



**M/US05.1**

**KNX Mini Ultrasonic Sensor**

**User Manual**

Version: V1.0.0

Published on Dec. 4th, 2020

## Content

|  |    |
|--|----|
| Legal Statement .....                              | I  |
| Update History .....                               | II |
| 1 Introduction.....                                | 1  |
| 1.1 Features.....                                  | 1  |
| 1.2 Important Notes.....                           | 2  |
| 1.3 Product Information .....                      | 2  |
| 2 Configuration on ETS5 .....                      | 6  |
| 2.1 Import Devices .....                           | 6  |
| 2.2 General .....                                  | 7  |
| 2.3 Light Control.....                             | 16 |
| 2.4 Function Status .....                          | 19 |
| 2.5 Logic Function A/B/C/D .....                   | 19 |
| 2.5 Logic Function E .....                         | 23 |
| 2.6 Block E.....                                   | 25 |
| 2.7 Output of Logic Function E .....               | 25 |
| 3 Examples.....                                    | 26 |
| 3.1 Single movement control one light.....         | 26 |
| 3.2 Master/Slave movement control one light.....   | 28 |
| 3.3 Light Control 1 (Fully-automatic/Normal) ..... | 30 |
| 3.4 Light Control 1 (Semi-automatic).....          | 32 |

## Legal Statement

HDL has all the intellectual property rights to this document and contents thereof. Reproduction or distribution for third parties are prohibited without written authorization from HDL. Any infringement of HDL's intellectual property rights will be investigated the legal liability.

The contents of this document will be updated as the updates of product versions or other reasons. Unless otherwise agreed upon, this document is to be used as a guidance only. All the statements, information and recommendations in this document makes no warranty expressed or implied.

HDL Automation Co., Ltd.

## Update History

The form below contains the information of every update. The latest version contains all the updates of all former versions.

| No. | Version | Update Information | Date          |
|-----|---------|--------------------|---------------|
| 1   | V1.0.0  | Initial release    | Dec 4th, 2020 |
|     |         |                    |               |
|     |         |                    |               |
|     |         |                    |               |
|     |         |                    |               |

## 1 Introduction

KNX Mini Ultrasonic Sensor (See Figure 1) contains four independent logic blocks and one combined logic block. The logic inputs include ultrasonic sensor status, brightness value, temperature and external telegrams. Depending on the user's needs, the sensor can be set to either master-slave mode or single mode, etc.

This manual offers the information on installation steps, connection and configuration of KNX Mini Ultrasonic Sensor on ETS5.

**Note:** the pictures in the manual are for reference, the actual pictures should prevail.



Figure 1. Mini Ultrasonic Sensor

### 1.1 Features

KNX Mini Ultrasonic Sensor main features include:

- (1) With 2CH lighting control, 4 sections of brightness and delay time can be set in dimming output. With gradually dimming effect, the sensor supports automatic or semi-automatic mode. Telegram locking/unlocking and delay time can be set.
- (2) With 2CH constant brightness control, dimming values and forced operation can be set.
- (3) The sensor has 5 logic blocks and each block contains 10 object outputs. Telegram locking/unlocking and delay time can be set.
- (4) Control types: Switch control, Absolute dimming control, Shutter control, Alarm control, Percentage control, Sequence control, Scene control, String (14 bytes) control, Threshold control, Logic combination control.
- (5) Logic inputs: Ultrasonic sensing status, brightness value, temperature and external telegrams.
- (6) 2 logical relations: AND, OR.
- (7) 2 working modes: Single mode and master / slave mode.
- (8) The logic validity can be set by external telegram so as to ensure that end users can reset

the logics.

**1.2 Important Notes**

- (1) Installation - This device should be mounted at the ceiling at a recommended height of 2-3m from the floor.
- (2) Programming - The device is compliant with the KNX standard and the parameters are set by the Engineering Tool Software (ETS).
- (3) The KNX bus voltage is 21-30V DC.

**1.3 Product Information**

(1) Dimensions - See Figure 2 – 4

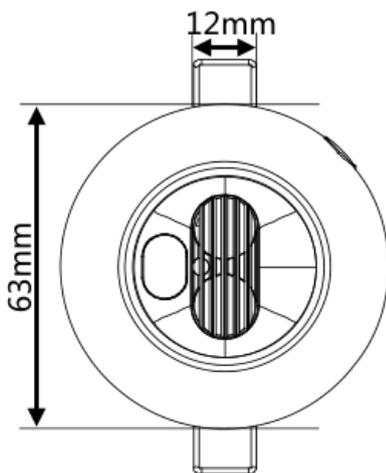


Figure 2. Dimensions - Front View

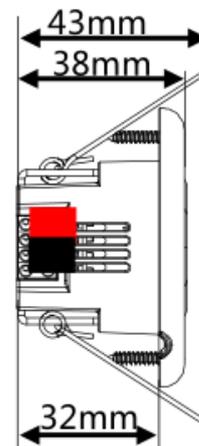


Figure 3. Dimensions - Side View

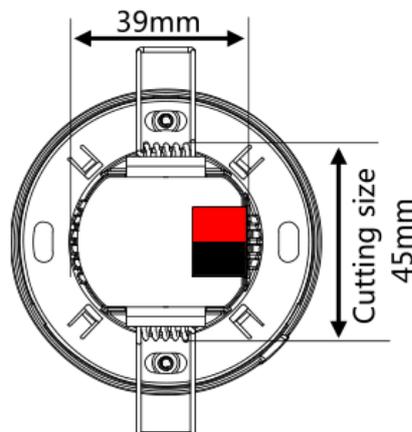


Figure 4. Dimensions - Back View

**(2) Components – See Figure 5 – 6**

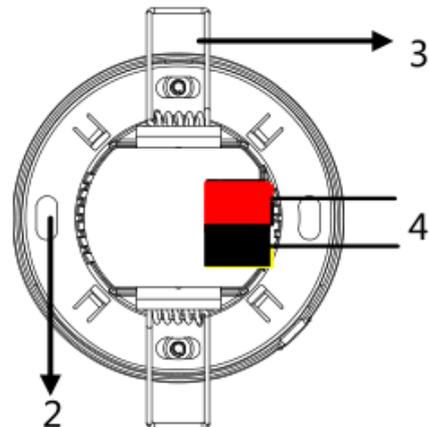
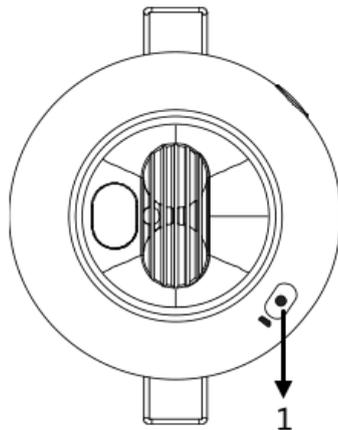
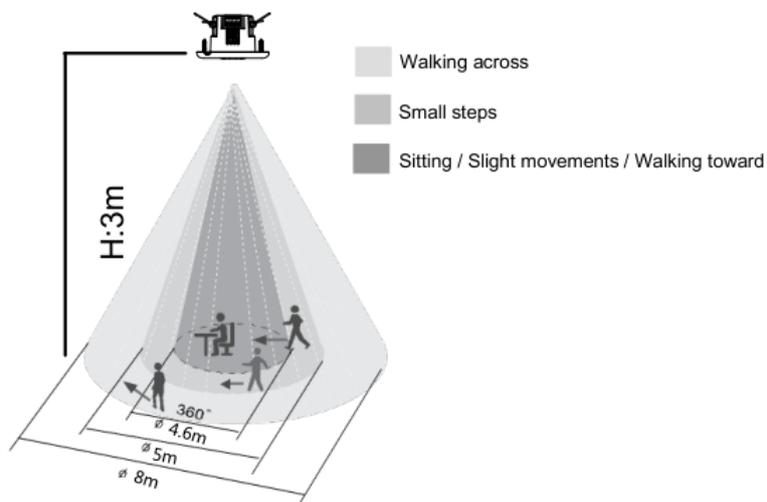


