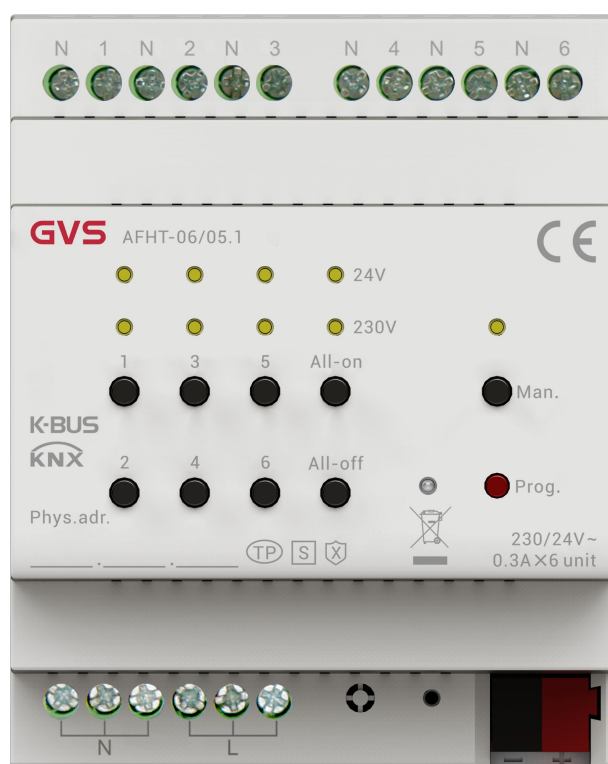# User manual

K·BUS Heating Actuator with Triac, 6-Fold_V1.4

AFHT-06/05.1

KNX/EIB Home and Building Control System

Attentions

1. **Please keep devices away from strong magnetic field, high temperature, wet environment;**

Away from magnetic field	Away from high-temp	Prevent moisture

2. **Do not fall the device to the ground or make them get hard impact;**

Handle with care

3. **Do not use wet cloth or volatile reagent to wipe the device;**

Wipe with care

4. **Do not disassemble the devices.**

Contents

Chapter 1 Summary

Heating Actuator with Triac is mainly used for the room temperature controller and valve control, can be installed in central Heating/cooling control system.

The valve driving supports 230V AC drive and 24V AC, with LED indication for valve status. Moreover, it supports manual operation which is on the front of the device to facilitate engineering commission.

Heating Actuator with Triac is a modular installation device for fast installation in the distribution board on 35 mm mounting rails to DIN EN 60 715. The electrical connection is implemented by using screw terminals. The connection to the KNX bus is implemented using the supplied bus connection terminal, and no need an extra voltage supply. The physical address assignment and parameter settings can be used with the engineering tool software ETS (version ETS5.7 or above) with the .knxprod file.

The manual provides detailed technical information about the Heating Actuator with Triac, including installation and programming details, and explains how to use the panel in conjunction with examples in actual use.

The functions are summarized as followed:
- **Thermal driving can support to 24V AC or 230V AC**
- **Valve output function, with local or external controller, up to 6 channels**
- **Room temperature controller, support to heating/cooling mode, integrating 2-point and PI control algorithm, with 5 scenes functions, up to 6 channels**
- **Manual operation**
- **Summer / Winter mode**
- **Valve purge function**
- **Valve disable function**
- **Forced operation function**
- **Operating voltage failure report**
- **Short-circuit / overload report**
- **Support KNX secure**

Chapter 2 Technical Data

Power supply	Bus voltage	21-30V DC, via the KNX bus
	Bus current	<13.5mA/24V, <11.5mA/30V
	Bus consumption	<345mW
Input	Voltage	24V / 230V AC
Output	Valve channel	6 channels
	Switching current	≤300mA, per channel (Ambient temperature 35℃)
	Voltage	24V / 230V AC
	Protection	Short-circuit / overload protection
Connection	KNX	Bus connection terminals (Red/Black)
	Inputs / Outputs	Screw terminals, Wire Range 0.2-2.5mm^2, Torque 0.4N-m
Operation and display	Programming button and Red LED	Assign the physical address
	Green LED flashing	Application layer running normally
	Manual button	Switch output
	Output LED	Indicate the valve status
	Man./Auto. button	Switch the Man. and Auto. mode
	Man./Auto. LED	Indicate the Man./Auto. mode status
	Operation	− 5 °C ... + 45 °C
Temperature	Storage	−25 °C ... + 55 °C
	Transport	− 25 °C ... + 70 °C
	Humidity	<93%, except dewing
Environment	On 35mm mounting rail	
Dimension	72 x 90 x 64 mm	
Weight	0.3KG	

Chapter 3 Dimension and Structural Diagram

3.1. Dimension Diagram
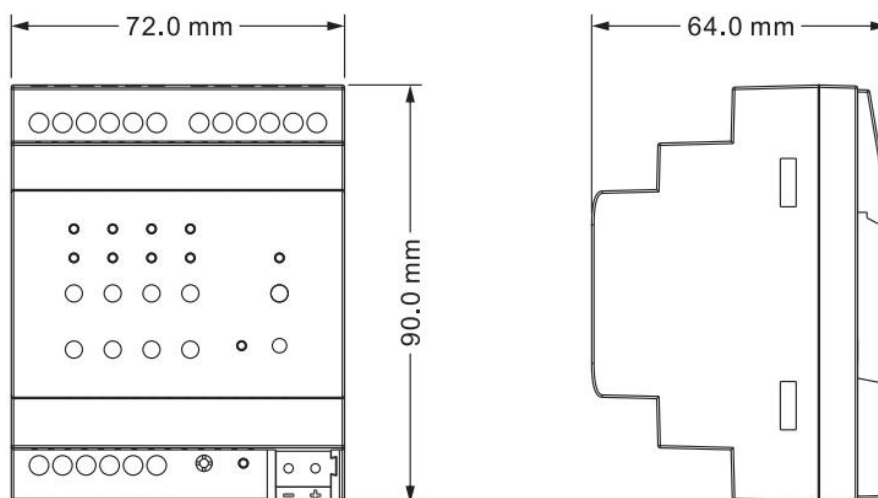
3.2. Structural Diagram
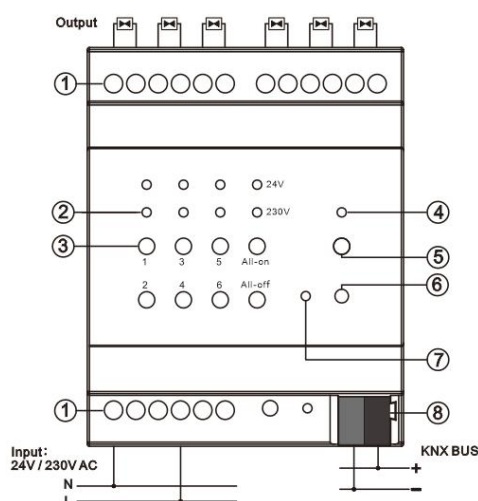
① 24V / 230V AC drive voltage input terminals, output terminals. The output terminals do not require connect to N additionally and the N are internally connected.

②③Manual operation buttons and status indicating LED for outputs:

Button 1~6 for controlling the channel valves open/close individually; All-on: the all valves open, All-off: the all valves close; LED to indicate valve status: always on when valve open; always off when valve close.

For indicating circuit is abnormal (short circuit/overload/under voltage), LED flashing, 1 second on and 1 second off.

Short circuit/Overload execution concept: when a short circuit is detected firstly,the output will be off, then the output will be active again according to the current control value after delay for 1 minute. If it remains short circuit, then the output will be off permanently and cannot be used until the device is

restarted.

④⑤Man./Auto. operation switch button and status indicating LED:

Long press 1 second the button to switch Man. and Auto. mode, LED on is Man. mode and off is Auto. mode.

⑥⑦Programming button and LED:

Red LED is for assigning the physical address, green flashing LED is for displaying application layer running normally.

Reset the device to the factory configuration: press the programming button and hold for 4 seconds then release, repeat the operation for 4 times, and the interval between each operation is less than 3 seconds

⑧ KNX bus connection terminal

Chapter 4 Project Design and Programming

Application	Maximum of communication objects	Maximum number of group addresses	Maximum number of associations	Secure group addresses
Heating Actuator with Triac, 6-Fold/1.0	**267**	**500**	**500**	**339**

General function

General function includes device In operation setting, thermal driving and failure status report, as well as can enable manual operation and summer/winter mode.

Output function

Up to support to 6 independently configurable valves, each channel can be linked to a local controller or an external controller, configurable valve type, valve control mode, valve purge function, valve disable function, forced operation function and short-circuit/overload status report.

Valve control mode supports to 2-point and PI control.

Controller function

Up to support to 6 independently configurable controllers, used for linkage with Room temperature controller.

Controller is mainly used to control the room temperature, automatically and optimally control the heating and cooling according to the use of the room or the needs of the occupants.

Supports manually switching of heating/cooling control, support options for three-level fan speed and auto fan speed, four operation modes: comfort, standby, economy and protection mode.

The setting temperature supports absolute and relative settings, as well as adjustable temperature range settings. Support 2-point and PI control.

Each channel with 5 configurable scene function.

Chapter 5 Parameter setting description in the ETS

5.1.KNX Secure

Heating Actuator with Triac is a KNX device that complies with the KNX secure standard. That is, you can run the device in safe way.

