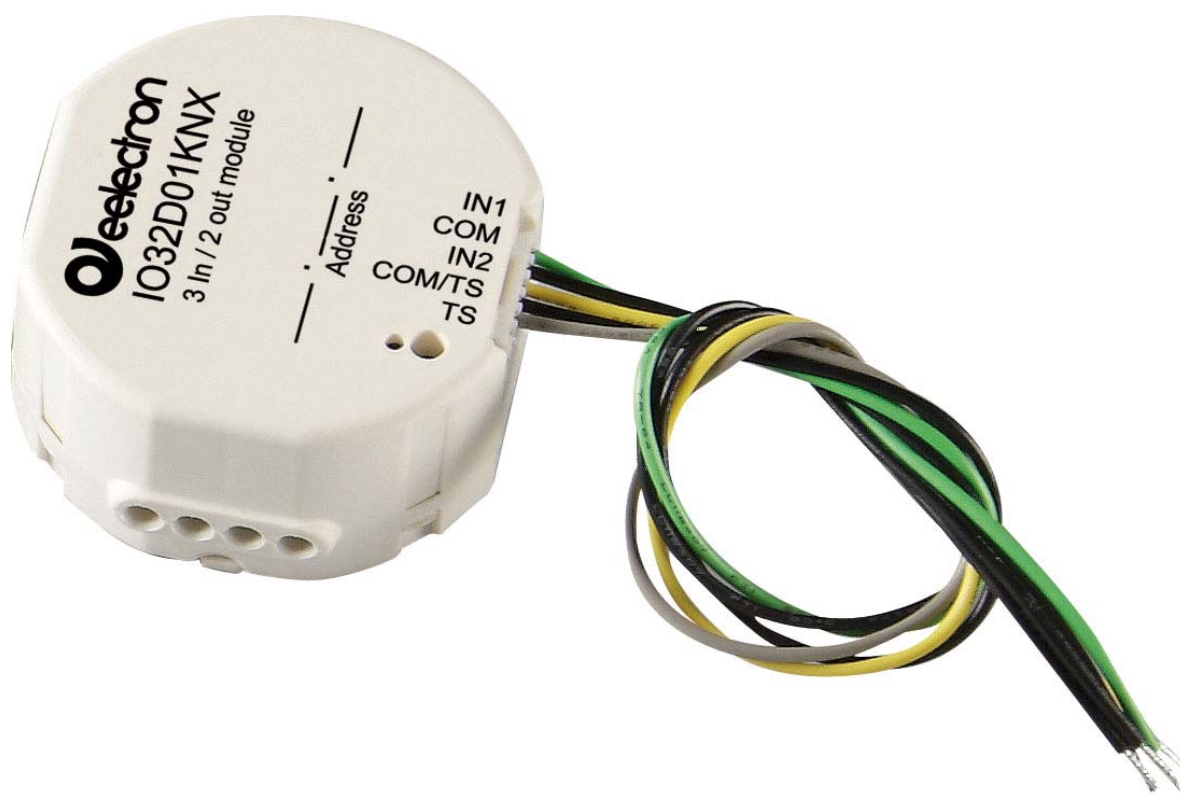**⦿eelectron**

INWALL 3 INPUT / 2 OUTPUT MODULE

IO32D01KNX

Product Handbook

Product:
> IO32D01KNX

Description:
> INWALL 3 INPUT / 2 OUTPUT MODULE

Document
> Version**: 1.4**

Date:
> 07/01/2014

KNX

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Any information inside this manual can be changed without advice.

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

Symbol for relevant information

Symbol for warning

1. General Introduction

This manual is intended to be used by installers and describes functions and parameters of the device IO32D01KNX and how is possible to change settings and configurations using ETS software tool.

2. Product and functional overview

IO32D01KNX module is designed to be installed in Home and Building installations (i.e. offices, hotels, private houses, etc...).
The module includes two digital inputs to interface free potential contacts, one analog input for temperature sensors and two relay output (bistable).

Digital inputs are intended to be connected to sensors, traditional buttons, etc; they can be used to on/off commands, dimming, shutter control, scene recall and control, sequences of 3 objects.

Analog input, can manage one temperature probe (with On/Off threshold) or one thermostats to control heating and cooling equipments, valves, 2 and 4 pipes fan coils; etc..

Analog input, alternatively to the temperature sensor, can manage a Infrared Receiver (IRX) in order to forward to the bus up to 8 channel coming from a Infrared Remote Control (IRC) with on/off commands, scenes, sequences of 2 objects, dimmer and shutter.

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

- TS01A01ACC (from -20°C to +100°C)
- TS01B01ACC (from -50°C to +60°C)

Outputs include switching function with timed delays, staircase function, scene recall, lock or logic function.

Device 2 outputs on board can be configured:

- Each output can be configured independently for load control (2 independent channels)
- Each output can be configured independently for ON / OFF or continuous switching (PWM) for Electric valves (solenoid actuators) (2 independent channels)
- Outputs can be configured in pairs for the management of roller shutters and blinds; (1 channel)

Digital inputs main functions:

- 1 bit commands: load activation / deactivation commands (ON/OFF/TOGGLE) with short press or with differentiation of long and short press
- 1 byte commands (unsigned 0-255 or HVAC commands or value % commands).
- Sending of long action telegrams on the same address of short action or on a different group address
- Cyclic sending
- Sequences (3 commands mixing 1bit/1byte objects) with different group addresses
- Edges for 1 bit / 1 Byte / sequences
- Dimmer management (with single or double push-button)
- Blind / Roller Shutter management (with single or double push-button)
- Scene management
- Input 2 can be used to drive a LED for signaling when Infrared receiver is configured (IRX)

- For digital inputs (IN1, IN2): Max. length of Connecting Cable: **≤ 30 m** (twisted cable)

- For analog input (IN 3): Max. length of Connecting Cable: **≤ 20 m** (twisted cable)

Analog input 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
- Window contact function
- Additional external temperature sensors (optional)

3. General Parameter Configuration

KNX PARAMETER	SETTINGS
Input debounce time	40 ms 80 ms 100 ms 150 ms 200 ms 600 ms 1 sec.

When a button connected to the input is pressed it is possible to have the contact opened or closed more than once before fixing into a stable position; this can be caused by a rapid succession of bounces between mechanicals contacts. For this reason it is important to determine a correct value of the parameter "debounce time" to avoid these bounces could be taken by the device as input switching.

How this parameter works: after the device has detected a change of status for an input channel, it waits for a time equal to the time set as "debounce time" before updating the value of the corresponding data point. The input signal is not evaluated during this time.

This parameters affects all 8 device input channels (where present)

Delay on Power-up	5 ÷ 15 seconds

Through this parameter is possible to set the delay of transmission of telegrams after a power on by selecting the time by which the device is allowed to send telegrams.

In large systems after a power failure or shutdown this delay avoids to generate excessive traffic on the bus, causing slow performance or a transmission block.

If there are different devices requiring sending telegrams on the bus after a reset, these delays must be programmed to prevent traffic congestion during the initialization phase.

The input detection and the values of objects are updated at the end of the transmission delay time

At the end of ETS programming the device behaves like after a power on.

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

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

4. Channels Configuration

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

KNX PARAMETER	SETTINGS
Inputs 1 and 2	Single Combined

Single: each channel can be configured independently
Combined: IN1 and IN2 combined to perform dimmer or shutter/blind function

KNX PARAMETER	SETTINGS
Analog input 3	Temperature sensor Thermostat

"Temperature Sensor": measures and sends temperature on the bus
"Thermostat" : controls different types of actuators regulating heating and cooling

5. Digital input <x> Configuration

For each of the 2 input channels, present on the device, the selections are made through a configuration page.

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

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

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

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

5.1. Activation on press / edge

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

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

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

Configurations for 1 bit object in events of closing or opening contact:

- Nothing (no telegram)
- On
- Off
- Toggle

Configurations for 1 bit object in events of closing or opening contact:

- Value 0-255 (generic signed int)
- Value o-100% (scaling value in steps of 5%0)
- HVAC Mode value (according to DPT_HVACMode 20.102)
  - AUTO
  - COMFORT
  - STANDBY
  - ECONOMY
  - BUILDING PROTECTION

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

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

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

Note 3:

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

Feedback object	Enabled Disable

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

Send Telegram on power up	Enabled Disable

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

Note 1:
If you enable the sending of the telegram for an input where you have already set the cyclic sending ; then the cyclic sending will start automatically at power on; at the end of the first period.

Note 2:
If the command selected is "TOGGLE", the first value sent is always 1 because the CO value on power on is 0.