Figure 5. Components - Interior View      Figure 6. Components - Back View

1. Programming button & programming LED
2. Screw hole
3. Spring clips
4. KNX/EIB bus connector

**(3) Detection Range - - See Figure 7**



Detection Range (At 25°C)

| Mounting height | Sitting / Slight movements / Walking towards | Small steps | Walking across |
|-----------------|--|-------------|----------------|
| 3m              | 4.6m   | 5m          | 8m             |

Figure 7. Detection Range

**(4) Ceiling – mounted - See Figure 8 – 10**

Step 1. When installing the sensor in the thin ceiling, produce an opening of diameter 45mm in the ceiling.

Step 2. Fix the sensor into position with the assistance of the spring clips after wiring.

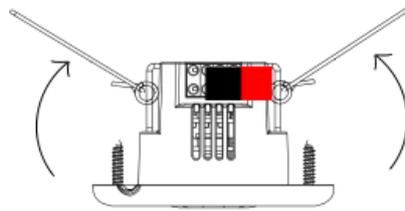


Figure 8

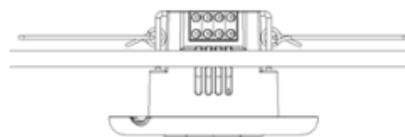


Figure 9

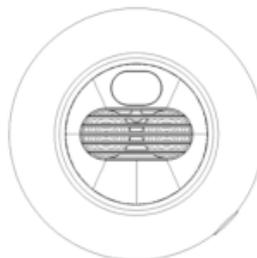
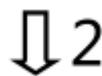


Figure 10

**(5) Flush - mounted - See Figure 11 – 14**

Step 1. When installing the sensor in the thick wall, produce an opening of diameter 45mm and depth of 35mm in the wall.

Step 2. Remove the spring clips and pry apart the cover and the sensor.

Step 3. Fix the sensor in the wall with screws.

Step 4. Attach the cover to the sensor.

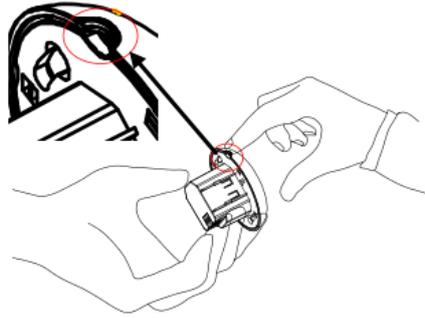


Figure 11

⇓1

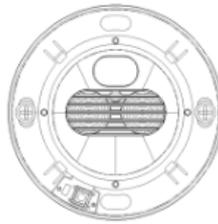


Figure 12

⇓2

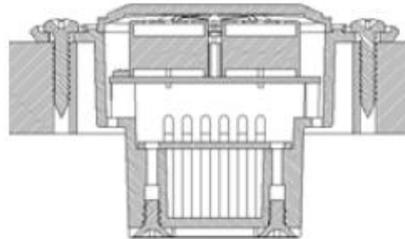


Figure 13

⇓3

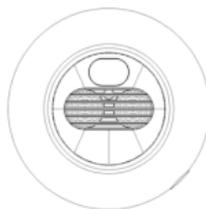


Figure 14

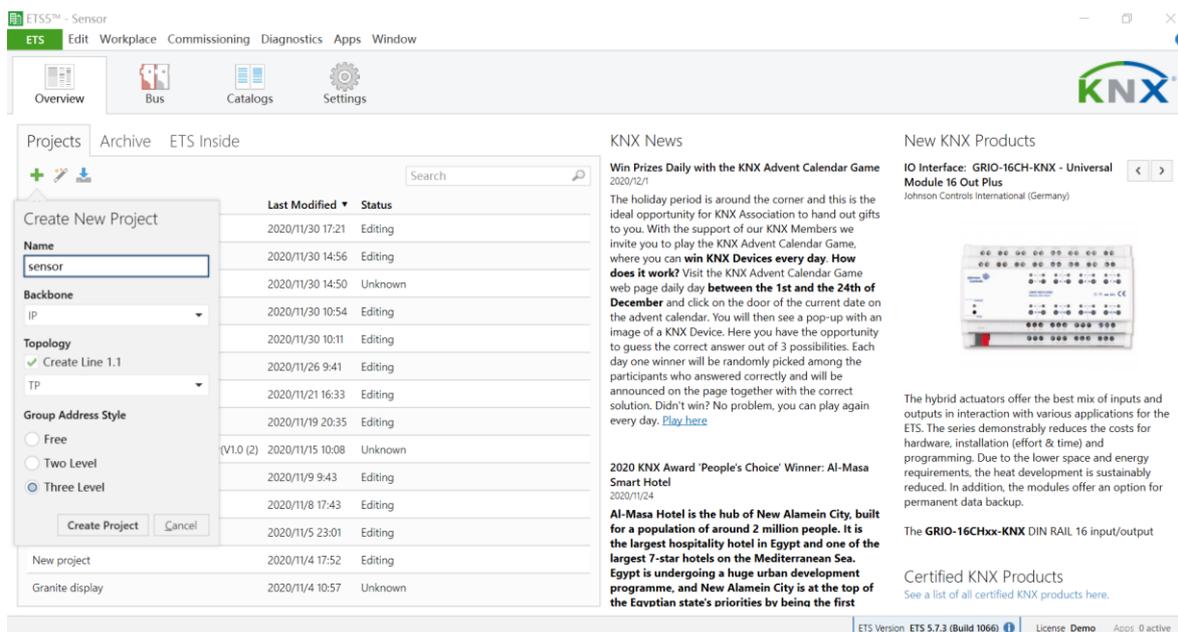
Figure 11 - 14. Installation – Flush-mounted

## 2 Configuration on ETS5

### 2.1 Import Devices

Add device/database before program it.

1. Create project in ETS5, if you have project, ignore it. Select three level group address style when create project.



2. Refer to the device version from the label, select Catalog, drag the database to current Line. According to the label of sensor, you can ask HDL technical support for corresponding database.