Fig.5.1 (1) "KNX Secure" parameter window

The device with KNX secure will be displayed notes on ETS, as shown as Fig.5.1(1).

If secure commissioning is actived in ETS project, the following information must be considered during device debugging:

❖   It is essential to assign a project password as soon as a KNX Secure device is imported into a project. This will protect the project against unauthorized access.

The password must be kept in a safe place – access to the project is not possible without it (not even the KNX Association or device manufacturer will be able to access it)!

Without the project password, the commissioning key will not be able to be imported.

❖   A commissioning key is required when commissioning a KNX Secure device (first download). This key (FDSK = Factory Default Setup Key) is included on a sticker on the side of the device, and it must be imported into the ETS prior to the first download:

✧   On the first download of the device, a window pops up in the ETS to prompt the user to enter the key, as shown in Fig.5.1 (2) below.

The certificate can also be read from the device using a QR scanner (recommended).
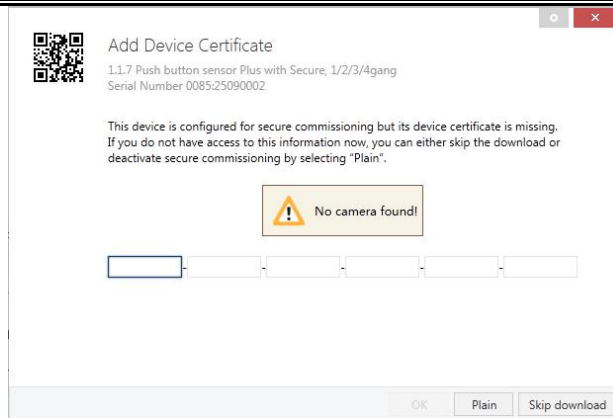
Fig.5.1(2) Add Device Certificate window

✧ Alternatively, the certificates of all Secure devices can be entered in the ETS beforehand.

This is done on the "Security" tab on the project overview page, as shown in Fig.5.1(3) below.

The certificates can be also added to the selected device in the project, as shown in Fig.5.1(4).
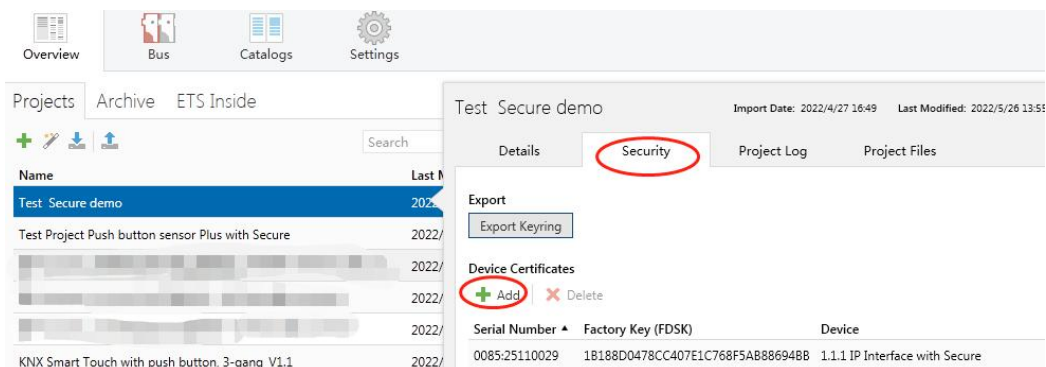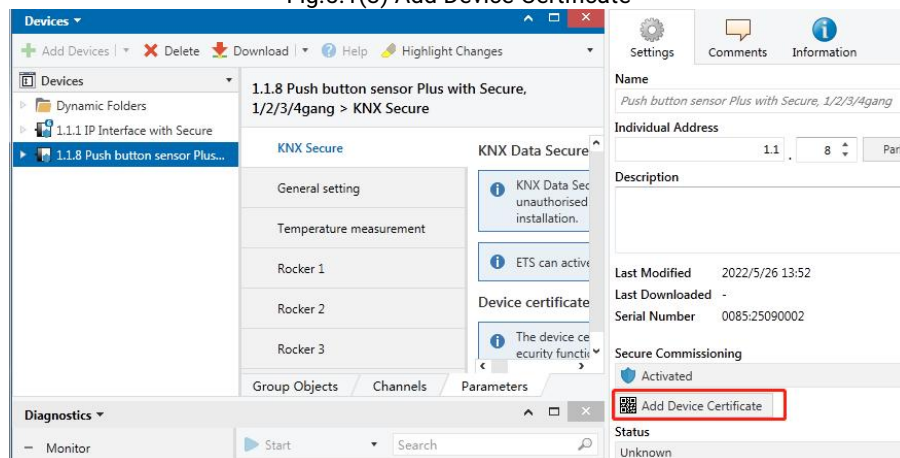

Fig.5.1(3) Add Device Certificate

Fig.5.1(4) Add Device Certificate

✧ There is a FDSK sticker on the device, which is used for viewing FDSK number.

Without the FDSK, it will no longer be possible to operate the device in KNX Secure mode after a reset.

The FDSK is required only for initial commissioning. After entering the initial FDSK, the ETS will assign a new key, as shown in Fig.5.1(5) below.

The FDSK will be required again only if the device was reset to its factory settings (e.g. If the device is to be used in a different ETS project).
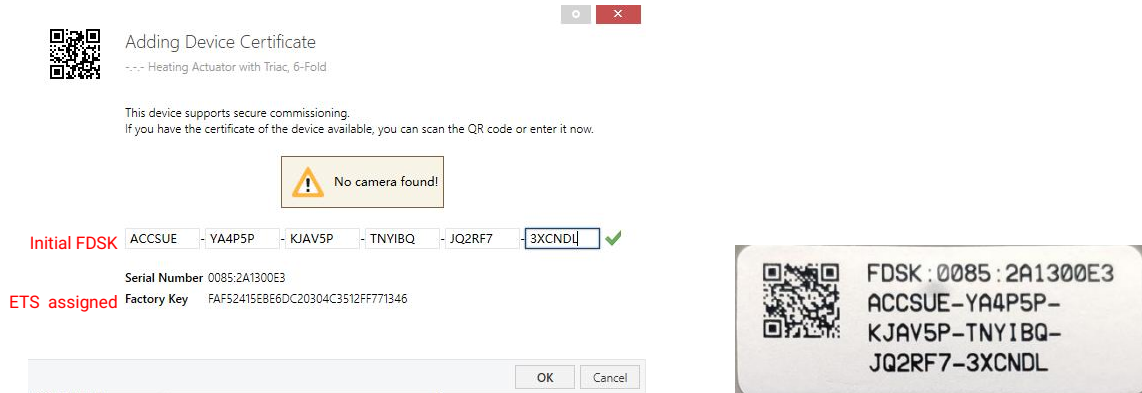

Fig.5.1(5)

Example:

If this application in the project needs to be tried with another device, it is no longer the original device. When the application is downloaded to a new device, the following prompt will appear on the left of Fig.5.1(6), click yes, the Add Device Certificate window will appear, then enter the initial FDSK of the new device, and you need to reset the device to the factory settings (it is not required if the device is still factory default; If it has been used, it will be required to reset, otherwise the following error message will appear on the right of Fig.5.1(6)), and then the device can be successfully downloaded again.
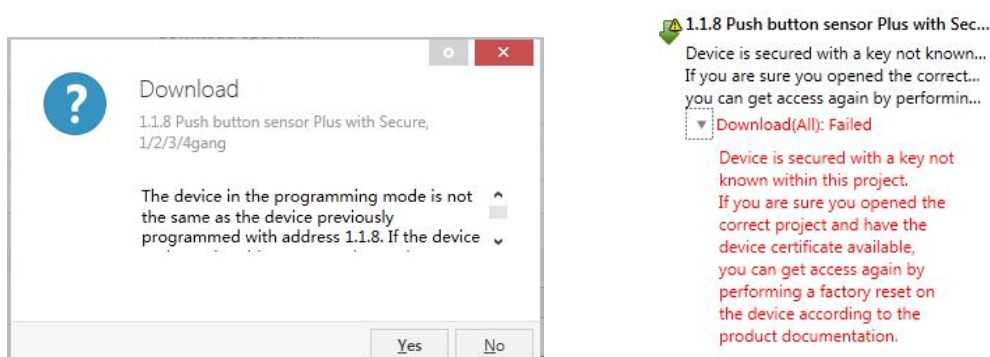

Fig.5.1(6) Example

Whether the device is replaced in the same project, or the device is replaced in a different project, the processing is similar: **Reset the device to the factory settings, then reassign the FDSK.**

After the device is downloaded successfully, the label Add Device Certificate turns gray, indicating that the key for this device has been assigned successfully, as shown in Fig.5.1(7) below.