5.2.   Activation short/ long press

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

TPL =MINIMUM TIME FOR LONG PRESS
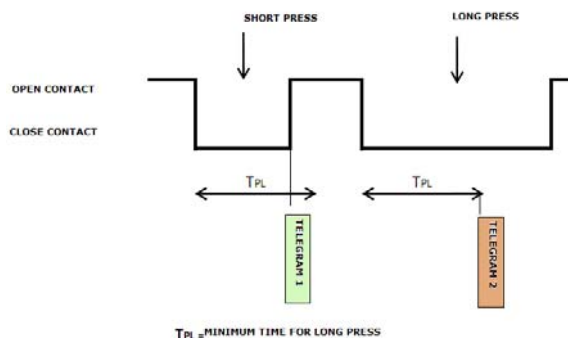
When contact is closed and the debounce time is over then counting time to contact closure starts; if the contact is opened again (note that debounce time is considered also in contact opening) before time exceeds TPL time, device executes the command associated with the event of "short press" and if, on the contrary, TPL timeout expires and contact is still closed then the command associated with the event of "long press" is executed.

The parameters and mode of transmission of telegrams can be managed through "activation on long and short press" are the same set with the configuration "Activation of press (edge)" to the exclusion of the function of cyclic sending that is not provided here.

5.3.   Input: Dimming

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

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

5.4.   Input: Shutter and Blind

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

Each input uses 2 communication objects:

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

5.5. Input: Scene Management

In this configuration page it's possible to set the input channel for scene management: learn and recall scene commands.

These different behaviour (recall and learn) are performed through two different actions (short and long press) of a push button connected to the input channel.

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

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

5.6. Commands in sequence

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

For example it is possible to define a sequence:

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

6. Temperature Probes

NTC temperature probe eelectron code TS01A01ACC or TS01B01ACC.

- TS01A01ACC (from -20°C to +100°C)
- TS01B01ACC (from -50°C to +60°C)
- Max. length of Connecting Cable: ≤ 20 m (twisted cable)

TS01A01ACC
Dimensions in millimetres
NTC resistence tolerance: ± 3% Measure range   -20°C ÷ +100°C Cable: 2 wire single insulation Cable colour: Black NTC colour: Black Warning: keep at least 6 mm from all live parts ⚠

TS01B01ACC
D1 = 9 mm D2 = 4 mm   L2 = 49 mm L1 = 1250 mm NTC resistence tolerance: ± 2% Measure range   -50°C ÷ +60°C Cable: 2 wire double insulation Cable colour: White NTC colour: White Warning: keep at least 3 mm from all live parts ⚠

7. Temperature Sensor Function

The temperature probe allows a reading of the temperature within its range with resolution 0.1 ° C.

KNX PARAMETER	SETTINGS
Temperature sensor calibration	-1,5°C ÷ +1.5°C with resolution, 0,1°C
It's 'possible to add an offset to the temperature value measured by the probe before it is sent on the bus or made available for reading.	
Temperature cyclic sending	Disable Enable
It's 'possible to enable the periodic sending of measured temperature value, if this option is disabled, reading can be done only on read-request.	
Sending interval	1 min ⁄ 30 min 5 min ⁄ 1 h 10 min ⁄ 4 h 15 min ⁄ 12 h 45 min ⁄ 24 h
If you enable the periodic sending the sending interval is set by this parameter.	

KNX PARAMETER	SETTINGS
Enable threshold T1 (low)	Disable Enable
You can also enable two thresholds for temperature and, for each thresholds, send a telegram of attention (of size 1 bit) whenever the measured temperature exceeds or falls below the threshold. For each threshold can be set whether to send the telegram "1" when the measured temperature "T" exceeds the threshold temperature "Tx" and then send the telegram "0" when the measured temperature "T" becomes less than the threshold temperature "Tx "or vice versa	
Enable threshold T2 (high)	Disable Enable
See description of "**Enable threshold T1 (low)"**.	
Value threshold T1	-15°C ÷ +55°C
Value threshold T2	-15°C ÷ +55°C
Telegram to send when T < T1	Telegram "0" Telegram "1"
Telegram to send when T > T2	Telegram "0" Telegram "1"
Object enable for Trigger 1 and 2	Hide Show

It's 'possible to enable/disable the remote temperature sensor with a communication object. When this object is enabled and receives a telegram "1" the temperature probe is active and sends trigger telegrams according to thresholds T1 and T2 values; otherwise only temperature value is periodically sent.

Initial value enable object	0 1
Allows to initialize enable object as active (1) or inactive (0) after power on, reset or download.	

8. Thermostat Function

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

- The thermostat operates temperature in a range from -50 ° C to + 100 ° C with 0.1 ° resolution.
- Setpoint values sent to the device on the bus are accepted in a range from 10°C to 35°C (from 10°C to 50°C from serial number 00048489)
- Setpoint accepted in SETPOINT MODE are in a range from 0°C to 35 °C from 10°C to 50°C from serial number 00048489)

9. Target Setpoint Settings

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

- HVAC Mode
- SETPOINT Mode

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

SETPOINT MODE object

When "Thermostat control mode" parameter is selected with the value SETPOINT MODE, object HVAC Mode is no longer visible.
Each time the thermostat receives a value on object SETPOINT MODE (2 byte size), it is used as setpoint for temperature control.

HVAC MODE object (switched heat / cool)

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

HVAC MODE object (automatic heat / cool)

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

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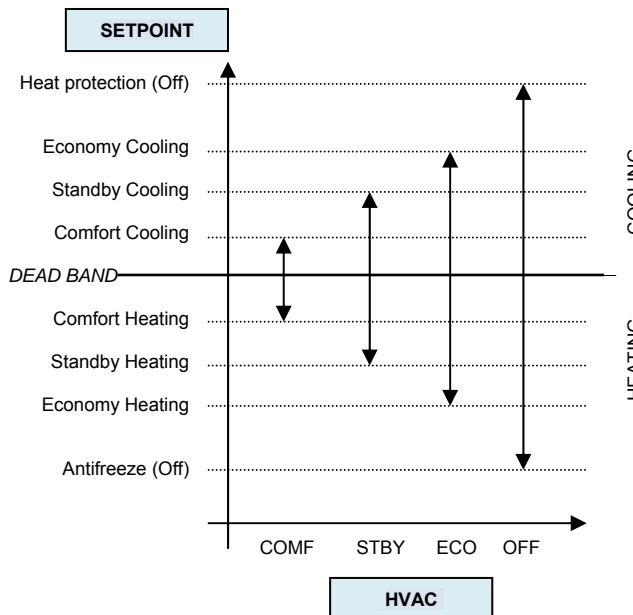
SETPOINT COMFORT object
SETPOINT STANDBY object
SETPOINT ECONOMY object

These 2 byte objects are used to set the setpoint values for COMFORT, STAND-BY, ECONOMY mode.
Whenever change, the setpoint are in saved in memory.
After download these setpoint are reset to values according to ETS parameter; on power up these object are set according to last values before power down.

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

SETPOINT OBJECTS	
Telegram received on:	**Setpoint changed:**
COMFORT (OBJ # 31)	Setpoint comfort heating
STANDBY (OBJ # 30)	Setpoint standby heating
ECONOMY (OBJ # 29)	Setpoint economy heating
COMFORT (OBJ # 32)	Setpoint comfort cooling
STANDBY (OBJ # 33)	Setpoint standby cooling
ECONOMY (OBJ # 34)	Setpoint economy cooling

COMFORT object

COMFORT object (1 bit size) is visible only when "Thermostat control mode" parameter is selected with the value HVAC MODE.

When a telegram "1" is received thermostat goes in COMFORT mode (it applies for both heating and cooling)

On receipt of a telegram "0", thermostat returns to the mode set by HVAC MODE object.

COMFORT mode can be set also with timing: after a time set by a parameter thermostat returns in the previous mode.

KNX PARAMETER	SETTINGS
Comfort Object	Time limited Time unlimited
Comfort Overwrite Time	1.. 255 (minutes)

WINDOW CONTACT object

This object, if enabled, has higher priority than HVAC MODE, SETPOINT MODE, COMFORT objects.

When a telegram is received ("0" or "1") on the communication object WINDOW CONTACT thermostat enters a power saving mode:

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

If the telegram received indicates that the window is opened thermostat change its mode or setpoint after 1 minute from the reception of the telegram.

When it receive a telegram corresponding to state "window closed" it restores the previous mode, always with a delay of 1 minute . The value of SETPOINT ADJUSTMENT (if enabled) is always restored.

SETPOINT ADJUSTMENT object

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

If the thermostat is operating in "HVAC MODE" the offset value is applied from the time of receipt of a valid telegram on object SETPOINT ADJUSTMENT until this value does not change, even in case of change of the active mode (Comfort and Standby only); this does not happen with regard to Economy mode and Building Protection: in this modes the value of object SETPOINT ADJUSTMENT is forced to 0.

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

ADDITIONAL TEMPERATURE object

It is possible to enable the reading of a second external probe which sends the measurement data to the thermostat via the communication object ADDITIONAL TEMPERATURE of size 2 bytes.