The screenshot shows the HDL software interface. The 'Topology Backbone' on the left shows a tree structure with '1.1.1 M/US05.1' selected. The main area displays the 'General' configuration for this device. Parameters include: System delay(2..255s) after bus voltage recovery (10), Heartbeat telegram (Disable), Status LED indicator (ON when movement detected), and (1)Movement sensor sensitivity (80%). The 'Catalog' at the bottom shows a table of devices with columns for Manufacturer, Name, Order Number, Medium, Application, and Version.

| Manufacturer | Name               | Order Number   | Medium | Application                           | Version |
|--------------|--------------------|----------------|--------|---------------------------------------|---------|
| HDL          | US 5L Sensor(V1.2) | M/US 1405 H003 | TP     | US 5L Sensor(V1.2)                    | 1.2     |
| HDL          | US 5L Sensor(V1.1) | M/US 1405 H003 | TP     | US 5L Sensor(V1.1)                    | 1.1     |
| HDL          | M/FMR4.1           | M/FMR4C1902    | TP     | 4 Channels Flush-mounted Relay Act... | 1.0     |

## 2.2 General

This document mainly describes 1.2 version M/US05.1 KNX Mini Ultrasonic sensor.

- (1) System delay (2...255s) after bus voltage recovery: time-delay function, namely a delay time between powering on the device and activating the system, which ranges from 2 to 255 s. The default value is 10 s.
- (2) Heartbeat telegram: It is used to check whether the communication between device and system is normal.
  - Disable: disable heartbeat telegram function.
  - Send value "0" cyclically: devices will send "0" on the KNX bus at a set time interval.
  - Send value "1" cyclically: devices will send "1" on the KNX bus at a set time interval.
  - Send value "1/0" inverted cyclically: devices will send "0" and "1" alternately on the KNX bus at a set time interval.

(3) Status LED indicator:

Set the LED indicator's status, for normal use ON when movement detected.

1.1.1 M/US05.1 > General

|                  |   |   |
|------------------|---|---|
| General          | System delay(2...255s) after bus voltage recovery | 10  |
| Light control    | Heartbeat telegram                                | Disable   |
| Function status  | Status LED indicator                              | ON when movement detected   |
| Logic function A | Sensor setting:                                   | Always is OFF   |
| Logic function B | (1)Movement sensor sensitivity (1%-100%)          | ON when movement detected ✓   |
| Logic function C | ->Movement sensor sensitivity via object          | ON when received '1',else OFF   |
| Logic function D | (2)Brightness quiver (5..30%)                     | ON when received '0',else OFF   |
| Logic function E | ->Lux compensation                                | ON when logic A is lock,else OFF                                      |
|                  | (3)Temperature hysteresis (0.1°C)                 | ON when logic A is unlock,else OFF                                    |
|                  | ->Temperature compensation (0.1°C)                | ON when logic B is lock,else OFF                                      |
|                  | Constant brightness:                              | ON when logic B is unlock,else OFF                                    |
|                  | Constant brightness function A                    | ON when logic C is lock,else OFF                                      |
|                  |   | ON when logic C is unlock,else OFF                                    |
|                  |   | ON when logic D is lock,else OFF                                      |
|                  |   | ON when logic D is unlock,else OFF                                    |
|                  |   | =====   |
|                  |   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |

Group Objects / Parameters

If select anyone except 'Always is OFF', there has 'Led indicator (Enable/Disable)' function.

We can use this Group Address to enable or disable the Led indicator.

| Number | Name                           | Object Function          | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|--------|--------------------------------|--------------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| 1      | General                        | Heartbeat telegram       |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus |             |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 27     | Light channel 1 external input | External telegram        |             |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 31     | Light channel 1 output         | Switching                |             |               | 1 bit  | C | R | - | T | - | switch    | Low      |
| 15     | General                        | Led indicator status     |             |               | 1 bit  | C | R | W | T | - | switch    | Low      |

'ON when received '1', else OFF', means if received 'Led indicator (Enable/Disable),1', then turn ON the Led indicator.

'ON when received '0', else OFF', means if received 'Led indicator (Enable/Disable),0', then turn ON the Led indicator.

### 2.1.1 Sensor Settings

(1) Movement sensor sensitivity (1%-100%): use 80% by default.

(2) Movement sensor sensitivity via object:

If enable, we can modify sensor sensitivity via Group Address.

Sensor setting:

(1) Movement sensor sensitivity (1%-100%)

-> Movement sensor sensitivity via object  Disable  Enable

| Number | Name                           | Object Function             | Description | Group Address | Length | C | R | W | T | U | Data Type            | Priority |
|--------|--------------------------------|-----------------------------|-------------|---------------|--------|---|---|---|---|---|----------------------|----------|
| 1      | General                        | Heartbeat telegram          |             |               | 1 bit  | C | - | - | T | - | enable               | Low      |
| 9      | General                        | Movement sensor sensitivity |             |               | 1 byte | C | - | W | T | - | percentage (0..100%) | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus    |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 27     | Light channel 1 external input | External telegram           |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 31     | Light channel 1 output         | Switching                   |             |               | 1 bit  | C | R | - | T | - | switch               | Low      |

(3) Brightness quiver (5...30%)

This threshold affects the actual effective range. Take an example as below.

The Brightness quiver is used for brightness in logic.

If  $n = 5\%$ ,  $\text{Threshold}_1 \leq \text{Threshold}_2$ ,  $\text{Threshold}_1 = 100 \text{ Lux}$  and  $\text{Threshold}_2 = 300 \text{ Lux}$ , actual effective range will be 95~315 Lux.

$$\text{Threshold}_1 * (1 - 5\%) = 100 * (1 - 5\%) = 95 \text{ Lux}$$

$$\text{Threshold}_2 * (1 + 5\%) = 300 * (1 + 5\%) = 315 \text{ Lux}$$

**Logic function A**

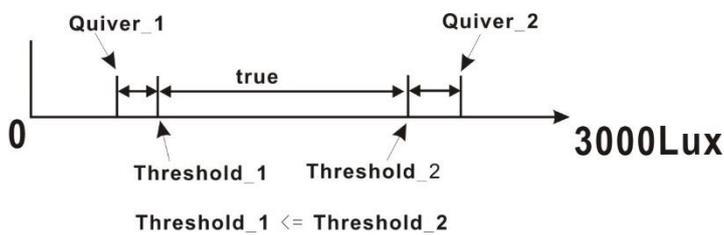
Block A  
 A1: Switching  
 Logic function B

(2) Enable brightness(Lux) sensor  Disable  Enable

Enable brightness(Lux) threshold A  Disable  Enable

-> Lux >= Threshold lower(0 ~ 1200 lux)

-> Lux <= Threshold upper(0 ~ 1200 lux)