Fig.5.1(7)

ETS generates and manages keys:

Keys and passwords can be exported as needed to the use of security keys outside of the associated ETS projects. As shown in Fig.5.1(8) below, the file extension is .knxkeys.
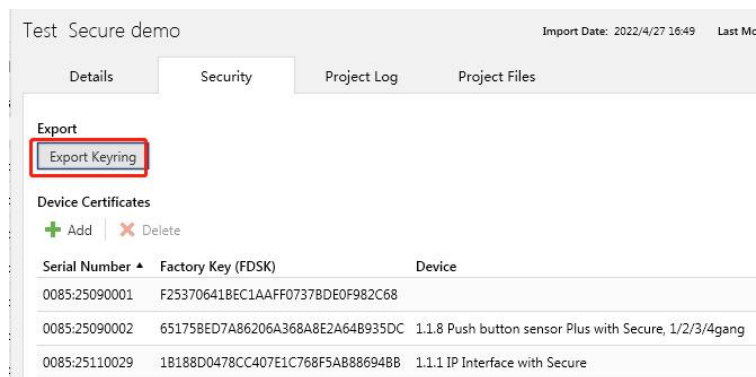

Fig.5.1(8)

Note: Any USB interface used for programming a KNX Secure device must support "long frames". Otherwise ETS will report a download failure information, as shown below.

5.2. Parameter window "General"

Fig.5.2 "General" parameter window

Parameter "Send delay after voltage recovery [0..15]s"

This parameter is for setting the delay time to send to bus after the device voltage recovery. Options: **0..15**

The setting dose not contain the device initialization time, and bus telegrams received during delay time will be recorded.

Parameter "Send cycle of "In operation" telegram [1...240, 0 = inactive]s"

This parameter is for setting the time interval when cyclically send telegrams through the bus to indicate this device in normal operation. When set to "0", the object "In operation" will not send a telegram. If the setting is not "0", the object "In operation" will send a telegram according to the setting period time with logic "1" to the bus. Options: **0...240s,0= inactive**

As to reduce the bus load as much as possible, the maximum time interval should be selected according to actual application requirement.

Parameter "Thermal driving"

This parameter is for setting the thermal driving. Options:

24V AC

230V AC

Parameter "Report operating voltage failure status"

This parameter is for setting whether to report operating voltage failure status.

When the parameter is enabled, if the driving can not arrive to 24V AC or 230V AC, report failure status via the object "Status of operating voltage failure".

Parameter "Number of valve outputs"

This parameter is for setting the number of valve outputs. Options:

> **1**
>
> **2**
>
> **...**
>
> **6**

Parameter "Number of room temperature controllers"

This parameter is for setting the number of room temperature controllers. Options:

> **1**
>
> **2**
>
> **...**
>
> **6**

Parameter "Manual operation"

This parameter is for setting whether to enable manual operation.

When enabled, the next parameter is visible.

Parameter "Manual to automatic by"

This parameter is for setting the way for manual operation switch to automatic. Options:

> **Only long press**
>
> **Both long press and automatic delay time**

Only long press: the manual/automatic operation only can be switched via long press the Man. button.

Both long press and automatic delay time: the manual/automatic operation only can be switched via long press the Man. button, or the setting delay time for the manual to automatic has elapsed. When this option is selected, the next parameter is visible and set the delay time.

——**Parameter "Delay time [10...6000]s"**

This parameter is for setting the delay time for an automatic reset from the "manual operation" to "automatic operation" status after the last push button operation. Options: **10..6000**

Parameter "Summer/Winter mode"

This parameter is for setting whether to enable Summer/Winter mode, when enabled, you can set the polarity of the object "Summer/Winter mode". Options:

> **Disable**
>
> **Summer=1/Winter=0**
>
> **Summer=0/Winter=1**

Parameter "Summer/Winter mode after download"

This parameter is visible when previous parameter is enabled. For setting the initial mode after

download. Options:

Unchange

Summer

Winter

When "Unchange" is selected, the first download is based on the mode with the object value of 0.

5.3. Parameter window "Output x"

Output-Local controller

Output-External controller

Fig.5.3 "Output x" parameter window

Parameter "Description (max 30char.)"

This parameter is for setting the name description for valve, each channel has corresponding

name.

Parameter "Controller from"

This parameter is for setting the controller to link the valve, set the local or external controller.

Options:

Local controller 1

Local controller 2

...

Local controller 6

External controller

The number of local controller is related to the parameter "Number of room temperature controllers".

When local controller is selected, it is important to consider whether the valve output and controller are matched. When matched, the following information is prompted:

> ℹ The output evaluates the control value from the local controller 1.

Parameter "Control value for valve output (1bit)"
Parameter "Control value for valve output (1byte)"
Parameter "Control value for valve output (1bit/1byte)"

This parameter is visible when the "Local controller x" is selected to link the valve. Set the control value for valve output. The options are displayed according to the control mode of local controller.

Parameter display is dependent on the control type of the selected local controller. When control mode is "Heating" or "Cooling", "Switching on/off(use 2-point control)" or "Switching PWM(use PI control)" is selected, display 1bit; "Continuous control(use PI control)" is selected, display 1byte. When control mode is "Heating/Cooling", display 1bit/1byte.

When "Heating", option is only **Control value of heating**

When "Cooling", option is only **Control value of cooling**

When "Heating/Cooling" and 2 pipe system, option is only **Control value of heating/cooling**

When "Heating/Cooling" and 4 pipe system, options:

Control value of heating

Control value of cooling

Parameter "Monitoring control value"

This parameter is visible when the "External controller" is selected to link the valve. Set whether to monitor control value.

When enabled, the following parameters are visible.

Parameter "Monitoring period of control value [10...65535]s"

This parameter is for setting the monitoring period of external control value, if it can not receive control value during the period, the device will consider the external controller error, it will output according the next parameter setting value. Options: **10...65535**

Parameter "Control value after fault occurs [0...100]"

Parameter "Control value after fault occurs (at summer) [0...100]"

Parameter "Control value after fault occurs (at winter) [0...100]"

These parameters are for setting the control value when the external controller error, the value is only temporary. If summer/winter mode is enabled, the control values for summer/winter mode can be configured independently.

If valve type is switch, the valve opens when the control value of this parameter setting >0%; When the control value is set to 0%, the valve closes.

Options: **0..100**

Parameter "Reply mode of Obj. "Control value fault""

This parameter is for setting the reply mode of Obj. "Control value fault". Options:

> **Respond after read only**
>
> **Respond after change**

Respond after read only: respond after read only the device receiving the device from bus or other bus, object "Control value fault" respond the current status to the bus.

Respond after change: while error change or the device receiving the request of read status, object "Control value fault" will send telegram to respond the current status to bus.

Parameter "Valve control mode"

This parameter is visible when "External controller" is selected to link the valve. Set the valve control mode of external controller. Options:

> **Switching on/off(use 2-point control)**
>
> **Continuous PWM(use PI control)**

Parameter "Evaluate valve open/close times for PWM"

This parameter is visible, when local controller is selected "Continuous control(use PI control)", or external controller is selected "Continuous PWM(use PI control)". Used for setting whether consider valve open/close time when PWM control. If not considered, it can not open/close valve fully when quickly switching. When the parameter is enabled, following two parameters are visible:

——**Parameter "Fully open time"**

This parameter is for setting the time of the valve open fully. Options: **0..600 s**

——**Parameter "Fully close time"**

This parameter is for setting the time of the valve close fully. Options: **0..600 s**

Parameter "Valve type"

This parameter is visible when "External controller" is selected to link the valve. Set the type of valve switch of external controller. Options:

> **Normal(de-energised closed)**

Inverted(de-energised open)

Normal (de-energised closed): indicates a normally closed valve;

Inverted (de-energised open): indicates a normally open valve.

Parameter "PWM cycle time [1..255]"

This parameter is visible when "External controller" is selected to link the valve and control mode is "Switching PWM(use PI control)". Set the time period for PWM control. Options: **1..255min**

For example, the control value is 20%, PWM cycle is 15min, that is valve will open 3min and close 12min, while the control value is 60%, valve will open 9min and close 6min. The control values come from local or external controller are determined by the configuration.

Parameter "Valve position after download"

This parameter is for setting the valve position after download, option is only **Close valve**

Parameter "If bus recovery, valve position"

This parameter is for setting the valve position when bus recovery. Options:

> **Unchange**
>
> **Close valve**

Parameter "Reply mode for valve status"

This parameter is for setting the reply mode of valve position status. Options:

> **Respond after read only**
>
> **Respond after change**

Respond after read only: respond after read only the device receiving the device from bus or other bus, object "Status of valve position" respond the current status to the bus.

Respond after change: while error change or the device receiving the request of read status, object "Status of valve position" will send telegram to respond the current status to bus.

Parameter "Minimum limitation of control value"
Parameter "Maximum limitation of control value"

These two parameters are visible when "External controller" is selected to link the valve and control mode is "Switching PWM(use PI control)". Set the limitations of control value.

The minimum limitation: **0..50%**

The maximum limitation: **51..100%**

Parameter "Control value lower than the minimum limitation"

This parameter is visible when "External controller" is selected to link the valve and control mode is "Switching PWM(use PI control)". Set the action when control value is lower than the minimum limitation. Options:

> **0%=0%，otherwise=Minimum limitation value**

To be the minimum limitation value

To be 0%

0%=0%，otherwise=Minimum limitation value: close when control value is 0%, and operate at the minimum limit when the other is below the minimum limitation.

To be the minimum limitation value: operate at the minimum limit when control value is below the minimum limitation, even if it is 0%.

To be 0%: close when control value is below the minimum limitation.

This parameter is for setting whether to enable valve cleaning function.