KNX PARAMETER	SETTINGS
Ratio between internal and additional sensor	90 % internal–10 % external 80 % internal–20 % external 70 % internal–30 % external 60 % internal–40 % external 50 % internal–50 % external 40 % internal–60 % external 30 % internal–70 % external 20 % internal–80 % external 10 % internal–90 % external Additional sensor only
This parameter set the "weight" to assign to internal and additional temperature;	
Surveillance time for additional sensor	10..255 (min)
Whenever the thermostat receive a valid data from additional temperature sensor it consider this value in the calculation of the measured temperature and reset the internal time (monitoring time), if the surveillance time expires without receiving any valid data thermostat start considering only the internal probe (at 100%) until it receives a new valid data. (see paragraph 10 "Temperature probe failure / out of range measurement ")	

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

- It is strongly recommended to set a value for surveillance time of the additional sensor more than twice of the period set for the cyclical sending of the additional sensor.

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

on/off control in heating mode:

THE MEASURED TEMPERATURE RISE ABOVE THE VALUE OF SETPOINT + DIFFERENTIAL: THERMOSTAT SENDS A OFF COMMAND

TARGET SETPOINT + DIFFERENTIAL

REGULATION DIFFERENTIAL

TARGET SETPOINT

THE MEASURED TEMPERATURE DECREASES BELOW THE VALUE OF SETPOINT THERMOSTAT SENDS A ON COMMAND

ACTUAL SETPOINT object

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

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

9.1. Two points on/off

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

on/off control in cooling mode:

THE MEASURED TEMPERATURE RISE ABOVE THE VALUE OF SETPOINT: THERMOSTAT SENDS A ON COMMAND

TARGET SETPOINT

REGULATION DIFFERENTIAL

TARGET SETPOINT - DIFFERENTIAL

THE MEASURED TEMPERATURE DECREASES BELOW THE VALUE OF SETPOINT - DIFFERENTIAL THERMOSTAT SENDS A OFF COMMAND
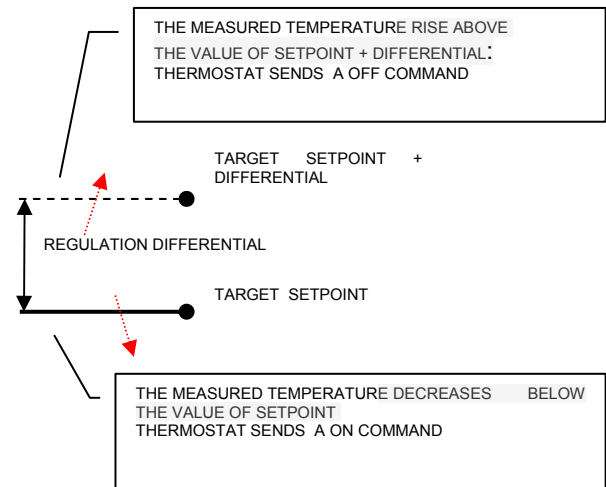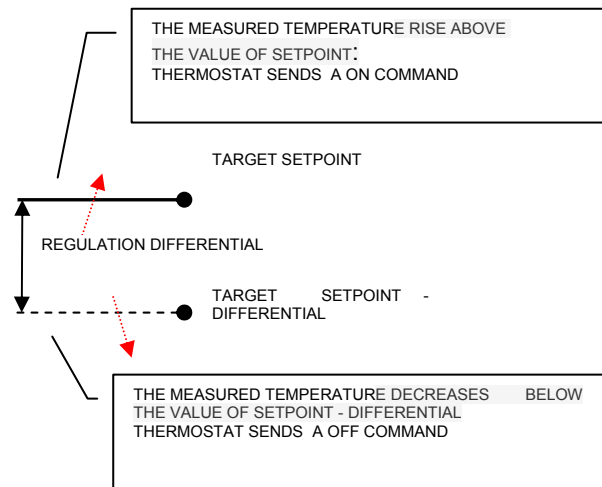
9.2. On/off with PWM control

On/off with PWM control is an algorithm that reduces the effects of hysteresis around the set point value by adjusting the controls on the values ranging from 0% to 100% where 0% means "control off" and 100% means "maximum control action".

Once a cycle time is defined the thermostat sets the actuator to ON for a fraction of the cycle time and OFF for the remaining part. Driving the actuator with the control value of 80% means that it is active (i.e., ON) for 80% of cycle time and OFF for the remaining 20%.

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

PWM control in heating mode:
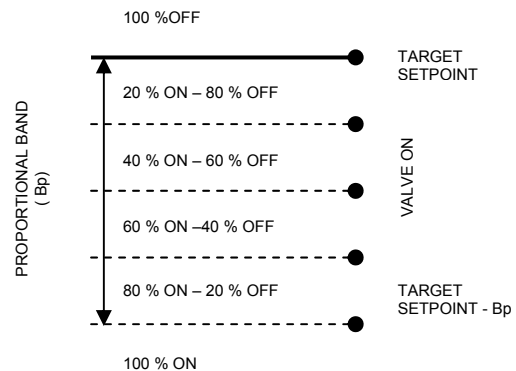
PWM control in cooling mode :
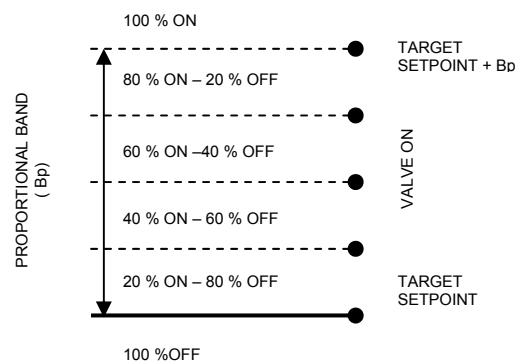
9.3. Fan coil on/off

Fan coil is a device that controls the flow of cooling / heating liquid driving a valve (2-pipe fan coil) or two valves (4-pipe fan coil).

Liquid exchanges heat/cool with the environment through a ventilation system controlled by a fan. The fan is driven by an engine that typically has 3 windings that can be enabled at 3 distinct speeds.

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

VENTILATION OFF   Tm
VALVE OFF
● TEMP. SP + Tdrv1

V1 ACTIVE   REGULATION DIFFERENTIAL:Tdrv1
● TEMP. SP Tsp

VALVE ON   V1 ACTIVE   REGULATION DIFFERENTIAL:Tdrv1
● TEMP. SP - Tdrv1

V2 ACTIVE   REGULATION DIFFERENTIAL:Tdrv2
● TEMP. SP – Tdrv1 – Tdrv2

V3 ACTIVE

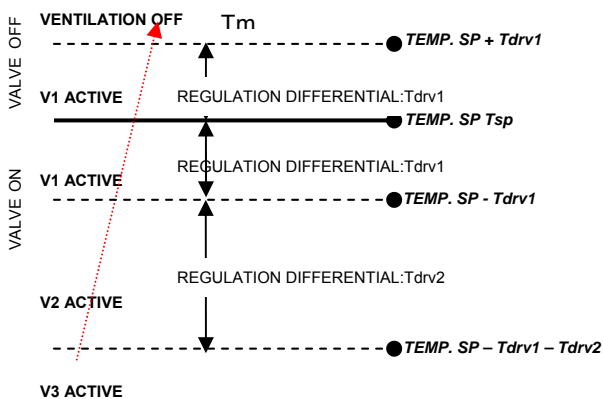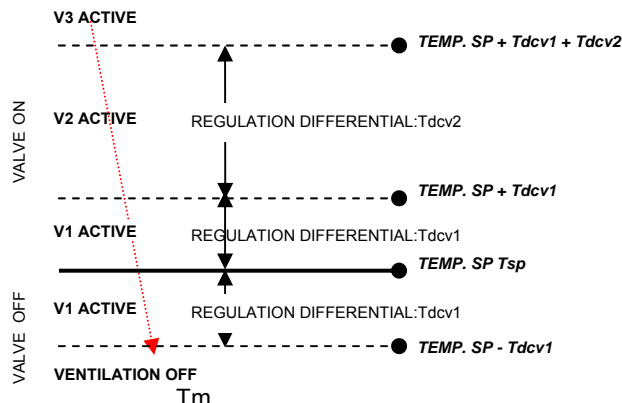**Control logic for a 3 speed fan coil in cooling:**
When temperature decreasing

V3 ACTIVE
● TEMP. SP + Tdcv1 + Tdcv2
VALVE ON
V2 ACTIVE   REGULATION DIFFERENTIAL:Tdcv2
● TEMP. SP + Tdcv1

V1 ACTIVE   REGULATION DIFFERENTIAL:Tdcv1
● TEMP. SP Tsp

VALVE OFF   V1 ACTIVE   REGULATION DIFFERENTIAL:Tdcv1
● TEMP. SP - Tdcv1

VENTILATION OFF
Tm

When temperature decreasing

VALVE OFF   VENTILATION OFF
● TEMP. SP + Tdrv1

VENTILATION OFF   REGULATION DIFFERENTIAL:Tdrv1
● TEMP. SP Tsp

VALVE ON   V1 ACTIVE   REGULATION DIFFERENTIAL:Tdrv1
● TEMP. SP - Tdrv1

V2 ACTIVE   REGULATION DIFFERENTIAL:Tdrv2
● TEMP. SP – Tdrv1 – Tdrv2

V3 ACTIVE   Tm

When temperature increasing

V3 ACTIVE   Tm
● TEMP. SP + Tdcv1 + Tdcv2
VALVE ON
V2 ACTIVE   REGULATION DIFFERENTIAL:Tdcv2
● TEMP. SP + Tdcv1

V1 ACTIVE   REGULATION DIFFERENTIAL:Tdcv1
● TEMP. SP Tsp

VALVE OFF   VENTILATION OFF   REGULATION DIFFERENTIAL:Tdcv1
● TEMP. SP - Tdcv1

VENTILATION OFF

Where:

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

Where:

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

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

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

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

CONTINUOUS CONTROL object

This 1 Byte object send % control value to actuator.