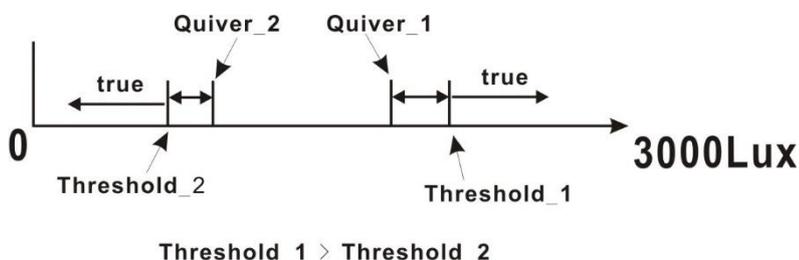
If  $n = 5\%$ ,  $\text{Threshold}_1 > \text{Threshold}_2$ ,  $\text{Threshold}_1 = 300 \text{ Lux}$  and  $\text{Threshold}_2 = 100 \text{ Lux}$ , actual effective range will be 105 ~ 285 Lux.

$$\text{Quiver}_1 = \text{Threshold}_1 * (1 - 5\%) = 300 * (1 - 5\%) = 285 \text{ Lux}$$

$$\text{Quiver}_2 = \text{Threshold}_2 * (1 + 5\%) = 100 * (1 + 5\%) = 105 \text{ Lux}$$

Logic function A

|                  |  |   |
|------------------|--|---|
| Block A          | (2)Enable brightness(Lux) sensor       | <input type="radio"/> Disable <input checked="" type="radio"/> Enable |
| A1: Switching    | Enable brightness(Lux) threshold A     | <input type="radio"/> Disable <input checked="" type="radio"/> Enable |
| Logic function B | ->Lux >= Threshold lower(0 ~ 1200 lux) | 300   |
|                  | ->Lux <= Threshold upper(0 ~ 1200 lux) | 100   |



(4) Lux compensation: If actual Lux value is not correct, you can use this to adjust the Lux value.

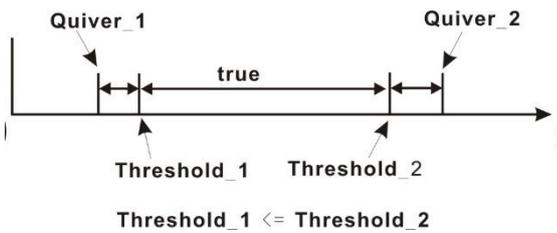
(5) Temperature hysteresis (0.1°C): The hysteresis for Logic Temperature input.

|                          |  |   |
|--------------------------|--|---|
| 1.1.1 M/US05.1 > General |  |   |
| General                  | System delay(2..255s) after bus voltage recovery | 10  |
| Light control            | Heartbeat telegram                               | Disable   |
| Function status          | Status LED indicator                             | ON when movement detected   |
| Logic function A         | Sensor setting:                                  |   |
| Block A                  | (1)Movement sensor sensitivity (1%-100%)         | 80%   |
| A1: Switching            | ->Movement sensor sensitivity via object         | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Logic function B         | (2)Brightness quiver (5..30%)                    | 5%  |
| Logic function C         | ->Lux compensation                               | 0   |
| Logic function D         | (3)Temperature hysteresis (0.1°C)                | 10  |
| Logic function E         | ->Temperature compensation (0.1°C)               | 0   |
|                          | Constant brightness:                             | =====   |
|                          | Constant brightness function A                   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |

If hysteresis is 10,  $Threshold_1 \leq Threshold_2$ ,  $Threshold_1 = 20^{\circ}C$  and  $Threshold_2 = 30^{\circ}C$ . Then effective value is 19~31°C.

$Threshold_1 - 1^{\circ}C = 19^{\circ}C$

$Threshold_2 + 1^{\circ}C = 31^{\circ}C$



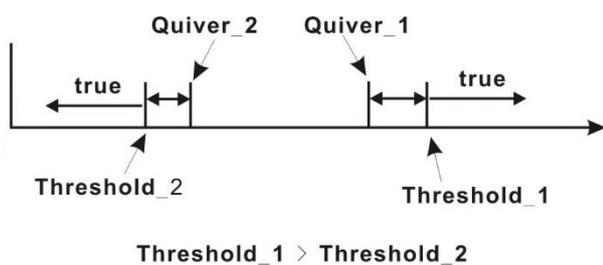
**1.1.1 M/US05.1 > Logic function A**

|                         |  |  |
|-------------------------|--|--|
| General                 | Use logical block A                      | <input type="radio"/> No <input checked="" type="radio"/> Yes  |
| Light control           | (1)Enable Movement sensor                | Single mode(independent sensor)  |
| Function status         | ->Movement sensor status                 | <input type="radio"/> Movement sensor detected is False,else is...<br><input checked="" type="radio"/> Movement sensor detected is True,else is F... |
| <b>Logic function A</b> |  |  |
| Block A                 | (2)Enable brightness(Lux) sensor         | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
| A1: Switching           | (3)Enable temperature sensor             | <input type="radio"/> Disable <input checked="" type="radio"/> Enable  |
| Logic function B        | ->Temperature >= Threshold lower (0.1°C) | 20   |
|                         | ->Temperature <= Threshold upper (0.1°C) | 30   |

If hysteresis is 10, Threshold\_1 > Threshold\_2, Threshold\_1 = 30°C and Threshold\_2 = 20°C. Then effective value is <21°C or <29°C.

Threshold\_1 – 1C= 29°C

Threshold\_2 + 1C= 21°C



|  |   |
|--|---|
| (3)Enable temperature sensor             | <input type="radio"/> Disable <input checked="" type="radio"/> Enable |
| ->Temperature >= Threshold lower (0.1°C) | 30  |
| ->Temperature <= Threshold upper (0.1°C) | 20  |

-> Temperature compensation (0.1°C): If temperature value is not correct, you can use this to adjust the temperature value.

### 2.1.2 Constant Brightness

(1) Constant brightness: Keep the range detected by the sensor at a constant value.

| Number | Name                           | Object Function                | Description | Group Address | Length | C | R | W | T | U | Data Type            | Priority |
|--------|--------------------------------|--------------------------------|-------------|---------------|--------|---|---|---|---|---|----------------------|----------|
| 1      | General                        | Heartbeat telegram             |             |               | 1 bit  | C | - | - | T | - | enable               | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus       |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 27     | Light channel 1 external input | External telegram              |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 31     | Light channel 1 output         | Switching                      |             |               | 1 bit  | C | R | - | T | - | switch               | Low      |
| 242    | Constant brightness A          | Dimming output value(0%..100%) |             |               | 1 byte | C | R | - | T | - | percentage (0..100%) | Low      |

Trigger condition: Detection and Brightness are as logic input condition. When sensor detects movement and brightness lower than the preset value, then turn on the light (100%), and then the light will be dimming to preset value by auto. If no movement after delay time, the Constant Brightness function will stop.

You can enable the Constant Brightness function A/B in General setting.