Note: the priority of manual operation and forced operation are higher, and the valve purge is lower. Before the valve cleaning is completed, its process is interrupted manually or by force, this cleaning is finished, and manual or forced operation exit will not continue the last cleaning.

If valve purge function is enabled, the following four parameters are visible.

Parameter "Duration of valve purge time [1...255]"

This parameter is for setting the duration of valve purge time. During this time, the valve is fully open. When this time passes, the status before cleaning is re-established. Options: **1...255min**

If the valve is prohibited during cleaning, the cleaning will continue. That is, the telegrams of disable and valve control will be recorded in the background when in cleaning, and follow the record to update the operation after the cleaning is completed.

Parameter "Automatic valve purge"

This parameter is for setting whether to enable function of automatic valve purge. When enabled, the next parameter is visible.

——**Parameter "Purge Cycle in weeks [1...12]"**

This parameter is for setting the period of automatic valve cleaning, in weeks. Options: **1...12**

The period time starts from the power-on of the device, and trigger the cleaning operation after timing is arrived. Once the cleaning is completed, the time will be reset, whether it is done by automatic cleaning or by object-triggered cleaning, this period will be reset.

Parameter "Reply mode for valve purge status"

This parameter is for setting the reply mode of valve purge status. Options:

Respond after read only

Respond after change

Respond after read only: respond after read only the device receiving the device from bus or other bus, object "Status of valve purge" respond the current status to the bus.

Respond after change: while error change or the device receiving the request of read status, object

"Status of valve purge" will send telegram to respond the current status to bus.

Parameter "Valve disable function"

This parameter is for setting whether to enable valve disable function. When enabled, you can set the polarity of the object "Disable". Options:

> **Disable**
>
> **0=Disable/1=Enable**
>
> **1=Disable/0=Enable**

Note: when operation is disabled, valve position is return to close status, and it will update the valve status according to the current control value when enabled again. During disabled, the received control telegram will be recorded, and fault monitoring is also continue.

Parameter "Forced operation function"

This parameter is for setting whether to enable forced operation function. When enabled, you can set the polarity of the object "Forced operation". Options:

> **Disable**
>
> **0=Disable/1=Enable**
>
> **1=Disable/0=Enable**

When forced operation function is enabled, the following parameters are visible:

Parameter "Control value for forced operation [0...100]"

Parameter "Control value for forced operation (at summer) [0...100]"

Parameter "Control value for forced operation (at winter) [0...100]"

These parameters are for setting the control value of forced operation. If summer/winter mode is enabled, the control values for summer/winter mode can be configured independently.

If valve type is 1bit, the valve opens when the control value of this parameter setting >0%; When the control value is set to 0%, the valve closes.

Options: **0..100%**

> ⓘ If the setting value is lower than the minimum limitation, forced operation will take minimum limitation value as reference

> ⓘ If the setting value is greater than the maximum limitation, forced operation will take maximum limitation value as reference

> ⓘ If use 2-point control, 0% means the valve is off while others means the valve is on

Parameter "Report short-circuit/overload status"

This parameter is for setting whether to report short-circuit or overload status.

5.4. Parameter window "Controller x"

5.4.1. Parameter window "General setting"

Fig.5.4.1 "General setting" parameter window

Parameter "Description (max 30char.)"

This parameter is for setting the name description for controller, each channel has corresponding

name.

This parameter is for setting the resource of the controller temperature reference, up to set 2 external sensors. Options:

External sensor 1

External sensor 1+2 combination

This parameter is visible when use combination sensors. Set this two external sensors to measure the specific gravity of the temperature. Options:

10% to 90%

20% to 80%

...

90% to 10%

For example, if the option is "40% to 60% ", then the internal sensor accounts for 40%, the external sensor accounts for 60%, and the control temperature = (external sensor 1 temperature × 40%) + (external sensor 2 × 60%), the controller of the device will control the temperature according to the calculated temperature.

When two sensors are combined for detection, when one sensor is in error, the temperature value detected by the other sensor is used.

This parameter for setting the time period for read request external temperature sensor. Options:

0..255

Send the read request to external sensor after voltage recovery or download.

The following parameters are visible when "External sensor 1+2 combination" is selected:

——**Parameter "Send temperature when the result change by [0...10]"**

This parameter is for setting when temperature turns to a certain value, whether to enable to send the current temperature value to the bus. Not send when disable. Options:

Disable

0.5K

1.0K

...

10K

——**Parameter "Cyclically send temperature [0...255,0=inactive]min"**

Setting the time for cyclically sending the temperature detection value to the bus. Not send when value is 0.

Options: **0..255**

Note: cyclically sending and change sending are independent of each other.

Parameter "Control value after temp. error[0..100]% (if 2-point control, set value '0'=0, set value '>0'=1)"

Parameter "Control value after temp. error (at summer)[0..100]% (if 2-point control, set value '0'=0, set value '>0'=1)"

Parameter "Control value after temp. error (at winter)[0..100]% (if 2-point control, set value '0'=0, set value '>0'=1)"

These parameters are for setting the control value when temperature error occur. If summer/winter mode is enabled, the control values for summer/winter mode can be configured independently. Options: **0..100**

If 2-Point control, then the parameter value is 0, as well as the control value; if the parameter value is more than 0, then the control value will be 1.

Parameter "Room temperature control mode"

This parameter is for setting room temperature control mode. Options:

> **Heating**
>
> **Cooling**
>
> **Heating and Cooling**

Parameters as follow are visible when "Heating and Cooling" is selected

——**Parameter "Heating/Cooling switchover"**

This parameter is for setting the switchover way of Heating/Cooling. Options:

> **Via object**
>
> **Automatic changeover**

——**Parameter "Heating/Cooling status after download"**

This parameter is for setting the heating/cooling control mode of device when power on RTC after download. Options:

> **Heating**
>
> **Cooling**

——**Parameter "Heating/Cooling status after voltage recovery"**

This parameter is for setting the heating/cooling control mode of device when power on RTC after voltage recovery. Options:

> **Heating**
>
> **Cooling**
>
> **As before voltage failure**

As before voltage failure: when the device is reset after power on, the control mode will recover as before voltage failure. If it is the first time the device is used or a newly enabled function page, the control mode after the device is started is in an uncertain state, and it needs to be manually selected at

this time.

——Parameter "**Room temperature control system**"

This parameter is for setting the type of RTC control system, that is, pipe types of fan coil water inlet/outlet. Options:

> **2 pipes system**
>
> **4 pipes system**

2 pipes system: Shares an inlet and outlet pipe for heating and cooling, that is, both hot and cold water are controlled by one valve.

4 pipes system: Has its own inlet and outlet pipes for heating and cooling, and two valves are needed to control the entry and exit of hot water and cold water respectively.

——Parameter "**Limit control mode switchover at summer**"

——Parameter "**Limit control mode switchover at winter**"

These two parameters are visible when summer/winter mode is enabled. Set whether to limit control mode switchover at summer/winter independently, when limited, it is only when summer and only heating when winter.

Parameter "Room temperature operation mode"

This parameter is for setting whether to enable room temperature operation mode.

When enable, support 4 modes with comfort, standby, economy and frost/heat protection. Support datatype of 1bit and 1byte, and preset a operation mode when download and voltage recovery.

Parameters as follow are visible when operation mode enabled.

——Parameter "**Controller status after download**"

This parameter is for setting the operation mode when power on controller after download. Options:

> **Comfort mode**
>
> **Standby mode**
>
> **Economy mode**

——Parameter "**Controller status after voltage recovery**"

This parameter is for setting the operation mode when power on controller after voltage recovery. Options:

> **Comfort mode**
>
> **Standby mode**
>
> **Economy mode**
>
> **Frost/heat protection**

As before voltage failure

——**Parameter "Extended comfort mode [0..255,0=inactive]min"**

This parameter is for setting the extended time of comfort mode. When value >0, activate the extended, and 1 bit object "Extended comfort mode" is visible. Options: **0..255**

When object receives telegram 1, comfort mode activation. If receive telegram 1 again during the delay time, the time is retiming. And comfort mode will return to previous operation mode once finish the timing. Exit the comfort mode when a new operation mode in delay time.

Change the operation mode will quit the timing, and heating/cooling switchover will not.

——**Parameter "1 bit object function for operation mode"**

This parameter is for setting whether to enable 1 bit objects of operation mode are visible. Corresponding mode activation when objects send telegram 1; Perform standby mode when object values of comfort, economy, protection received from the bus are 0.

——**Parameter "1 bit object for standby mode"**

This parameter is visible when previous parameter enabled. Set whether to enable 1 bit object of standby mode is visible.

Parameters as follow are visible when operation mode disabled.

——**Parameter "Initial setpoint temperature (°C)"**

This parameter is for setting the initial value of setpoint temperature. Options:

> **10.0**
>
> **10.5**
>
> **...**
>
> **35.0**

When initial setpoint temperature is less than the min. setpoint temperature, display following warning:

> ❌ The setpoint is less than minimum,so minimum will regard as setpoint in fact

When initial setpoint temperature is greater than the max. setpoint temperature, display following warning:

> ❌ The setpoint is greater than maximum,so maximum will regard as setpoint in fact

Automatic H/C mode changeover dead zone

——**Parameter " Upper/Lower dead zone"**

These two parameters are visible when control mode"Heating and Cooling" is selected, and "Automatic changeover" is selected. Setting the dead zone range of auto switchover heating/cooling. Options:

0.5K

1.0K

...