SET MAN/AUTO MODE object

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

10. Temperature probe failure / out of range measurement

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

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

TEMPERATURE SENSOR ALARM object

In event of temperature probe failure / out of range measurement a telegram from 1 bit communication object - obj #39: "Temperature sensor alarm" - is sent on the bus with value 1. As soon the temperature sensor works good again a value "0" is transmitted.

To correctly manage the use of internal and/or additional refers to the following possible configuration modes:

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

Measure of temperature is performed every 60 seconds; if the temperature probe is disconnected or in short circuit the control action is interrupted and the controlled actuators are switched off.

probe disconnection / short circuit / out of range measurement:

Obj #21 "Actual temperature" transmits 0 °C
Obj #39 "Temperature sensor alarm transmits "1"

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

Measure of internal temperature is performed every 60 seconds; the additional temperature is read every 60 considering last value received on Obj #22 "Additional temperature".

The value of temperature sent on the bus is the pounded average between internal and additional probes value.

If the additional temperature is out of range or the surveillance time expires without any message received, thermostat start considering only the internal probe until it receives a new valid value from the additional probe; in this case the additional value is taken in count again.

Anyway, if the internal temperature is out of range or probe is disconnected / short circuit then the control action is interrupted and the controlled actuators are switched off:

Obj #21 "Actual temperature" transmits 0 °C regardless the value received from additional sensor.
Obj #39 "Temperature sensor alarm transmits "1"

When internal probe starts again to measure a "in-range" value thermostat start again its control action.

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

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

If internal probe is anyway connected (but not used until additional probe is working good) then in event of failure of the additional probe the internal probe is used (see behaviour of configuration mode 1).

When additional probe begin to measure a "in-range" value thermostat start again its control action and return to consider the additional probe.

11. Behavior of Thermostat on voltage failure, recovery and commissioning.

Behavior on bus voltage failure

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

Behavior on bus voltage recovery

On bus voltage recovery all the communication objects are set to 0 except for objects for which a parameter is defined for the initial value.
Thermostat keeps these values in memory and restore them after recovery:
- Heat / Cool mode (if enabled)
- HVAC Mode (if enabled)
- Base Setpoint (if enabled)
- Force value in manual mode (if enabled)

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

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

Behaviour on commissioning (ETS Download)

After download it is possible to set initial value of:
- Heat / Cool mode (if enabled)
- HVAC Mode (if enabled)
For other communications objects the behavior is identical to bus voltage recovery.

Wrong application download

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

KNX

12. Remote control

Analog input, alternatively to the temperature sensor, can manage a Infrared Receiver (IRX) in order to forward to the bus up to 8 channel coming from a Infrared Remote Control (IRC) with on/off commands, scenes, sequences of 2 objects, dimmer and shutter.

This feature requires an accessory for infrared receiver and a infrared remote control:

IRX cabling - code: **IR00A01ACC**

This cabling provide a Infrared receiver; digital input 1 and 2 with one common wire are always available. Input 2 can be configured as a signalling led to show when a proper infrared command is received (connecting eelectron LED code LD00A0xACC or LD00A1xACC).

IRC device – code: **RC01A01IRC**
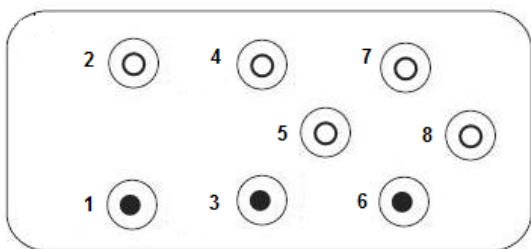
- • Infrared Remote Control needs a CR2025 battery (included)

Infrared Remote Control provide 8 channels for the IRX in order to forward on KNX bus simple commands (on/off; toggle, scenes, sequences of 2 objects, 1 dimmer or 1 shutter.

Remote control has 8 channels that can be configured independently; then channels 5,6,7,8 can be set together to integrate a special function.

- ⚠ • When IO32D01KNX device is enabled to manage infrared receiver and infrared remote control the temperature sensor cannot be connected anymore and is not possible to enable the thermostat function.

- • There are no special procedures to link together IO32D01KNX device and a RC01A01IRC remote control: only in ETS it is necessary to enable the peripheral Infrared receiver. This means that every remote control can be received by any IO32D01KNX, this must be taken in count to avoid unexpected behaviours.

- • Consider that the communication between infrared receiver and remote control is optical (infrared) therefore the remote control must "see" the infrared receiver.

- • The maximum distance between remote control and infrared receiver is 8 mt. And the maximum angle is 90° (45° left or right)

- • To have a reliable communication between infrared receiver and remote control it is necessary to direct the remote control at the point where the infrared receiver is installed.
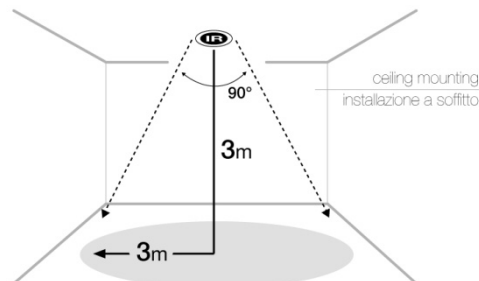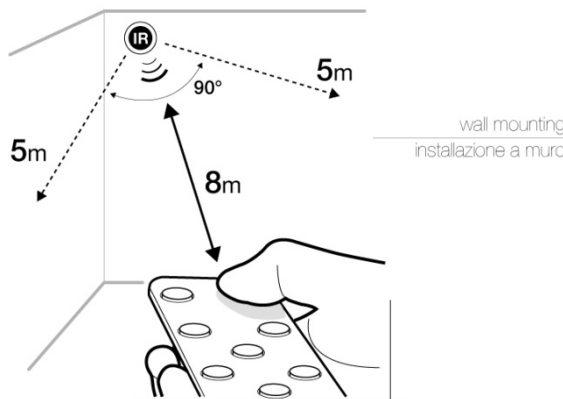
- Do not install IRX on direct sunlight to avoid decreasing of performances.

no direct sunlight
non esporre direttamente
alla luce solare
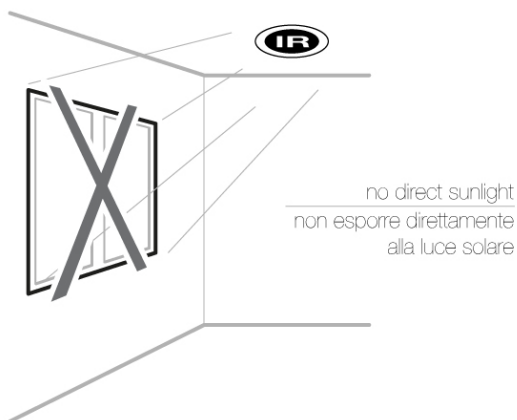
- Do not install IRX too near to fluorescent lamps to avoid decreasing of performances.

fluorescent lamp
luce fluorescente
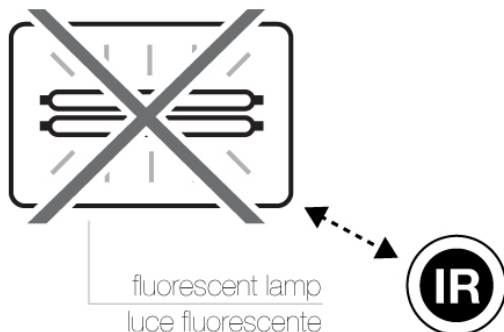
12.1. Remote control configuration

Buttons on **RC01A01IRC** remote control are indicated as follow:
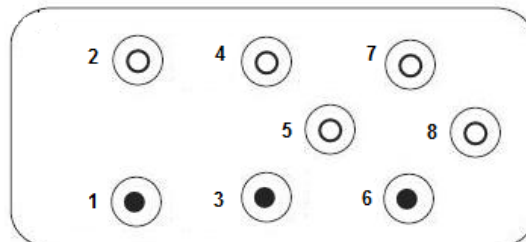
Every channel on the remote control can be configured to perform one of the following functions:

- Activation on press
- Scene
- Command sequences (channels form 1 to 4)

12.2. Activation on press

Configurations for 1 bit object in events pressing the remote control button:

- On
- Off
- Toggle

Configurations for 1 byte object in events of pressing the remote control button:

- Value 0-255 (generic signed int)
- Value o-100% (scaling value in steps of 5%0)
- HVAC Mode value (according to DPT_HVACMode 20.102)
  o AUTO
  o COMFORT
  o STANDBY
  o ECONOMY
  o BUILDING PROTECTION

12.3. Scene

In this configuration it's possible to set the remote control channel for scene management: only recall scene command is avalable.