1.1.1 M/US05.1 > Constant brightness A

|                              |  |
|------------------------------|--|
| <b>General</b>               | Lux value from <input checked="" type="radio"/> Local lux sensor <input type="radio"/> External lux telegram   |
| Light control                | -> Constant brightness value(0~1200 lux) <input type="text" value="100"/>                                      |
| Function status              | Change constant brightness value via bus <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| <b>Constant brightness A</b> | Lux quiver(n%): constant brightness lux* ((1-n%) and (1+n%)) <input type="text" value="10%"/>                  |
| Logic function A             | Output setting:<br>Minimum dimming time interval limit (0.1~5.0 s) <input type="text" value="1.0 s"/>          |
| Logic function B             | Minimum dimming step value limit (1~10%) <input type="text" value="1%"/>                                       |
| Logic function C             | Maximum dimming step value limit (1~10%) <input type="text" value="5%"/>                                       |
| Logic function D             | Minimum dimming value limit <input type="text" value="0%"/>  |
| Logic function E             | Maximum dimming value limit <input type="text" value="100%"/>  |
|                              | First dimming value of constant brightness after power on <input type="text" value="80%"/>                     |
|                              | Operational setting:<br>Constant brightness control after power on <input type="text" value="Start"/>          |

Group Objects / Parameters

- Lux value can get from local lux sensor or external lux sensor.

| Number | Name                  | Object Function                | Description | Group Address | Length  | C | R | W | T | U | Data Type            | Priority |
|--------|-----------------------|--------------------------------|-------------|---------------|---------|---|---|---|---|---|----------------------|----------|
| 0      | General               | Heartbeat telegram             |             |               | 1 bit   | C | - | - | T | - | enable               | Low      |
| 30     | Object output A1      | Switching                      |             |               | 1 bit   | C | R | - | T | - | switch               | Low      |
| 211    | Constant brightness A | Dimming output value(0%..100%) |             |               | 1 byte  | C | R | - | T | - | percentage (0..100%) | Low      |
| 212    | Constant brightness A | External Lux telegram(0~2000)  |             |               | 2 bytes | C | R | W | T | U | lux (Lux)            | Low      |

- Constant brightness value range is 0~1200 lux and it use 100 lux by default. It can be changed by Bus if change constant brightness value via bus option is enabled.

Change constant brightness value via bus  Disable  Enable

|     |                       |                                |         |   |   |   |   |        |                      |
|-----|-----------------------|--------------------------------|---------|---|---|---|---|--------|----------------------|
| 0   | General               | Heartbeat telegram             | 1 bit   | C | - | T | - | enable | Low                  |
| 30  | Object output A1      | Switching                      | 1 bit   | C | R | - | T | -      | switch               |
| 211 | Constant brightness A | Dimming output value(0%..100%) | 1 byte  | C | R | - | T | -      | percentage (0..100%) |
| 213 | Constant brightness A | Constant bri.. Lux (0~2000)    | 2 bytes | C | R | W | T | U      | lux (Lux)            |

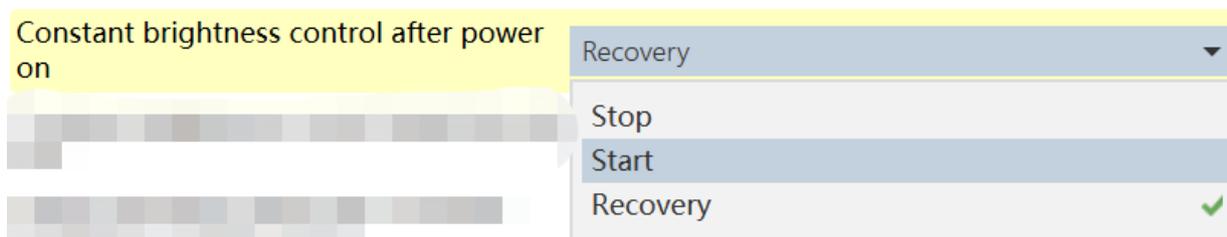
(2) Output setting

- Minimum dimming time interval limit range is from 0.1s to 5.0s.
- Minimum dimming step value limit range is from 1 to 10%.
- Maximum dimming step value limit range is from 1 to 10%.
- Minimum dimming value limit range is from 0% to 100%.
- Maximum dimming value limit range is from 0% to 100%.
- First dimming value of constant brightness after power on: After the power recovery, sensor will restore to the selected dimming value. Dimming value can be 0% ~ 100% and last dimming value. It uses 80% dimming value by default.

(3) Operational setting

- Constant brightness control after power on: After the power recovery, whether the constant brightness control function is enabled or disabled. Recovery means restore to the status before power failure after re-power on.

Operational setting:



- Constant brightness control start/stop via bus: Enable or disable the constant brightness control from the bus.

Constant brightness control start/stop via bus



Disable

Disable ✓

Enable('1'-Start/'0'-Stop)

Enable('1'-Stop/'0'-Start)

| Number | Name                  | Object Function                | Description | Group Address | Length  | C | R | W | T | U | Data Type            | Priority |
|--------|-----------------------|--------------------------------|-------------|---------------|---------|---|---|---|---|---|----------------------|----------|
| 0      | General               | Heartbeat telegram             |             |               | 1 bit   | C | - | - | T | - | enable               | Low      |
| 30     | Object output A1      | Switching                      |             |               | 1 bit   | C | R | - | T | - | switch               | Low      |
| 211    | Constant brightness A | Dimming output value(0%..100%) |             |               | 1 byte  | C | R | - | T | - | percentage (0..100%) | Low      |
| 213    | Constant brightness A | Constant bri.. Lux (0~2000)    |             |               | 2 bytes | C | R | W | T | U | lux (Lux)            | Low      |
| 210    | Constant brightness A | '1'-Start/'0'-Stop             |             |               | 1 bit   | C | R | W | T | U | start/stop           | Low      |

(4) Output dimming value after constant brightness control stopped: Whether directly output a specific dimming value after stop constant brightness control.

(5) Forced operation

Activate an operation after the power recovery. Usually it is used to output a different dimming value than constant brightness. When the force is stopped, return to constant brightness output.

Forced operation  Disable  Enable

1.1.1 M/US05.1 > A: Forced operation

|                       |   |   |
|-----------------------|---|---|
| General               | The forced operation status after power on                              | To forced operation A1  |
| Constant brightness A | Forced operation A1   | <input type="radio"/> Disable <input checked="" type="radio"/> Enable |
| A: Forced operation   | -> Forced operation start/stop(stop:back to constant brightness output) | '1'-Start,'0'-Stop  |
| Function status       | -> Forced operation dimming value                                       | 0%  |
| Logic function A      | -> Change forced dimming value via bus                                  | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Block A               | Forced operation A2   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |

(6) Trigger

Trigger  Disable  Enable

1.1.1 M/US05.1 > A: Trigger

|                       |                                      |   |
|-----------------------|--------------------------------------|---|
| General               | Constant brightness object trigger 1 | <input type="radio"/> Disable <input checked="" type="radio"/> Enable                         |
| Constant brightness A | Object value '0' trigger             | <input type="radio"/> Disable <input checked="" type="radio"/> Enable                         |
| A: Trigger            | ->Constant brightness value          | <input checked="" type="radio"/> To new lux <input type="radio"/> To the lux before triggered |
| Function status       | ->>New lux(0~2000 lux)               | 0   |
| Logic function A      | Object value '1' trigger             | <input type="radio"/> Disable <input checked="" type="radio"/> Enable                         |
| Block A               | ->Constant brightness value          | <input checked="" type="radio"/> To new lux <input type="radio"/> To the lux before triggered |
| A1: Switching         | ->>New lux(0~2000 lux)               | 40  |
| Logic function B      | Constant brightness object trigger 2 | <input checked="" type="radio"/> Disable <input type="radio"/> Enable                         |
|                       | Constant brightness object trigger 3 | <input checked="" type="radio"/> Disable <input type="radio"/> Enable                         |