10K

Under heating control, when the actual temperature(T) is greater than or equal to the setpoint temperature + the upper dead zone, then mode heating switch to cooling;

Under cooling control, when the actual temperature(T) is less than or equal to the setpoint temperature + the upper dead zone, then mode cooling switch to heating.

Parameter "Window contact input function"

This parameter is visible when operation mode is enabled. Set whether to link to window contact status.

——**Parameter "Delay for window contact [0..65535]s"**

This parameter is visible when operation mode and window contact input function are enabled. Set the delay time to window contact detection. That is, when receive a telegram "window open", the controller will regard that as a valid signal and execute the behaviour after this delay time. Options: **0..65535**

——**Parameter "Controller mode for open window"**

This parameter is visible when operation mode and window contact input function are enabled. If window status is open, perform corresponding operation according to configuration. (For the operation mode, the Switch and Setpoint temperature, as well as Heating/Cooling mode are recorded in the background if control telegrams are received, and performed after the window is closed. If there is no telegram receiving during timing, return to the mode before the window was opened.) Options:

Economy mode

Frost/heat protection

Parameter "Bus presence detector function"

This parameter is visible when operation mode is enabled. Set whether to link to bus presence detector status.

If presence is detected, enter the comfort mode and it will be restored to original mode after leaving. If there is a telegram/manual operation to adjust the mode during the period, the telegram is logged in the background, and it will be exited comfort mode and restored to the mode after leaving. If

there is no telegram receiving during timing, return to original mode. (If receive the presence status cyclically, comfort mode can not be re-triggered, and only can be after leaving.)

Parameter "Scene"

This parameter is for setting whether to enable scene function is visible. When enabled, link to operation mode or setpoint temperature.

Parameter "Min./Max. setpoint temperature [5..37]° C"

These parameters are visible when operation mode is disabled. Set to limit the adjustable range of the setpoint temperature. Options:

5°C

6°C

…

37°C

These parameters are display below the parameters settings interface "Setpoint" when operation mode is enabled.

If the setpoint temperature beyond the limited range, the will output the limited temperature.

For setpoint temperature, the Min. value must less than the Max., if not, it can not be modified on ETS.

5.4.2. Parameter window "Setpoint"

Fig.5.4.2(1) Setpoint_Relative" parameter window

-.-.- Heating Actuator with Triac, 6-Fold > Controller 1-... > Setpoint

🛡 KNX Secure	Setpoint method for operating mode ○ Relative ● Absolute
⇄ General	**Heating**
▥ Output 1-...	Setpoint temperature in comfort mode [5..37] `21` ▾ °C
▥ Output 2-...	Setpoint temperature in standby mode [5..37] `19` ▾ °C
▥ Output 3-...	Setpoint temperature in economy mode [5..37] `17` ▾ °C
▥ Output 4-...	Setpoint temperature in frost protection mode [5..10] `7` ▾ °C
▥ Output 5-...	**Cooling**
▥ Output 6-...	Setpoint temperature in comfort mode [5..37] `23` ▾ °C
⌁ Controller 1-...	Setpoint temperature in standby mode [5..37] `25` ▾ °C
General setting	Setpoint temperature in economy mode [5..37] `27` ▾ °C
Setpoint	Setpoint temperature in heat protection mode [30..37] `35` ▾ °C
Heating control	ⓘ Note: The heating setpoint must be always less than the cooling setpoint.
Cooling control	
Scene	Min. setpoint temperature [5..37] `16` ▾ °C
	Max. setpoint temperature [5..37] `32` ▾ °C

Fig.5.4.2(2) "Setpoint_Absolute" parameter window

This parameter window is visible when operation mode is enabled, and display according to control mode.

This parameter is for setting the setpoint method for operating mode. Options:

> **Relative**
>
> **Absolute**

Relative: relative adjustment, the setpoint temperature of economy mode and standby mode will refer to the defined temperature setpoint.

Absolute: absolute adjustment, each mode has its independent temperature setpoint.

Parameters as follow are visible when the setpoint temperature adopts the relative adjustment method.

Parameter "Base setpoint temperature (°C)"

This parameter is for setting the basic setpoint temperature, form witch the initial setpoint temperature of the room comfort mode is obtained. Options:

> **10.0**
>
> **10.5**

...

35.0

The setpoint value will be modified through object "Base setpoint adjustment", then the new value will be stored after the device power off.

Current basic setpoint temperature = modified basic setpoint temperature +/- accumulated offset(if existence)

When adjusting the setpoint temperature of current operation mode, the setpoint value will be changed with it, but the relative temperature of each mode is unchanged.

When base setpoint temperature is less than the min. setpoint temperature, display following warning:

❌ The setpoint is less than minimum,so minimum will regard as setpoint in fact

When base setpoint temperature is greater than the max. setpoint temperature, display following warning:

❌ The setpoint is greater than maximum,so maximum will regard as setpoint in fact

Parameter "Additional setpoint offset for setpoint adjustment"

This parameter is for setting whether to enable additional setpoint offset function for setpoint adjustment, mainly used to adjust setpoint temperature by 1 bit object. Options:

Disable

Enable

Increase/decrease offset by 1 bit object "Setpoint offset", adjust the setpoint temperature indirectly, and send offset value to the bus by 2 byte object "Float offset value". Also reset the offset value by 1 bit object "Setpoint offset reset", modified the offset value by 2 byte object "Float offset value". Save the offset value when control mode and operation mode changed.

Three parameters as follow are visible when offset function enabled.

——**Parameter "Step of setpoint offset"**

This parameter is for setting step value of setpoint offset increased/decreased when receiving telegrams. Telegram 1- increase, telegram 0- decrease. Accumulated offset can be saved when power off. Options:

0.5K

1K

Setpoint temperature of current mode = base temperature + fix offset of mode + accumulated additional offset

Note: fix offset of mode is the offset of standby and economy modes compared to comfort mode,

which is decided by the follow parameters of heating/cooling. Accumulated additional offset is adjusted by 1bit object "Setpoint offset", or directly modified the offset value by 2 byte object "Float offset value".

——**Parameter "Min. setpoint offset [-10..0]K"**

This parameter is for setting the maximum offset allowed when negative offset (setpoint temperature is decreased). Options: **-10..0**

——**Parameter "Max. setpoint offset [0..10]K"**

This parameter is for setting the maximum offset allowed when forward offset (setpoint temperature is increased). Options: **0..10**

For offset, the Min. value and the Max. can not equal to 0 at the same time, if not, it can not be modified on ETS.

Automatic H/C mode changeover dead zone (only for comfort mode)

Parameter "Upper/Lower dead zone"

These two parameters are visible when control mode "Heating and Cooling" is selected, and "Automatic changeover" is selected. Setting the dead zone range of auto switchover heating/cooling. Options:

0.5K

1.0K

...

10K

Under heating control, when the actual temperature(T) is greater than or equal to the setpoint temperature + the upper dead zone, then mode heating switch to cooling;

Under cooling control, when the actual temperature(T) is less than or equal to the setpoint temperature + the upper dead zone, then mode cooling switch to heating.

Parameter "Reduced heating in standby mode [0...10]K"

Parameter "Increased cooling in standby mode [0...10]K"

These two parameters are for setting the setpoint of standby mode. Options:

0K

1K

...

10K

Heating: The setpoint of standby mode is the temperature setpoint minus the reference value;

Cooling: The setpoint of standby mode is the temperature setpoint plus the reference value.

Parameter "Reduced heating in economy mode [0...10]K"

Parameter "Increased cooling in economy mode [0...10]K"

These two parameters are for setting the setpoint of economy mode. Options:

0K

1K

...

10K

Heating: The setpoint of economy mode is the temperature setpoint minus the reference value;

Cooling: The setpoint of economy mode is the temperature setpoint plus the reference value.

Parameter "Setpoint temperature in frost protection mode [5…10]°C"

This parameter is for setting the setpoint of frost protection mode. Options:

5°C

6°C

...

10°C

Under the frost protection mode, when room temperature reduce to the setpoint, the controller will trigger a control telegram so that related heating controller will output heating control to prevent the temperature from being too low.

Parameter "Setpoint temperature in heat protection mode [30…37]°C"

This parameter is for setting the setpoint of heat protection mode. Options:

30°C

31°C

...

37°C

Under the heat protection mode, when room temperature raise to the setpoint, the controller will trigger a control telegram so that related cooling controller will output cooling control to prevent the temperature from being too high.

Parameters as follow are visible when the setpoint temperature adopts the absolute adjustment method.

Parameter "Setpoint temperature in comfort mode [5…37]°C"
Parameter "Setpoint temperature in standby mode [5…37]°C"
Parameter "Setpoint temperature in economy mode [5…37]°C"

These parameters are for setting the setpoint temperature in comfort, standby and economy mode when heating or cooling. Options:

5°C

6°C

...

37°C

This parameter is for setting the setpoint temperature in frost protection mode when heating.

Options:

5°C

6°C

...

10°C

This parameter is for setting the setpoint temperature in heat protection mode when cooling.

Options:

30°C

31°C

...

37°C

> ℹ Note: The heating setpoint must be always less than the cooling setpoint.

