" parameter defines the valve hysteresis.



If parameter "Fancoil valve" in the "Thermostat Settings" page is set to "proportional", valves are set as independent and parameters "bandgap" and "proportional band [Bp]" can be set specifically for both cool and heat status.

PI Fan coil control

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

This mode is useful for controlling Fan coils (selecting 2 or 4 pipes) or generic proportional actuators such as valve drivers; in this case, only the 1-byte object must be connected, avoiding connecting the valve objects.

Fan coil speed forcing

In Fan coil mode (1-bit or 1-byte management), it is possible to force the use of a single speed and to bypass automatic selection of the same. This mode is useful, for example, in small rooms such as hotel rooms, or where the fan speed can cause noise. To activate the forcing, it is necessary to act on the 1-bit object that selects AUTO/MAN and then on the object that activates the desired speed (3x 1-bit object or 1x 1-byte object in % mode).

ON/OFF Ventilation Object

When using the fan-coil, it is also possible to activate the "ventilation" mode. In this mode, the fan-coil never turns off the fan even when, after reaching the desired setpoint, the heating/cooling valve closes. In any case, it is necessary to set the desired speed for ventilation using the speed forcing object; in AUTO mode, in fact, the ventilation will stop when the set point is reached. It is also possible to make the "ventilation" mode already active after the download without having to switch it on/off via a communication object.

2nd Stage Object

The 2nd Stage object is an additional control object for the regulation of a second heating or cooling equipment; a 1-bit control can be set for this object; if the control is a byte it is possible to set PI control (Proportional Integral). With the "Bandwidth" parameter you set how much the current 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 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.

Temperature probe – errors /measurements out of range

If the temperature probe is disconnected or short-circuited, the control action is interrupted and the controlled actuators are deactivated.

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

Temperature Alarm Object

Alarm objects are available for each thermostat and for each temperature probe; in case of probe failure or out of range measurement, a telegram with value "1" on the 1 bit communication object is sent on the bus. As soon as the temperature sensor works again, the value "0" is transmitted.

To correctly manage the internal or rear probe or KNX via bus, refer to the following configuration modes:

CONFIGURATION 1 MODE
Only probe connected to input 2
<p>If the temperature probe is disconnected or short-circuited, the control action is stopped and the controlled actuators are deactivated.</p> <p>Probe disconnection/short circuit/measurement out of range:</p> <ul style="list-style-type: none"> • "Temperature" obj is not sent • "Alarm" obj transmits "1"

CONFIGURATION 2 MODE
Only KNX probe temperature
<p>The KNX probe is read considering the last value received on the "KNX probe temperature" Obj.</p> <p>If the KNX probe value is out of range or the surveillance time expires without any message received:</p> <p>"Alarm" Obj transmits "1" until the KNX probe is received again.</p>

CONFIGURATION 3 MODE
Mix of probe connected to KNX probe input and temperature
<p>The KNX probe is read considering the last value received on the "KNX temperature probe" Obj.</p> <p>The value of the temperature sent on the bus is the weighted average between the values of the front probe and KNX probe.</p> <p>If the KNX probe value is out of range or the surveillance time expires without having received any message, the thermostat starts considering only the other probe until it receives a new valid value from the KNX probe; in this case the bus value is considered again.</p>

13. Thermostat behaviour on bus failure, recovery and download.

Behaviour on bus voltage failure


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

Behaviour 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
- HVAC Mode
- Base Setpoint
- Setpoint Adjustment
- Force value in manual mode
- Ventilation

Control values (i.e. commands to actuators) are calculated using actual setpoint and 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 behaviour of actuator in order to switch the heating / cooling equipment off after bus power on.

Behaviour on ETS Download

After download it's possible to set initial value of:
Heat / Cool mode
HVAC Mode
Ventilation

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

14. 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 or the correct ETS application must be downloaded



Downloads:

Download latest versions on our website:

- KNX parameter handbook: http://www.lithoss.be/images/uploads/pdf/Lithoss_Sx_PARAMETER_HANDBOOK_2022.pdf
- ETS file 1 button: http://www.lithoss.be/images/uploads/pdf/Lithoss_S1_2022.zip
- ETS file 2 buttons: http://www.lithoss.be/images/uploads/pdf/Lithoss_S2_2022.zip
- ETS file 4 buttons: http://www.lithoss.be/images/uploads/pdf/Lithoss_S4_2022.zip