- To new lux: if to change current constant brightness value to new one, enable trigger function, send value "0" or "1" to number 222 group address.
- To the lux before triggered: if to switch back to current constant brightness value, select this option.

| Number | Name                            | Object Function                | Description | Group Address | Length | C | R | W | T | U | Data Type            | Priority |
|--------|---------------------------------|--------------------------------|-------------|---------------|--------|---|---|---|---|---|----------------------|----------|
| 0      | General                         | Heartbeat telegram             |             |               | 1 bit  | C | - | - | T | - | enable               | Low      |
| 30     | Object output A1                | Switching                      |             |               | 1 bit  | C | R | - | T | - | switch               | Low      |
| 211    | Constant brightness A           | Dimming output value(0%..100%) |             |               | 1 byte | C | R | - | T | - | percentage (0..100%) | Low      |
| 222    | Constant brightness A Trigger 1 | '1/'0'-trigger                 |             |               | 1 bit  | C | R | W | T | - |                      | Low      |

2.1.3  $PI:u(k)=Kp(\text{Proportional coefficient})[e(k)-e(k-1)]+Ki(\text{integration time})e(k)$

Dimming speed (for PI): Select the suitable dimming speed for constant brightness function.

Defined

- Lowest(Ki=1%,Kp=1%)
- Lower(Ki=5%,Kp=5%)
- Low(Ki=10%,Kp=10%)
- Middle(Ki=15%,Kp=15%)
- Fast(Ki=30%,Kp=30%)
- Faster(Ki=60%,Kp=60%)
- Fastest(Ki=100%,Kp=100%)

PI:u(k)=Kp(Proportional coefficient )e(k)-e(k-1)]

Dimming speed (for PI) Middle(Ki=15%,Kp=15%)

### 2.3 Light Control

Lighting control function. If just use PIR or PIR + brightness to control the light, you can set the parameter in Light Control1 or Light Control2. Take Light Control1 as example.

Enable the Light Control1 in General.

1.1.1 M/US05.1 > Light control

|                       |   |  |
|-----------------------|---|--|
| General               | Use light channel 1?                    | <input type="radio"/> No <input checked="" type="radio"/> Yes                |
| <b>Light control</b>  | Operation mode                          | <input checked="" type="radio"/> Normal <input type="radio"/> semi-automatic |
| Function status       | -Follow-up time seconds                 | 0  |
| Constant brightness A | -Follow-up time minutes                 | 1  |
| Logic function A      | -Follow-up time hours                   | 0  |
| Logic function B      | -Follow-up time change via object?      | <input checked="" type="radio"/> No <input type="radio"/> Yes                |
| Logic function C      | Threshold value brightness              | 500  |
| Logic function D      | -Threshold value brightness via object? | <input checked="" type="radio"/> No <input type="radio"/> Yes                |
| Logic function E      | Use brightness shutdown?                | <input checked="" type="radio"/> No <input type="radio"/> Yes                |
|                       | Output                                  | =====  |
|                       | -Object type                            | <input checked="" type="radio"/> 1bit <input type="radio"/> 1byte            |
|                       | -Value when detection                   | <input type="radio"/> OFF-"0" <input checked="" type="radio"/> ON-"1"        |
|                       | -Value when non-detection time out      | <input checked="" type="radio"/> OFF-"0" <input type="radio"/> ON-"1"        |
|                       | Safety time(seconds)                    | 0  |

Group Objects Parameters

■ Operation mode:

Normal: The logic can start by automation.

Semi-automatic: The logic needs to start when it receives External switching telegram '1'.

No matter which mode you select, create and link group address to Number 27.

| Number | Name                           | Object Function                | Description | Group Address | Length | C | R | W | T | U | Data Type            | Priority |
|--------|--------------------------------|--------------------------------|-------------|---------------|--------|---|---|---|---|---|----------------------|----------|
| 1      | General                        | Heartbeat telegram             |             |               | 1 bit  | C | - | - | T | - | enable               | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus       |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 27     | Light channel 1 external input | External telegram              |             |               | 1 bit  | C | - | W | T | - | switch               | Low      |
| 31     | Light channel 1 output         | Switching                      |             |               | 1 bit  | C | R | - | T | - | switch               | Low      |
| 242    | Constant brightness A          | Dimming output value(0%..100%) |             |               | 1 byte | C | R | - | T | - | percentage (0..100%) | Low      |

- Follow-up time: If there is no detection after this time, it will trigger the output for non-detection.

- Follow-up time change via object: If Yes, then can use group address to change the follow-up time from BUS.

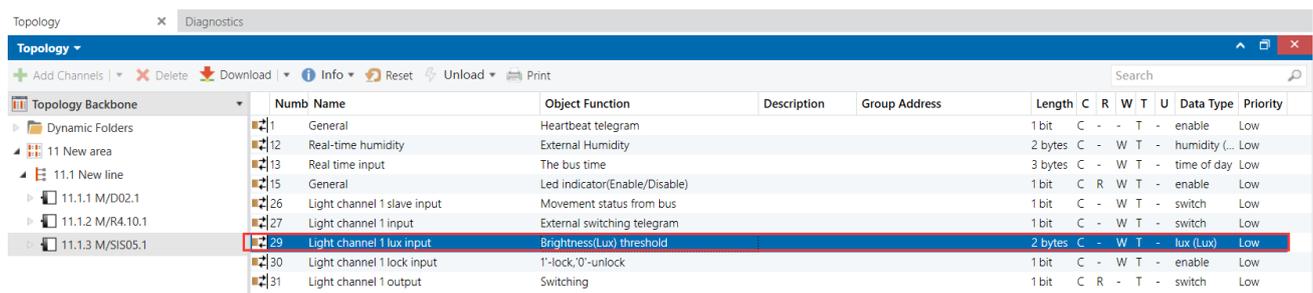
| Number | Name                           | Object Function                | Description | Group Address | Length  | C | R | W | T | U | Data Type            | Priority |
|--------|--------------------------------|--------------------------------|-------------|---------------|---------|---|---|---|---|---|----------------------|----------|
| 1      | General                        | Heartbeat telegram             |             |               | 1 bit   | C | - | - | T | - | enable               | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus       |             |               | 1 bit   | C | - | W | T | - | switch               | Low      |
| 27     | Light channel 1 external input | External telegram              |             |               | 1 bit   | C | - | W | T | - | switch               | Low      |
| 28     | Light channel 1 time input     | follow-up time(minutes)        |             |               | 2 bytes | C | - | W | T | - | time (min)           | Low      |
| 31     | Light channel 1 output         | Switching                      |             |               | 1 bit   | C | R | - | T | - | switch               | Low      |
| 242    | Constant brightness A          | Dimming output value(0%..100%) |             |               | 1 byte  | C | R | - | T | - | percentage (0..100%) | Low      |

■ Threshold value brightness:

In light control parameters, all the conditions use “AND” logical relationship by default. If only use PIR sensor and brightness is less than 1200, set threshold to 1200.