For absolute adjustment mode, when "Heating and Cooling" is selected, whether it is manual changeover, either bus changeover or automatic changeover, the heating setpoint value must be less than or equal to the cooling of the same operation mode, if not, it can not be modified on ETS.

1.When the ambient temperature is higher than the setpoint temperature of current mode in cooling, it is changed to cooling mode; When the ambient temperature is lower than the setpoint temperature of current mode in heating, it is changed to heating mode.

2.In the same operation mode, the setpoint temperature difference between cooling and heating remains constant, whether it is written on the bus or adjusted on the panel. That is, when adjust the setpoint temperature, it need to update cooling and heating setpoint temperature of current operation mode at the same time.

3.When user operates on the panel or the bus is received setpoint temperature, it is still necessary to limit the value according to the high and low thresholds, that is heating and cooling temperature neither can not be lower than the min., or can not be higher than the max.. If

parameters configuration of ETS is not met the condition, it will be noted warnings:

When the setpoint temperature of comfort/standby/economy mode is less than the min. setpoint temperature, display following warning:

> ❌ The setpoint is less than minimum,so minimum will regard as setpoint in fact

When the setpoint temperature of comfort/standby/economy mode is greater than the max. setpoint temperature, display following warning:

> ❌ The setpoint is greater than maximum,so maximum will regard as setpoint in fact

Note: for relative/absolute adjustment, in protection mode, the setpoint temperature is only configured via ETS, and not limited with the min./max. value. When the received setpoint value from bus is different from the ETS configuration, the value is not updated and returned to the current setpoint temperature, to update synchronously to other devices on the bus.

5.4.3. Parameter window "Heating/Cooling control"

Parameter setting of "Switching on/off(use 2-point control)"

Parameter setting of "Switching PWM(use PI control)"

Parameter setting of "Continuous control(use PI control)"
Fig.5.4.3(1) "Heating/Cooling control" parameter window

Parameters of this window display according to control mode and control system(2 pipe or 4pipe).

Parameter "Type of heating/cooling control"

This parameter is for setting the type of heating/cooling control. Different control types are suitable for controlling different temperature controllers. Options:

Switching on/off(use 2-point control)

Switching PWM(use PI control)

Continuous control(use PI control)

Parameter "Invert control value"

This parameter is for setting whether to invert control value or normal sending control value, so that the control value will be suitable for the valve type. Options:

No

Yes

Yes: Sending the control value to the bus through objects after inverting the control value.

Two parameters as follow are suitable for 2 point control:

——Parameter "Lower Hysteresis [0...200]*0.1K "

——Parameter "Upper Hysteresis [0...200]*0.1K "

These two parameters are for setting the lower/upper hysteresis temperature in HVAC heating or cooling. Options: **0..200**

Under heating control,

When the actual temperature(T) > the setting temperature + the upper hysteresis temperature, then will stop heating;

When the actual temperature(T) < the setting temperature - the lower hysteresis temperature, then will start heating.

For example, the lower hysteresis temperature is 1K, the upper hysteresis temperature is 2K, the setting temperature is 22℃, if T is higher than 24℃, then it will stop heating; if T is lower than 24℃,then it will start heating; if T is between 21~24℃, then it will maintain the previous status.

Under the cooling control,

When the actual temperature (T) < the setting temperature -the lower hysteresis temperature, then will stop cooling;

When the actual temperature (T) > the setting temperature +the upper hysteresis temperature, then will start cooling.

For example, the lower hysteresis temperature is 1K, the upper hysteresis temperature is 2K, the setting temperature is 26℃, if T is lower than 25℃, then it will stop cooling; if T is lower than 28℃, then it will start cooling; if T is between 28~25℃, then it will maintain the previous status.

2-point control mode is a very simple control mode. When adopting this control mode, it is necessary to set the upper hysteresis temperature and the lower hysteresis temperature through parameters. When setting the hysteresis temperature, the following effects need to be considered

1. When hysteresis interval is small, the temperature range will be small, however, frequent sending of control value will bring large load to the bus;

2. When hysteresis interval is large, the switch switching frequency will be low, but it is easy to cause uncomfortable temperature change.
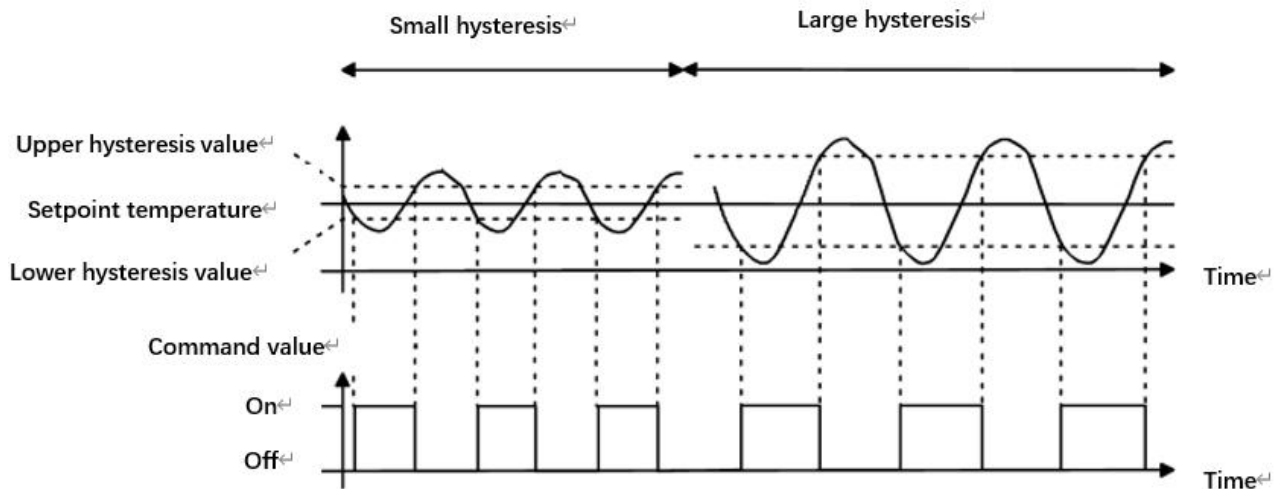
Fig.5.4.3(2) Effects of hysteresis on control value switch action(heating) under2-point control mode

Two parameters as follow are suitable for PI control:

──**Parameter "Heating speed "**

──**Parameter "Cooling speed"**

These two parameters are for setting the responding speed of heating or cooling controller. Different responding speeds are suitable for different environments.

Options:

> **Hot water heating (5K/150min)**
>
> **Underfloor heating (5K/240 min)**
>
> **Electrical heating (4K/100min)**
>
> **Split unit (4K/90min)**
>
> **Fan coil unit (4K/90min)**
>
> **User defined**

Options

> **Cooling ceiling (5K/240min)**
>
> **Split unit (4K/90min)**
>
> **Fan coil unit(4K/90min)**
>
> **User defined**

──**Parameter "Proportional range [10..100]*0.1K"(P value)**

──**Parameter "Reset time [0..255]min"(I value)**

These two parameters are visible when "User defined" is selected. Set the PI value of PI controller.

Options: **10..100 (P value)**

Options: **0..255 (I value)**

This parameter is only visible when the control type is "Switching PWM(use PI control)". Set the period of the control object cycle to send the switch value, the object sends the switch value according to the duty cycle of the control value. For example, if the set period is 10 min and the control value is 80%, then the object will send an open telegram for 8 min. If the control value is changed, the time duty ratio of the on/ off telegram of the object will also change, but the period is still the time of parameter setting.

Options: **1..255**

The PI values of "Switching PWM (use PI control)" output a "on/off" telegram according to the duty cycle of the control value.

Parameter "Send control value on change by [0...100,0=inactive]%"

This parameter is visible when control type is "Continuous control (use PI control)", for setting the changing value of the control value to be sent to the bus. Options: **0..100, 0＝inactive**

Parameter "Cyclically send control value [0...255]min"

This parameter is for setting the period for cyclically sending the control value to the bus. Options: **0..255**

Parameter "Control value lower than the minimum limitation"

This parameter is for setting the action when control value is lower than the minimum limitation. Options:

> **0%=0%，otherwise=Minimum limitation value**
> **To be the minimum limitation value**
> **To be 0%**

0%=0%，otherwise=Minimum limitation value: close when control value is 0%, and operate at the minimum limit when the other is below the minimum limitation.

To be the minimum limitation value: operate at the minimum limit when control value is below the minimum limitation, even if it is 0%.

To be 0%: close when control value is below the minimum limitation.

In PI control mode, the predefined control parameters of each PI controller in heating or cooling system are recommended as follows:

(1) Heating

Heating type	P value	I value(integration time)	Recommended PI control type	Recommended PWM period
Hot water Heating	5K	150min	PWM	15min
Underfloor heating	5K	240min	PWM	15-20min
Electrical heating	4K	100min	PWM	10-15min
Split unit	4K	90min	PWM	10-15min

(2) Cooling

Cooling type	P value	I value(integration time)	Recommended PI control type	Recommended PWM period
Cooling ceiling	5K	240min	PWM	15-20mIn
Split unit	4K	90min	PWM	10-15min

(3) User defined

When the parameter"Heating/Cooling speed" is set to "User defined", the parameter value of P (scale factor) and I (integration time) can be set through the parameter. When adjusting the parameters, refer to the fixed PI value mentioned in the above table. Even if the control parameters are adjusted slightly, the control behavior will be significantly different.