KNX PARAMETER	SETTINGS
Scene Number	Number of the scene: 0 ÷ 63

This parameter sets the value of the scene you intend to 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.

12.4. Commands sequences

The function allows you to associate the action of pressing the remote control button a single sequence of different commands on the bus.
The sequence consists of 2 commands which can each be sized as 1 bit or 1 byte; you can associate different commands to each element of the sequence or decide to send commands only on one of the two events.
The waiting time between a command and the next is fixed in 1 second.
Each object communication can be connected to a different group address.

For example it is possible to define a sequence:

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

12.5. Special Function for buttons 5,6,7,8

Buttons 5,6,7,8 can be configured together to implement a single "special function".
Special function available are :

- Dimmer
- Shutter
- HVAC Mode
- Manual Fan Coil
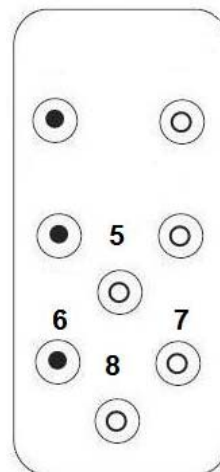
DIMMER:

Button 5: Light ON
Button 8: Light OFF
Button 6: Light Brightness Increment
Button 7: Light Brightness Decrement

SHUTTER:

Button 5: Shutter UP
Button 8: Shutter DOWN
Button 6: Shutter Stop / Shutter Step UP
Button 7: Shutter Stop / Shutter Step DOWN

HVAC MODE:

Button 5: BUILDING PROTECTION Mode
Button 8: STANDBY Mode
Button 6: COMFORT Mode
Button 7: ECONOMY Mode

MANUAL FAN COIL:

This mode acts on 2 different communication object: 1st is a 1 byte obj to set the % value of the fan coil speed, 2nd is a 1 bit obj to set to MAN (=0) the manual/auto mode of fan coil controllers.

Every 1 byte value of the buttons can be selected from 0% to 100% in steps of 5%.

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13. Output Configuration

Device 2 outputs on board can be configured:

- Each output can be configured independently for load control (2 channels)

- Each output can be configured independently for ON / OFF or PWM switching for Electric valves (solenoid actuators) (2 channels)

- Outputs can be configured in pairs for the management of shutters; (1 channel)

14. Generic load control

This configuration is ok to control lights or other loads accordingly to the maximum acceptable load for every type of lamp / load (see instruction sheet).

KNX PARAMETER	SETTINGS
Contact Type	NO – Normally Open NC - Normally Close
With this parameter you can set the operating mode of the relay. The relay can be used as "open contact" or "close contact"; This difference is logical because the relay has only one pole and it is not available a terminal connected to the NC contact	

OUTPUT (Relay status)	NO – Normally Open	NC – Normally Close
ON (Activated)	NO contact is closed	NC contact is open
OFF (Deactivated)	NO contact is open	NC contact is closed

| KNX PARAMETER	SETTINGS
Behaviour on power down	ON OFF STOP – no movement
When bus voltage fall down under approximately 18V device enters the power down routine and it is possible to set the status of the relay status.	
Behaviour on power up	ON OFF Keep status before Power down
On power up it is possible to set the status of each relay with this parameter	

- When value "Keep status on power down" for the parameter "**Behaviour on power up**" is selected, then it is maintained in memory the state of the relay before the power down sequence which can change the relay status accordinglt to the parameter "*Behaviour on power down"*

| KNX PARAMETER	SETTINGS
Activation telegram	Telegram "0" Telegram "1"
For every function above selected you can set a parameter to determine if the function is activated with a telegram "0" (and then off with "1") or is activated with telegram "1" (and then off with "0");	
Timing Function	ON / OFF with delay ON with delay/ timing OFF
ON / OFF with delay it is possible to set a delay between the reception of a telegram and the switch of the relay ; for both telegrams: activation and deactivation ON with delay / timing OFF it is possible to set a delay between the reception of a telegram of activation and the switch of the relay; the OFF switch is automatic after a configurable time (staircase timer)	
Relay Feedback	Disabled When status changes On request
Disabled Status is never transmitted ad related communication object is not visible When status changes Status is transmitted every time the relay switch changing his status from ON to OFF or from OFF to ON. On request Status communication object is available and updated when status changes but the telegram is not transmitted. Read propriety is enabled.	
Telegram value for status sending	Telegram "0" when value is OFF Telegram "0" when value is ON
This parameter defines which telegram value is associated to the ON or OFF status.	

KNX

14.1. Function ON/OFF

Function ON/OFF is always available through communication object <Output x> Relay Command.

Behavior of the relay set to "NO" and "NC" when activation telegram is telegram "1":
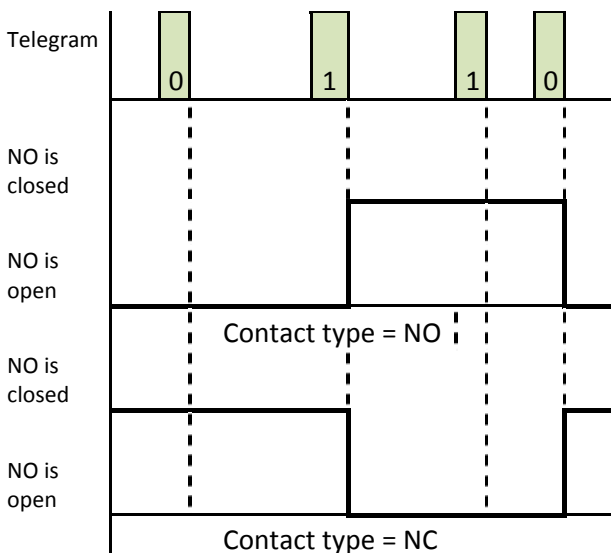
Behavior of the relay set to "NO" and "NC" when activation telegram is telegram "0":
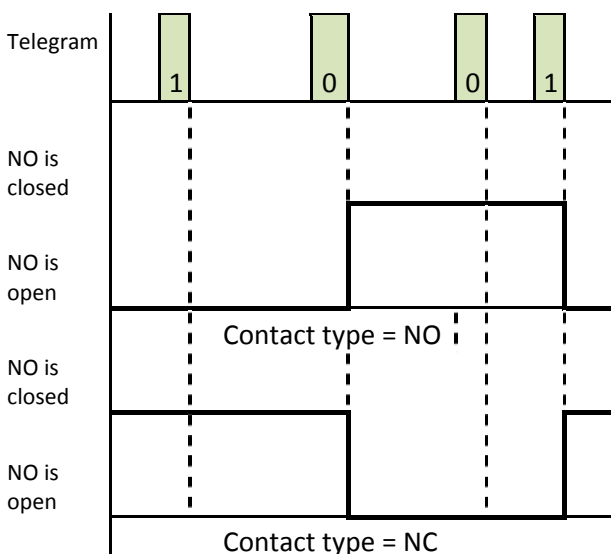
14.2. Timing Functions

It's always possible to manage, for each relay, on/off commands and timing commands in order to select if switch it on/off for indefinite time or with timing function. Timing function is activated by receiving a command on the communication object <Output x> Relay Timing Command.

Two possible timing fun functions:

- **ON / OFF with delay**: it is possible to set a delay between the reception of a telegram and the switch of the relay ; for both telegrams: activation and deactivation

- **ON with delay / timing OFF**: it is possible to set a delay between the reception of a telegram of activation and the switch of the relay; the OFF switch is automatic after a configurable time (staircase timer)

14.3. Function ON/OFF with delay

In this configuration it is possible to set a time delay on the relay activation (TON) and also a delay time for the relay deactivation (TOFF)

The opening and closing of the contact, when the parameters are different from zero, occurs later than the receipt of the telegram. Activation and deactivation delays are set separately.