For example: If the brightness is less then Threshold value and it detects movement, will turn on the light. If the brightness is over then Threshold value and it detects movement, will not turn on the light.

- Threshold value brightness via object: If yes, then can use group address to change the threshold value from BUS.



■ Use brightness shutdown:

If Yes, it will trigger the output for non-detection when value is in Threshold value brightness during delay time.

Use brightness shutdown?  No  Yes

-Calculate delay time(1..50minutes)

-Threshold value brightness

When the brightness is 1000 lux during 1 minute, will turn off the light directly.

■ Output mode:

Individual: It can send out one output, you can select the output type (1bit or 1byte) and the value for detection/non-detection.

■ Safety time (seconds):

Only after this safety time will newer output be activated.

Safety time(seconds)

■ Lock:

'1'-lock, '0'-unlock; '0'-lock, '1'-unlock: Used 1bit group address to lock/unlock the logic for Light Control1.

| Number | Name                           | Object Function          | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|--------|--------------------------------|--------------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| 1      | General                        | Heartbeat telegram       |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 26     | Light channel 1 slave input    | Movement status from bus |             |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 27     | Light channel 1 external input | External telegram        |             |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 30     | Light channel 1 lock input     | '1'-lock,'0'-unlock      |             |               | 1 bit  | C | - | W | T | - | enable    | Low      |
| 31     | Light channel 1 output         | Switching                |             |               | 1 bit  | C | R | - | T | - | switch    | Low      |

| Number | Name                        | Object Function               | Description | Group Address | Length  | C | R | W | T | U | Data Type      | Priority |
|--------|-----------------------------|-------------------------------|-------------|---------------|---------|---|---|---|---|---|----------------|----------|
| 1      | General                     | Heartbeat telegram            |             |               | 1 bit   | C | - | - | T | - | enable         | Low      |
| 12     | Real-time humidity          | External Humidity             |             |               | 2 bytes | C | - | W | T | - | humidity (...) | Low      |
| 13     | Real time input             | The bus time                  |             |               | 3 bytes | C | - | W | T | - | time of day    | Low      |
| 15     | General                     | Led indicator(Enable/Disable) |             |               | 1 bit   | C | R | W | T | - | enable         | Low      |
| 26     | Light channel 1 slave input | Movement status from bus      |             |               | 1 bit   | C | - | W | T | - | switch         | Low      |
| 27     | Light channel 1 input       | External switching telegram   |             |               | 1 bit   | C | - | W | T | - | switch         | Low      |
| 30     | Light channel 1 lock input  | Scene telegram                |             |               | 1 byte  | C | - | W | T | - | scene num...   | Low      |
| 31     | Light channel 1 output      | Switching                     |             |               | 1 bit   | C | R | - | T | - | switch         | Low      |

-- Only lock/unlock: Just lock/unlock the logic for Light Control1.

-- Lock/Unlock and transmit value: Lock/Unlock the logic for Light Control1 and send out a value to output group address. For example: Lock the logic and turn on the light when you

press button.

-- Automatic unlock after lock delay: It will automatically unlock after the delay time.

## 2.4 Function Status

1.1.1 M/US05.1 > Function status

|                  |  |  |
|------------------|--|--|
| General          | Slave ultrasonic sensor status report                      | <input type="radio"/> No <input checked="" type="radio"/> Yes                            |
| Function status  | -> Transmit telegram value when ultrasonic sensor detected | <input type="radio"/> Slave value-'0' <input checked="" type="radio"/> Slave value-'1'   |
| Logic function A | Lux value report   | <input type="radio"/> No <input checked="" type="radio"/> Yes                            |
| Block A          | -> Lux report mode   | <input checked="" type="radio"/> Report when changed <input type="radio"/> Report cyclic |
| A1: Switching    | -> Differential value for report (1..200lux)               | 20   |
|                  | -> Minimum time interval(1..255s)                          | 1  |

■ Slave ultrasonic sensor status report: send value “0” or “1” to bus.

| Number | Name             | Object Function            | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|--------|------------------|----------------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| 0      | General          | Heartbeat telegram         |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 30     | Object output A1 | Switching                  |             |               | 1 bit  | C | R | - | T | - | switch    | Low      |
| 3      | Function status  | Slave sensor status to bus |             |               | 1 bit  | C | - | W | T | - | switch    | Low      |

■ Lux report mode: feedback current lux value to bus.

1.1.1 M/US05.1 > Function status

|                  |  |  |
|------------------|--|--|
| General          | Slave ultrasonic sensor status report        | <input checked="" type="radio"/> No <input type="radio"/> Yes                            |
| Function status  | Lux value report                             | <input type="radio"/> No <input checked="" type="radio"/> Yes                            |
| Logic function A | -> Lux report mode                           | <input checked="" type="radio"/> Report when changed <input type="radio"/> Report cyclic |
| Block A          | -> Differential value for report (1..200lux) | 20   |
|                  | -> Minimum time interval(1..255s)            | 1  |

| Number | Name             | Object Function       | Description | Group Address | Length  | C | R | W | T | U | Data Type | Priority |
|--------|------------------|-----------------------|-------------|---------------|---------|---|---|---|---|---|-----------|----------|
| 0      | General          | Heartbeat telegram    |             |               | 1 bit   | C | - | - | T | - | enable    | Low      |
| 30     | Object output A1 | Switching             |             |               | 1 bit   | C | R | - | T | - | switch    | Low      |
| 5      | Function status  | Brightness(Lux) value |             |               | 2 bytes | C | R | - | T | - | lux (Lux) | Low      |

## 2.5 Logic Function A/B/C/D

There are four independent logic, you can select movement /brightness /temperature /humidity /external telegram as logic input conditions, and you can use 1bit group address to

enable/disable the logic function.

Take Logic Function A as example:

1.1.1 M/US05.1 > Logic function A

|                  |                                      |  |
|------------------|--------------------------------------|--|
| General          | Use logical block A                  | <input type="radio"/> No <input checked="" type="radio"/> Yes  |
| Light control    | (1)Enable Movement sensor            | Single mode(independent sensor) ▼  |
| Function status  | ->Movement sensor status             | <input type="radio"/> Movement sensor detected is False,else is...<br><input checked="" type="radio"/> Movement sensor detected is True,else is F... |
| Logic function A | (2)Enable brightness(Lux) sensor     | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
| Block A          | (3)Enable temperature sensor         | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
| A1: Switching    | (4)Enable external telegram 1        | Disable ▼  |
| Logic function B | (5)Enable external telegram 2        | Disable ▼  |
| Logic function C | Logical relation of block A          | <input checked="" type="radio"/> AND <input type="radio"/> OR  |
| Logic function D | Result of logic A inverted           | <input checked="" type="radio"/> No <input type="radio"/> Yes  |
| Logic function E | Status(True/False) of logic A to bus | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
|                  | <1>Use logical A function lock?      | <input checked="" type="radio"/> No <input type="radio"/> Yes  |

Group Objects / Parameters

(1): Enable movement sensor: If enable, the movement sensor as logic input condition.