In addition, the integration time should be set properly. If the integration time is too long, the adjustment will be slow, and the oscillation will not be obvious; if the integration time is too small, the adjustment will be fast, but the oscillation will occur. 0 means the integral term is not used.

$$Y=K*(X_1-X_2)+X_1*K*(t/T_N)+Y_1$$
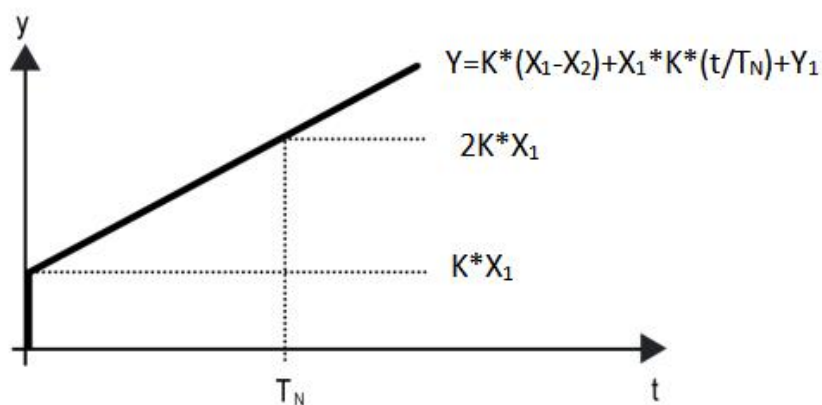
Fig.5.4.3(3) control value of PI control mode

Y: control value

Y1: last control value

X1: temperature deviation = set temperature - actual temperature

X2: last temperature deviation = set temperature - actual temperature

T_N: integration time

K: scale factor (the scale factor is not zero)

PI control algorithm: $Y = K * (X1-X2) + X1 * K * t / T_N + Y1$

When the integration time is set to zero, the PI control algorithm is: $Y = K (X1-X2) + Y2$

Setting and influence of user-defined parameters:

Parameter setting	Effect
K: If the scale range is too small	Quick adjustment, and overshoot will occur
K: If the scale range is too small	Slow adjustment, but no overshoot
T_N: If the integration time is too short	Quick adjustment, but there will be oscillation
T_N: If the integration time is too long	Slow adjustment, no obvious oscillation

5.4.4. Parameter window "Scene"

Fig.5.4.4 Scene" parameter window

This parameter window is visible when scene function is enabled.

Parameter "x->Assign scene NO.[1..64,0=inactive]"(x=1~5)

This parameter is for setting the triggered scene number. Up to support 5 triggered scenes.

Options: **0..64, 0=inactive**

Scenes can be recalled or stored. When a new scene is stored, the original saved new scene is still valid when the voltage is recovered again after the bus has been powered down.

These two parameters as follow are visible when the option is greater than 0:

——Parameter "Temperature"

This parameter is visible when operation mode is disabled. Set the status of setpoint temperature.

Options:

> **Unchange**
>
> **5°C**
>
> **6°C**
>
> **..**
>
> **37°C**

When setpoint temperature of scene is less than the min. setpoint temperature, display following warning:

> ❌ The setpoint is less than minimum,so minimum will regard as setpoint in fact

When setpoint temperature of scene is greater than the max. setpoint temperature, display following warning:

❌ The setpoint is greater than maximum,so maximum will regard as setpoint in fact

———Parameter "Operation mode"

This parameter is visible when operation mode is enabled. Set the status of operation mode.

Option:

        Unchange

        Comfort mode

        Standby mode

        Economy mode

        Frost/heat protection

Chapter 6 Description of Communication Object

The communication object is the medium to communicate other device on the bus, namely only the communication object can communicate with the bus.

NOTE: "C" in "Flag" column in the below table means enable the communication function of the object; "W" means value of object can be written from the bus; "R" means the value of the object can be read by the other devices; "T" means the object has the transmission function; "U" means the value of the object can be updated.

6.1. "General" Communication Object

Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
1	General	In operation			1 bit	C	R	-	T	-	switch	Low
2	General	Summer/Winter mode			1 bit	C	-	W	T	U	switch	Low
3	General	Status of operating voltage failure			1 bit	C	R	-	T	-	alarm	Low

Fig.6.1 "General" communication object

NO.	Object Function	Name	Data Type	Flag	DPT
1	**In operation**	**General**	**1bit**	**C,R,T**	**1.001 switch**
The communication object is used to periodically send a telegram "1" to the bus to indicate this device in normal operation. The period is set by the parameter.				
2	**Summer/Winter mode**	**General**	**1bit**	**C,W,T,U**	**1.001 switch**
The communication object is used to send summer/winter mode to the bus.The telegram value is determined by parameter. The object will send a read request when device voltage recovery.				
3	**Status of operating voltage failure**	**General**	**1bit**	**C,R,T**	**1.005 alarm**

The communication object is used to feedback the status of operating voltage failure, send the failure report if the input voltage can not arrive 24V AC or 230V AC. Send telegram only when the input has changed. Telegrams:

1——Fault

0——Normal

When 24V AC is selected, the input voltage is greater than 2.5V and less than 48V, feedback the normal telegram; while the input is less than 2.5V or greater than 48V, feedback the failure value.

When 230V AC is selected, the input voltage is greater than 48V, feedback the normal telegram; while the input less than 48V, feedback the failure value.

Note: 48V is a threshold voltage to judge the input is 24V AC or 230V AC, and the error is ±10V.

Table 6.1 "General" communication object table

6.2. "Output" Communication Object

Fig.6.2 "Output" communication object

NO.	Object Function	Name	Data Type	Flag	DPT
4	**Control value**	**Output 1-{{...}}**	**1bit** **1byte**	**C,W**	**1.001 switch** **5.001 percentage**
	The communication object is visible when "External controller" is selected. 1bit object is suitable for 2-point control, it is used to control valve switch; And 1byte object is suitable for PI control, it is used to control the valve position. The name in parentheses changes with the parameter "Description (max 30 char.)". If description is empty, display "Output 1-..." by default. The same below.				
5	**Trigger valve purge**	**Output 1-{{...}}**	**1bit**	**C,W**	**1.003 enable**

	The communication object is used to trigger the valve purge. Telegrams:
	
	    1——Start valve purge
	
	    0——End valve purge				

6	**Forced operation**	**Output 1-{{...}}**	**1bit**	**C,W**	**1.003 enable**
	The communication object is used to active/inactive forced operation. Telegram value is defined by parameter.				
7	**Disable**	**Output 1-{{...}}**	**1bit**	**C,W**	**1.003 enable**
	The communication object is used to disable/enable valve output. Telegram value is defined by parameter.				
8	**Status of valve position**	**Output 1-{{...}}**	**1bit**	**C,R,T**	**1.001 switch**

	The communication object is used to feedback the status of valve position to bus. Telegrams:
	
	    1——Close
	
	    0——Open				

9	**Control value fault**	**Output 1-{{...}}**	**1bit**	**C,R,T**	**1.005 alarm**

	The communication object is visible when "External controller" is selected. Used to monitor the control value whether for fault, and send the telegram to bus. Telegrams:
	
	    1——Fault
	
	    0——Normal
	
	Note: when the control value from external sensor is not received in monitoring time, the object will report the control value fault. Once receive the control value, remove fault status.				

10	Status of valve purge	Output 1-{{...}}	1bit	C,R,T	1.003 enable

The communication object is used to feedback the status of valve purge to bus. Send telegram only when the status has changed. Telegrams:

1——Valve purge running

0——Valve purge stop

11	Status of Short-circuit/Overload	Output 1-{{...}}	1bit	C,R,T	1.005 alarm

The communication object is used to feedback the status of output failure, such as short-circuit or overload. Send telegram only when the status has changed. Telegrams:

1——Fault

0——Normal

<center>Table 6.2 "output" communication object table</center>

6.3. "Controller" Communication Object

	Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
	64	Controller 1-...	Power on/off			1 bit	C	R	W	-	-	switch	Low
	65	Controller 1-...	External temperature sensor 1			2 bytes	C	-	W	T	U	temperature (°C)	Low
	66	Controller 1-...	External temperature sensor 2			2 bytes	C	-	W	T	U	temperature (°C)	Low
	67	Controller 1-...	Base setpoint adjustment			2 bytes	C	-	W	-	-	temperature (°C)	Low
	68	Controller 1-...	Setpoint offset			1 bit	C	-	W	-	-	step	Low
	69	Controller 1-...	Float offset value			2 bytes	C	-	W	-	-	temperature difference (K)	Low
	70	Controller 1-...	Setpoint offset reset			1 bit	C	-	W	-	-	reset	Low
	71	Controller 1-...	Heating/Cooling mode			1 bit	C	-	W	-	-	cooling/heating	Low
	72	Controller 1-...	Operation mode			1 byte	C	-	W	-	-	HVAC mode	Low
	73	Controller 1-...	Comfort mode			1 bit	C	-	W	-	-	enable	Low
	74	Controller 1-...	Economy mode			1 bit	C	-	W	-	-	enable	Low
	75	Controller 1-...	Frost/Heat protection mode			1 bit	C	-	W	-	-	enable	Low
	76	Controller 1-...	Standby mode			1 bit	C	-	W	-	-	enable	Low
	77	Controller 1-...	Extended comfort mode			1 bit	C	-	W	-	-	acknowledge	Low
	78	Controller 1-...	Scene			1 byte	C	-	W	-	-	scene control	Low
	79	Controller 1-...	Window contact			1 bit	C	-	W	T	U	window/door	Low
	80	Controller 1-...	Presence detector			1 bit	C	-	W	T	U	occupancy	Low
	81	Controller 1-...	Actual temperature, status			2 bytes	C	R	-	T	-	temperature (°C)	Low
	82	Controller 1-...	Base temperature setpoint, status			2 bytes	C	R	-	T	-	temperature (°C)	Low
	83	Controller 1-...	Setpoint offset, status			2 bytes	C	R	-	T	-	temperature difference (K)	Low
	84	Controller 1-...	Current temperature setpoint, status			2 bytes	C	R	-	T	-	temperature (°C)	Low
	85	Controller 1-...	Heating/Cooling mode, status			1 bit	C	R	-	T	-	cooling/heating	Low
	86	Controller 1-...	Operation mode, status			1 byte	C	R	-	T	-	HVAC mode	Low
	87	Controller 1-...	Comfort mode, status			1 bit	C	R	-	T	-	enable	Low
	88	Controller 1-...	Economy mode, status			1 bit	C	R	-	T	-	enable	Low
	89	Controller 1-...	Frost/Heat protection mode, status			1 bit	C	R	-	T	-	enable	Low
	90	Controller 1-...	Standby mode, status			1 bit	C	R	-	T	-	enable	Low
	91	Controller 1-...	Heating control value			1 bit	C	R	-	T	-	switch	Low
	92	Controller 1-...	Cooling control value			1 bit	C	R	-	T	-	switch	Low

<center>Fig.6.3 "Controller" communication object</center>

NO.	Object Function	Name	Data Type	Flag	DPT
64	Power on/off	Controller 1 - {{...}}	1bit	C,W,R	1.001 switch

The communication object is used to receive the telegram from the bus to control the controller power on/off. Telegrams:

1——On

0——Off

	The name in parentheses changes with the parameter "Description (max 30 char.)". If description is empty, display "Controller 1 - ..." by default. The same below.				
65	External temperature sensor 1	Controller 1 - {{...}}	2byte	C,W,T,U	9.001 temperature
66	External temperature sensor 2	Controller 1 - {{...}}	2byte	C,W,T,U	9.001 temperature
	These two communication objects are used to receive the temperature value detected by the temperature sensor of the device form the bus, up to 2 external temperature sensors. Range:-50~99.8℃				
67	Current setpoint adjustment Base setpoint adjustment	Controller 1 - {{...}}	2byte	C,W	9.001 temperature
	"Current setpoint adjustment" is visible when operation mode is not enabled, and under absolute adjustment. Used to modify the base value of the set temperature; and to modify set temperature value of current room operation mode when absolute adjustment. "Base setpoint adjustment" is visible only when relative adjustment, used to modify the base value of the set temperature, that is, the temperature setting value of the comfort mode, and the setting temperature of the standby mode and the economy mode changes according to the relative change. In the protection mode, only the temperature setting value of the protection mode is modified.				
68	Setpoint offset	Controller 1 - {{...}}	1bit	C,W	1.007 step
	The communication object is visible only when absolute adjustment, and offset function enabled. Used to adjust the offset to adjust setpoint temperature indirectly. The step value set according to the parameter. Telegrams: 1——Increase the offset 0——Decrease the offset				
69	Float offset value	Controller 1 - {{...}}	2byte	C,W	9.002 temperature difference
	The communication object is visible only when absolute adjustment, and offset function enabled. Used to modify the accumulated offset via 2 byte float value.				
70	Setpoint offset reset	Controller 1 - {{...}}	1bit	C,W	1.015 reset
	The communication object is visible only when absolute adjustment, and offset function enabled. Reset offset value when telegram is 1.				
71	Heating/Cooling mode	Controller 1 - {{...}}	1bit	C,W	1.100 cooling/heating
	The communication object is used for switching the heating and cooling via the bus. Telegrams: 1——Heating 0——Cooling				
72	Operation mode	Controller 1 - {{...}}	1byte	C,W	20.102 HVAC mode
73	Comfort mode	Controller 1 - {{...}}	1bit	C,W	1.003 enable
74	Economy mode	Controller 1 - {{...}}	1bit	C,W	1.003 enable
75	Frost/Heat protection mode	Controller 1 - {{...}}	1bit	C,W	1.003 enable
76	Standby mode	Controller 1 - {{...}}	1bit	C,W	1.003 enable
	These communication objects are used to control the RTC operation mode via the bus.				

When 1 byte: object 72 is visible, telegrams: 1-comfort, 2-standby, 3-economy, 4-protection, other reserved.

When 1bit:

     Object 73—— Comfort mode

     Object 74—— Standby mode

     Object 75—— Economy mode

     Object 76—— Protection mode

When the object receives the telegram "1", the corresponding mode is activated. When 1 bit standby object is not enable, and the telegrams of comfort, economy, protection mode are 0, is standby mode. When 1 bit standby object is enable, standby object receives "1" activates standby mode, 0 is ignored.

77	**Extended comfort mode**	**Controller 1 - {{...}}**	**1bit**	**C,W**	**1.016 acknowledge**

The communication object is used for triggering time to extended comfort mode. Telegrams:

     1——Activate comfort mode

     0——No sense

Activate comfort mode when the object receives telegram 1. If receive again telegram 1 in delay time, time will be timed again. And return the previous operation mode from comfort mode once finish timing. If there is a new operation mode in delay time, exit the comfort mode.

If change the operation mode will exit the timing, but switch the heating/cooling will not.

78	**Scene**	**Controller 1 - {{...}}**	**1byte**	**C,W**	**18.001 scene control**

The communication object is visible when scene function enabled. Used to recall/storage scene via bus.

79	**Window contact**	**Controller 1 - {{...}}**	**1bit**	**C,W,U**	**1.019 Window/door**

The communication object is used to receive the switch status of window contact. Telegrams:

     1——Open window

     0——Close window

80	**Presence detector**	**Controller 1 - {{...}}**	**1bit**	**C,W,U**	**1.018 occupancy**

The communication object is used to receive the room occupancy status from presence detector. Telegrams:

     1——Occupied

     0——Not occupied

81	**Actual temperature, status**	**Controller 1 - {{...}}**	**2byte**	**C,R,T**	**9.001 temperature**

The communication object is visible when temperature reference of controller function is combination of 2 external sensors. Used to send the actual temperature after the combination to the bus.

82	**Base temperature setpoint, status**	**Controller 1 - {{...}}**	**2byte**	**C,R,T**	**9.001 temperature**

The communication object is visible only when relative adjustment. Used to send the current base set temperature to the bus.

	Current base set temperature value = parameter set value (or object 67 base value)+accumulated offset value				
83	Setpoint offset, status	Controller 1 - {{...}}	2byte	C,R,T	9.002 temperature difference

The communication object is visible only when relative adjustment. Used to send the accumulated offset value of base set temperature to the bus.

84	Current temperature setpoint, status	Controller 1 - {{...}}	2byte	C,R,T	9.001 temperature

The communication object is used to send current set temperature to the bus.

For relative adjustment, setpoint temperature of current mode =

base temperature + fix offset of mode + accumulated additional offset

85	Heating/Cooling mode, status	Controller 1 - {{...}}	1bit	C,R,T	1.100 cooling/heating

The communication object is used to feedback the telegram of switching cooling and heating function to the bus.

86	Operation mode, status	Controller 1 - {{...}}	1byte	C,R,T	20.102 HVAC mode
87	Comfort mode, status	Controller 1 - {{...}}	1bit	C,R,T	1.003 enable
88	Economy mode, status	Controller 1 - {{...}}	1bit	C,R,T	1.003 enable
89	Frost/Heat protection mode, status	Controller 1 - {{...}}	1bit	C,R,T	1.003 enable
90	Standby mode, status	Controller 1 - {{...}}	1bit	C,R,T	1.003 enable

These communication objects are used to send RTC operation mode status to the bus.

When 1 byte: object 86 is visible, telegrams: 1-comfort, 2-standby, 3-economy, 4-protection, other reserved.

When 1bit:

Object 87—— Comfort mode

Object 88—— Economy mode

Object 89—— Protection mode

Object 90—— Standby mode

When a mode is activated, the corresponding object only sends telegram "1". When 1 bit standby object is not enable, activate standby mode when comfort, economy, protection objects send telegram 0 together. When 1 bit standby object is enable, activate standby mode only when standby object send 1.

91	Heating control value Heating/cooling control value	Controller 1 - {{...}}	1bit	C,R,T	1.001 Switch 5.001 percentage
92	Cooling control value	Controller 1 - {{...}}	1bit	C,R,T	1.001 Switch 5.001 percentage

These two communication objects are used to send control value of heating or cooling function to control the switch of controller valve and adjust the indoor temperature.

Send 1bit telegram value (Switch on/off - 2-point control): on/off

Send 1bit telegram value (Switch PWM - PI control): on/off
Sen 1byte telegram value (Continuous control(use PI control)): 0..100%

Table 6.3 "Controller" communication object table