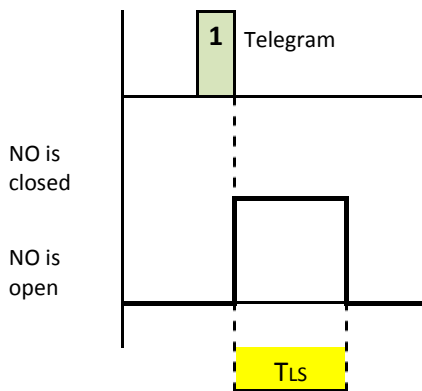| KNX PARAMETER	SETTINGS
Delay on Activation	True False
Delay on Deactivation	True False
Delay on Activation (Base Time)	1 sec. 1 minute 1 hour
Delay on Activation (Factor)	1.. 255
The delay time between the receipt of a telegram and the execution of the command is given by : Delay of Activation Time = Delay on Activation (Base Time) x Delay on Activation (Factor)	
Delay on Deactivation (Base Time)	1 sec. 1 minute 1 hour
Delay on Deactivation (Factor)	1.. 255
The delay time between the receipt of a telegram and the execution of the command is given by : Delay of Activation Time = Delay on Deactivation (Base Time) x Delay on Deactivation (Factor)	

14.4. Function ON with delay/timing OFF

After receiving a telegram from the Relay Command Object, the relay is active for a time (TLS) that can be set by a parameter; when TLS expires, it turns off automatically.

It is also possible to set a delay on activation time (TON) (see "ON with delay" function).

"Duration of relay activation" (TLS) and "ON delay time" (TON) are programmable by ETS.
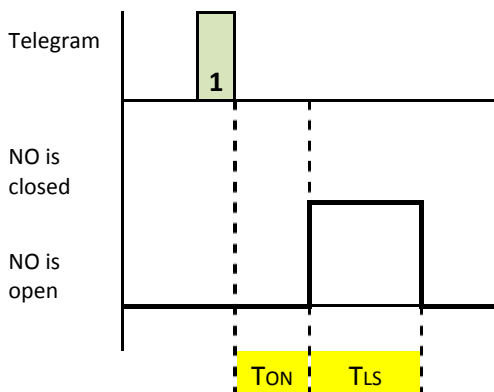
"ON delay time" (TON) can be disable by ETS.

KNX PARAMETER	SETTINGS
Timing can be stopped	True False
This allows you to set the behaviour of the device when it receives a OFF command: True On receiving a OFF command, the device immediately executes the command and switch off the relay without waiting the end of the timing phase False On receiving a OFF command, the device ignores the command and continues the timing phase; the load is deactivated at the end of the set time and it is not possible to deactivate it using a bus command.	

Warning Function	True False
Warning Time (seconds before time ends)	15 sec 30 sec 1 min. 2 min
Switch Off Time	0,5 sec 1,0 sec 1,5 sec 2,0 sec
Here you can set the warning time before the deactivation of the stairway light function, upon which the device will consequently signal the imminent termination of the stairway light function by switching off, for a brief time, the light.	

Duration of relay timing can be stopped with an OFF command:
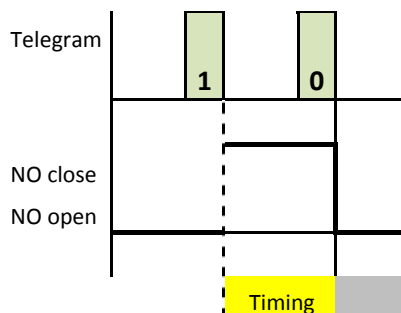
Warning Function:
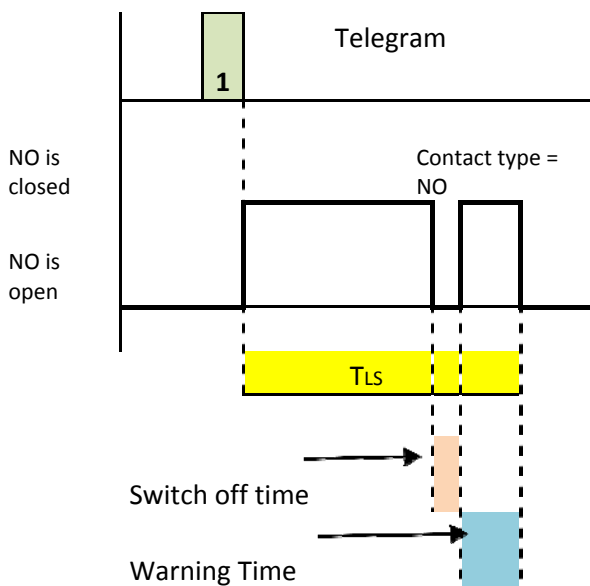
Duration of relay timing is re-triggerable:

Extension Mode:

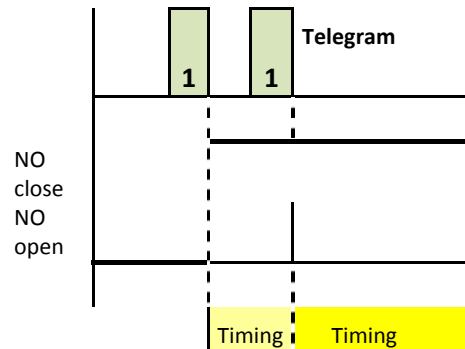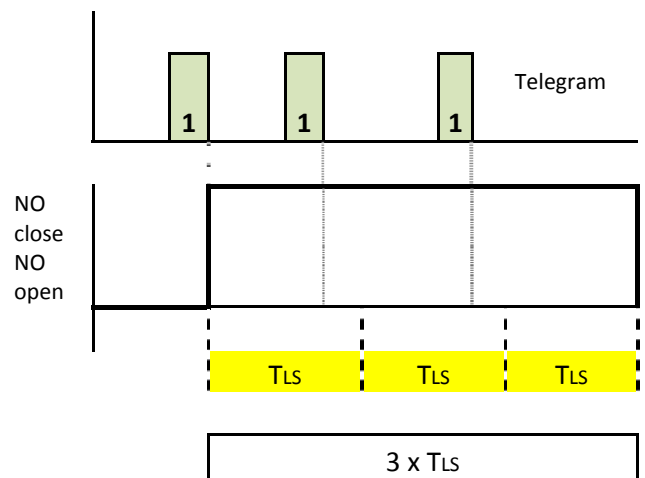
KNX PARAMETER	SETTINGS
Send ON when Timing is active	Ignore Trigger Mode Extension Mode
This allows you to set the behaviour of the device when it receives a ON command while the staircase timing is running: Ignore On receiving a ON command, the device ignores it and goes on executing the timing. Trigger Mode On receiving a ON command, the device restart the stairs light time execuiting the whole time again. Extension Mode On receiving the command the device extends the stairs light time, increasing it by the time of the standard stairs light time. Note that the extension option does not reset the timing but it changes its duration and becomes a multiple of the set stairs light time. The maximum number of extension is allowed by the parameter "Maximum numbert of Time Extension"	

14.5. ON/FF vs Timing Functions

ON / OFF Commands have higher priorities respect timing command: here some examples:

Timing is active and relay receives activation command (ON)
- If received on CO : "<Output x> Relay timing command" then it follows the parameter settings (ignore / trigger /extension mode)
- If received on CO : "<Output x> Relay command" then relay stay activated without timing

Timing is active and relay receives deactivation command (OFF)
- If received on CO : "<Output x> Relay timing command" then it follows the parameter settings (Timer can be stopped: true/false)
- If received on CO : "<Output x> Relay command" then relay switch off and all the timings are reset.

15. Output Additional Functions

In IO32D01KNX 3 additional function can be enabled:

- **LOCK FUNCTION** : this function according to the command received from the bus, blocks the relay in a specific condition when a "lock on" command arrives, this state is kept until a "lock off" command is received; any command received during the period in which the block is activated is not executed.
- **LOGIC FUNCTION**: This function allows you to control the load, not only using the relay Switch Command object, but using the result of a logic operation; the logic function consists in two logic ports: the operation is performed among the logic input and the relay command object.
- **SCENE FUNCTION**: The scene function manage two possible commands to the device: **perform scene**, that is a command to create a specific condition; **learn scene**, that is a command to memorize the current status of the contact at the moment the command is received, and then reproduce it once the perform command is received.

LOCK and LOGIC function are alternative functions and only one of them can be enabled at a time.

15.1. Logic Function

Enabling logical operation allow to submit the command for the output to a result of a logical operation between the communication object <Output x> Logic Function and the communication object <Output x> Relay Command or <Output x> Relay Timing Command.

1 – Update on <Output x> Relay Command: result of the logic operation between this object and the <Output x> Logic Function object is applied to the object **<Output x> Relay Command (no timing function)**

2 - Update on <Output x> Relay Timing Command: result of the logic operation between this object and the <Output x> Logic Function object is applied to the object <**Output x> Relay Timing Command (timing function performed)**.

3 - Update on <Output x> Logic Function: result of the logic operation between this object and the <Output x> Relay Command object is applied to the object <**Output x> Relay Command (no timing function)**.

By ETS is possible to select the logical operation to use: every time a telegram is received on the logical object or on the control object then the logical operation is calculated again and the result is taken as a command for the relay.

- The result of the logical operation is applied to the communication object "<Output x> Relay Command therefore the relay does not execute any timing function as a result of a logical operation

KNX PARAMETER	SETTINGS
Logic function	AND OR XOR
This parameter selects the logical operation	
Initial Value for logic Operation	"0" "1" Last value received
This parameter selects the value the logical object must have on power up . "Last value received" setting is intended to be the last value received before power down.	

- The value assumed by the logic communication object set by the parameter "Initial Value for logic Operation" does not switch automatically the relay because this behaviuor is determined by the parameter "Behaviour on power up"

15.2. Lock Function

When lock function is enabled it allows, as a result of receiving a telegram on the *<Output x> Lock Function;* to switch the relay in a defined state and force it to maintain this state even if the object switching value changes.

KNX PARAMETER	SETTINGS
Initial Value for Lock Object	"0" "1" Last value received
This parameter selects the value the lock object must have on power up. "Last value received" is intended to be the last value received before power down.	
Telegram for Lock Activation	"0" "1" Last value received
This parameter selects the values associated to the "lock" or "unlock" condition.	
Relay Position when Lock is Active	Relay is Deactivated Relay is Activated

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This parameter selects the state the relay must assume when the "lock function" becomes active". (**See note**).

Position when Lock Ends	Relay is Deactivated
	Relay is Activated
	Keep previous state and ignore telegrams
	Keep previous state and don't ignore telegrams

Relay is Deactivated
Relay is in "OFF" position (**See note**).

Relay is Activated
Relay is in "ON" position **(See note).**

Keep previous state and ignore telegrams
Relay returns in the state it was before lock function became active

Keep previous state and don't ignore telegrams
the output channel returns to its condition prior to the activation of the block unless you have received a telegram on the switch object or scenario; in this case, the last command received is executed

O • If the parameter "Initial Value for Lock Object" has the same value of "Telegram for Lock Activation" happens that, on power up, the output channel starts in lock mode, waiting for a "unlock" telegram in order to become active. Note that, even if the relay starts with lock function already active it does not go automatically in the position defined by the parameter "Relay Position when Lock is Active "; because this behaviuor is determined only by the parameter "Behaviour on power up"

O • The "activated" and "deactivated" conditions for each output channels correspond to ON or OFF condition upon the settings made for the "Contact Type" parameter.

15.3. Scene Function

When the scene function is enabled a communication object named <*Output x*> *Scene* becomes visible.

It is possible to send to the device two possible commands:

- **recall scene**: is a command to create a specific condition.
- **store scene:** is a command to learn and store the current status (at the moment the command is received) of the contact, and then reproduce it once the recall command is received.

For every channel it is possible to store a maximum of 4 output scene.

KNX PARAMETER	SETTINGS
Scene Number <X>	0 … 64
For the 4 possible scenes, this number is the unique identifier for the scene: valid numbers are from 0 to 63; 64 means scene is not active.	
Initial value Scene <X>	Contact Open Contact Close
For the 4 possible scene this number allow to initialize the status associated to previously selected scene number avoiding to execute the store scene procedure. If the store scene is done, this value is overwritten.	
Learn Scene	Enabled Disabled
This parameter enable / disable the output channel from storing value received from the bus; if this parameter is set to disable the value associated are set only by the parameters *"Initial value Scene <X>"* and cannot be modified without a ETS download.	

O • When a scene is recalled the output channel behaves in the same way as it would have received a telegram "0" or "1" on the <Output x> Relay Command communication objects; this means that if the scene always trigger a **NOT TIMED** command.

O • After a ETS download the device assumes the value of parameter: "**Initial value Scene <X>"** as a value in memory for the corresponding scene and overwrites previous memorized scene positions.

KNX

15.4. Priority table for Output

Priority	Description
high	Parameter: Relay Position on Power down
	Parameter: Relay Position on Power up
	Lock Object
PRIORITY	Relay Command Object Scene Object Logic Object
low	Relay timing command

15.5. Behavior of output on voltage failure, recovery and commissioning.

Behavior on bus voltage failure

On failure of bus voltage behavior of output is driven by the parameter: ***Behaviour on power down***

Behavior on bus voltage recovery

On bus voltage recovery behavior of output is driven by the parameter: ***Behaviour on up***

Behaviour on commissioning (ETS Download)

After download behavior of output is the same as ***Behaviour on up***

Wrong application download

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

16. Electric valve control

Each output can be configured to drive an electric valve (solenoid valve) typically used in heating and cooling systems for floor panels.

- Use this output configuration when you want to drive an ON/OFF type solenoid valve. In this type of valve one of two states (open or closed) is associated with the condition of valve powered, the other to valve not powered.

- If you use this configuration, the control algorithm must be resident in the control device (thermostat, etc. ..).; the relay act only to power or not the valve.

16.1. Main Parameters

KNX PARAMETER	SETTINGS
Control Value	1 bit 1 byte
This parameter defines whether the relay controls of the valve is carried out with 1-bit (ON / OFF) or 1-byte (0 to 100%) commands. When you select the 1-byte value the control is done through a PWM **(See notes)**.	
Valve Position when relay is open	Valve Open Valve Close
This parameter permits to set the behavior of the relay according to the state of the valve. If you have a valve that opens when the relay is closed and you want it to be activated by an ON command of a thermostat (most common situation), you must set this parameter at the value "Valve Closed" and the parameter (see below) "Activation telegram" with value "Telegram "0" close the valve"	
Activation telegram	Telegram "0" close the valve Telegram "1" close the valve
It is possible to set a parameter to determine if the function is activated with a telegram "0" (and then off with "1") or is activated with telegram "1" (and then off with "0");	
Cycle Base Time For PWM	5 min to 60 min in step of 5 min.
(See notes)	
Lower limit value	0% 10% 20% 30%

Defines the minimum value below which the valve is always closed (0% / 10% / 20% / 30%)

Upper limit value	100% 90% 80% 70%
Defines the maximum value above which the valve is always open (70% / 80% / 90% / 100%)	
Sending State Telegram	Disabled When status changes On request

Disabled
Status is never transmitted ad related communication object is not visible

When status changes
Status is transmitted every time the relay switch changing his status from ON to OFF or from OFF to ON.

On request
Status communication object is available and updated when status changes but the telegram is not transmitted. Read propriety is enabled.

Telegram Value for status sending	Telegram "0" when relay is open Telegram "1" when relay is open
This set the value you want transmit when relay is open or close (and therefore the valve is open or close according to the parameter "**Valve Position when relay is open**"	
Anti-Locking Valve Function	Disabled Enabled
It is possible to enable an automatic switching valve function, useful when there are long periods of inactivity, for example during the summer season. If this function is activated you can select how long can be the period of inactivity (see parameter " **Anti-Locking Valve Activation Period** "); before that the valve performs a switching ON and after 5 minutes.a switching OFF	
Anti-Locking Valve Activation Period	3 days 10 days
Determines the maximum period of inactivity allowed.	
Lock Function	Disabled Enabled
When lock function is enabled it allows switching the relay in a defined state and forcing it to maintain this state even if the it receives 1-bit or 1 byte control commands.	
Behaviour on power down	Valve Open Valve Close STOP – no movement

When bus voltage fall down under approximately 18V device enters the power down routine and it is possible to set the status of the relay status (**See notes**).	
Behaviour on power up	Valve Open Valve Close STOP – no movement
On power up it is possible to set the status of each valve (and therefore the relay) with this parameter **(See notes)**	

- PWM control is used to reduce the hysteresis of the temperature typical of ON / OFF control. The relay drives the valve with ON / OFF commands and make a proportional control (0% ° 100%) based on the value received on the CONTINUOUS CONTROL OBJECT modulating the amplitudes of the On and OFF pulses (PWM).
  This mode is active when 1-byte control was previously selected.

- When is selected the value "STOP – no movement" for the parameter "Behaviour on power up" it is maintained the state assumed before power down.

16.2. Lock Function

KNX PARAMETER	SETTINGS
Telegram for Lock Activation	Telegram "0" Telegram "1"
This parameter selects the values associated to the "lock" or "unlock" condition.	
Valve Position when Lock is Active	Valve Open Valve Close
This parameter selects the state the valve must assume when the "lock function" becomes active". (**See notes**).	
Position when Lock Ends	Valve Open Valve Close Keep previous state and ignore telegrams Keep previous state and don't ignore telegrams
Valve Open	

"valve open" position (**See notes**).

Valve Close
"valve closed" position (**See notes**).

Keep previous state and ignore telegrams
Relay returns in the state it was before lock function became active

Keep previous state and don't ignore telegrams
the output channel returns to its condition prior to the activation of the block unless you have received a telegram on the switch object or scenario; in this case, the last command received is executed.

- If the parameter "**Initial Value for Lock Object**" has the same value of "**Telegram for Lock Activation**" happens that, on power up, the output channel starts in lock mode, waiting for a "unlock" telegram in order to become active. Note that, even if the relay starts with lock function already active it does not go automatically in the position defined by the parameter "**Relay Position when Lock is Active** "; because this behavior is determined only by the parameter "**Behaviour on power up"**.

- The "valve opened" and "valve closed" conditions for each output channels correspond to ON or OFF condition of the relay upon the settings made for the "**Valve Position when relay is open**" parameter.

17. Output Configuration for shutter

Outputs can be configured in pairs for the management of roller shutters and blinds.

Out / Function / Terminals			Out / Function / Terminals		
OUT 1	▲ (up)	1/2	OUT 2	▼(down)	3/4

KNX PARAMETER	SETTINGS
Shutter Type	Shutter Venetian
Select "Venetian" if the shutter has louvers, select shutter if it is a roller shutter.	
Shutter travel time (sec.)	0 ÷ 3000
This parameter set the total travel time for shutter.	
Extra Time for shutter travel (sec.)	1 ÷ 255
This parameter indicates the number of seconds to add to the travel time for all the movements that bring the shutter completely up or down.	
Stop time between 2 shutter movements	200 ms 500 ms 1 sec 2 sec 5 sec
Set the minimum time for the shutter to stop from passing from a movement to another.	
Absolute position (%)	Enabled Disabled
When enabled this parameter shows 2 communication object: "SHUTTER POSITION % OBJECT" and "VALUE SHUTTER POSITION % OBJECT"; SHUTTER POSITION %: a positioning control command can be sent to the device using a percentage value (the value is relative to the percentage of closure: 10%, 50%, etc. .. 0% = shutter totally up, % = shutter totally down) VALUE SHUTTER POSITION %: through 1 byte telegram the information on the current shutter position can be sent, (the value is relative to the percentage of closing).	

17.1. Delay on opening and closing

These parameters can be used if you want to drive double doors. In this case, one door must start first in opening and the other must start first in closing.

KNX PARAMETER	SETTINGS
Delay on move up	Disabled Enabled
Enable / disable a delay between the receipt of an up command and the start of the movement.	
Time for Delay on move up	5 sec 10 sec 20 sec 30 sec
Values for the delay	
Delay on move down	Disabled Enabled
Enable / disable a delay between the receipt of a down command and the start of the movement.	
Time for Delay on move down	5 sec 10 sec 20 sec 30 sec
Values for the delay	

OPENING

1st TO OPEN

CLOSING

1st TO CLOSE
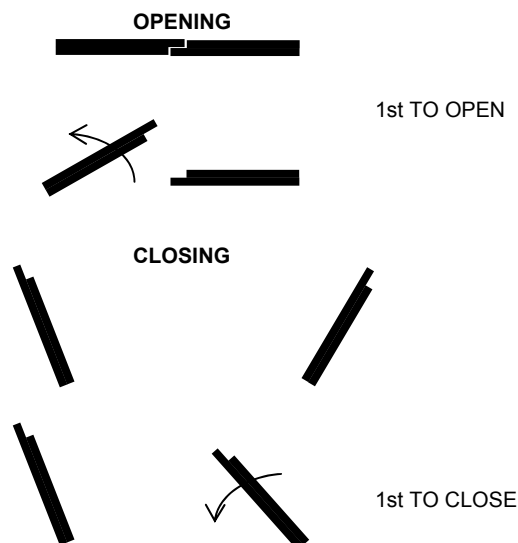
KNX PARAMETER	SETTINGS
Step time for louvres movement (x 100ms)	1 ÷ 180
This parameter selects how long the movement for every step of the louvers is (visible only if shutter type is "Venetian"; range from 100 ms to 18 sec.	

17.2. Louvers automatic movement

If the channel is configured for Venetian control (Parameter "***Shutter Type*** = Venetian") it is possible to enable an automatic movement of the louvers which is executed at the end of movements of the shutter.; these movements are:

- Movement for scene command (if brings the shutter in a position different from totally up)
- Movement at the end of a lock or alarm state (if brings the shutter in a position different from totally up)
- Movement for a Position % command (if brings the shutter in a position different from totally up)

This automatic function moves the louvers up after a shutter down movement and down after a shutter up movement.

KNX PARAMETER	SETTINGS
Louvers automatic movement	Never Always After up movements After down movements
Set when the automatic movement must start.	
Number of automatic steps after move up	1 ÷ 15
Number of automatic steps after move down	1 ÷ 15
This parameter set the time of the movement : if this parameter is set to "2" and **"Step time for louvers movement (x 100ms)"** is set to "3" then the automatic movement is 300ms x 2 = 600ms	

17.3. Additional Functions

In IO32D01KNX 3 additional functions can be enabled for shutter:

- **SCENE FUNCTION**: The scene function manage two possible commands to the device: **perform scene**, that is a command to create a specific condition; **learn scene**, that is a command to memorize the current status (at the moment the command is received) of the shutter position, and then reproduce it once the perform command is received.

- **LOCK FUNCTION** : this function according to the command received from the bus, blocks the shutter in a specific condition when a "lock on" command arrives, this state is kept until a "lock off" command is received; any command

received during the period in which the block is activated is not executed.

- **ALARM FUNCTION**: this function allows linking the shutter channel to a rain or wind sensor to protect it from damage.

- This function (if enabled) requires the sensor linked to send cyclically a telegram, even if the alarm is off. If the shutter does not receive any telegram for a defined time (see parameter "**supervision time for alarm**") it goes in the alarm position as if it would have been received a alarm telegram.

17.4. Scene Function

When the scene function is enabled a communication object named *<Channel x> Scene* becomes visible.
It is possible to send to the device two possible commands:
- **recall scene** - is a command to create a specific position of the shutter
- **store scene** - is a command to learn and store the current position of the shutter (in the moment the command is received), and then reproduce it once the recall command is received

It is possible to store a maximum of 4 output scene.

KNX PARAMETER	SETTINGS
Scene Number <X>	0 ÷ 64
For the 4 possible scenes this number is the unique identifier for the scene: valid numbers are from 0 to 63; 64 means scene is not active.	
Initial value Scene <X>	Values between 0% and 100% in steps of 5%
For the 4 possible scene this number allow to initialize the position associated to previously selected scene number avoiding to execute the store scene procedure. If the store scene is done, this value is overwritten.	
Learn Scene	Enabled Disabled
This parameter enable / disable the output channel from storing value received from the bus; if this parameter is set to disable the value associated are set only by the parameters ***"Initial value Scene <X>"*** and cannot be modified without a ETS download.	

- After a ETS download the device assumes the value of parameter: "**Initial value Scene <X>"** as a value in memory for the corresponding scene and overwrites previous memorized scene positions.

17.5. Lock Function

When lock function is enabled it allows, as a result of receiving a telegram on the *<Channel x> Lock Function;* to set the shutter in a defined position and force it to maintain this position even if the channel receives move commands.

- If the parameter "**Initial Value for Lock Object**" has the same value of "**Telegram for Lock Activation**" happens that, on power up, the shutter channel starts in lock mode, waiting for a "unlock" telegram in order to become active. Note that, even if the shutter channel starts with lock function active it does not go automatically in the position defined by the parameter "**Shutter Position when Lock is Active** "avoiding to have automatic and unexpected movements when the power returns after a black out.

17.6. Alarm Function

Alarm function must be activated if the shutter has to be controlled by weather sensors, typically rain and wind sensors.
The sensor must send telegram "0" if no alarm is active ad telegram "1" if the alarm becomes active.
When shutter has the alarm function active goes in a defined position and cannot be moved (except with if the lock function became active) for the time the alarm is still active.

KNX PARAMETER	SETTINGS
Supervision Time for Alarm (min)	1… 120 (min)
This parameter selects how long is the supervision time for the alarm function.	

If this time is set, for example, to 30 min, the shutter need to receive at least once in 30 min. a telegram from the sensor even if the telegrams means "no alarm". It this not happens the alarm became active (lack of supervision) and need to receive a "no alarm telegram" to reset. For this, only sensor with cyclic sending can be used and we strictly recommend set the supervision at least double the cyclic sending period.

Shutter Position when Alarm is Active	Move Up Move Down Stop – no movement
This parameter selects the values associated to the "alarm" condition.	

- If Alarm Function is enabled it is mandatory to link a sensor with cyclic telegram sending; if the communication object is not linked or no telegram is received before the end of supervision time the alarm becomes active and the shutter goes in alarm position.

17.7. Shutter position after lock and alarm

This parameter set the final position of the shutter after the end of a lock or an alarm condition (of course if both functions are no "active" the value of this parameter is not considered)

KNX PARAMETER	SETTINGS
Shutter position after lock and alarm	Move Up
	Move Down
	Previous position and ignore telegrams
This parameter selects the values associated to the end of "lock"or "alarm" condition.	

17.8. Priority Table for shutter

Priority	Description
high	Power down behavior: relay are always opened
	Power on behavior: relay are always opened (only for shutter mode)
PRIORITY	Lock Object
	Alarm Object
	Up/down movement Stop movement Object Scene Object Absolute position Object
low	Step movement Object

17.9. Behavior of shutter on voltage failure, recovery and commissioning.

Behavior on bus voltage failure / recovery and on commissioning (ETS Download)

On failure or recovery of bus voltage output are always opened

Wrong application download

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