-- Disable: The ultrasonic sensor is not used in this logic.

-- Single mode (independent sensor): This ultrasonic sensor works as logic input condition, and you can select the sensor status. Suggest select ultrasonic sensor detected is True, else is False.

-- Master/Slave mode (Master sensor): More sensors work as logic input condition, but this sensor as master. It can use 1bit group address to link to slave sensor, when receive salve value, then the master set to Ture.

General

Use logical block A  No  Yes

Light control

(1)Enable Movement sensor  No  Yes

Function status

Logic function A

Block A

| Number | Name             | Object Function          | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|--------|------------------|--------------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| 1      | General          | Heartbeat telegram       |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 41     | Object input A   | Movement status from bus |             |               | 1 bit  | C | - | W | T | U | switch    | Low      |
| 61     | Object output A1 | Switching                |             |               | 1 bit  | C | R | - | T | - | switch    | Low      |

(2): Enable Brightness (Lux) Sensor: It supports up to 3 brightness thresholds. You can select the brightness value.

(2)Enable brightness(Lux) sensor  Disable  Enable

Enable brightness(Lux) threshold A  Disable  Enable

->Lux >= Threshold lower(0 ~ 1200 lux)

->Lux <= Threshold upper(0 ~ 1200 lux)

->Changed Lux threshold value via bus  No  Yes

->Brightness(Lux) status

->Independent control <object output 8>  No  Yes(Separated from logic and output)

Enable brightness(Lux) threshold B  Disable  Enable

-- Change Lux threshold value via bus: If enable, can modify the value via group address.

-- Brightness (Lux) status: Select the Ture/False status for logic.

-- Independent control < object output 8: It can independently control the object output8 when brightness is in the range. This is separated from Logic A.

->Independent control <object output 8>  No  Yes(Separated from logic and output)

-->>Enable/disable independent control via bus  No  Yes

-->>Operation mode

-->><Object output 8 > status when independent control disabled

(3): Enable temperature sensor: If enable, the local temperature works as logic input condition, you can select the temperature range and the temperature status.

And it supports modify the temperature threshold value from Bus.

(3)Enable temperature sensor       Disable    Enable

->Temperature >= Threshold lower (0.1°C)     

->Temperature <= Threshold upper (0.1°C)     

->Changed temperature threshold value via bus       No    Yes

->Temperature status     

(5) Enable external telegram 1

(6) Enable external telegram 2

-- There are two external telegram which from Bus can work as logic input condition.

■ Logic relation of block A:

AND: Only when all input conditions are met can the target be executed

OR: If one of the input conditions is met, the target can be executed

■ Result of logic A inverted: Inverted the logic A result or not.

■ **Status (True/False) of logic A to bus:** If enable, it will send out the logic A status to Bus via group address.

■ **Use logical A function lock?**

-- Use telegram via bus: If yes, then can use Big telegram or Scene telegram to lock/unlock the Logical A.

| Number | Name                | Object Function     | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|--------|---------------------|---------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| 1      | General             | Heartbeat telegram  |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 61     | Object output A1    | Switching           |             |               | 1 bit  | C | R | - | T | - | switch    | Low      |
| 78     | <1>Logic A function | Lock logic function |             |               | 1 bit  | C | - | W | T | - | enable    | Low      |

-- Logic A output status when logic function lock: Set the output status when logic lock.

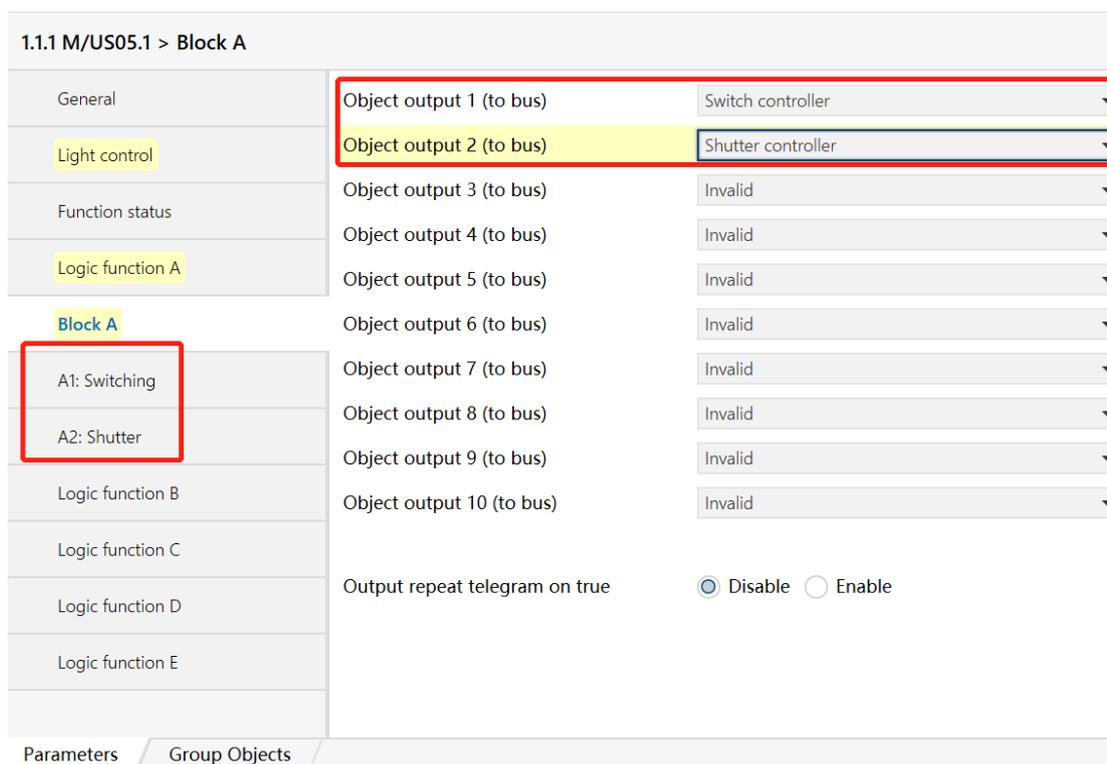
-- Logic A automation unlock after logic function lock: It will auto unlock after delay time.

- **Logic A output status when logic function unlocks:** Set the output status when logic unlock.
- **Feedback logic A function lock status:** If enable, it can use 1bit group address to feedback the lock status to Bus.

### 2.1.4 Block A

Enable the output object for logic, take Logic function A as example. Logic function B/C/D are same.

For example: Logic function A has two outputs, one is control single light, second is control curtain.



Output repeat telegram on true: Enable/disable the repeat telegram on true.

### 2.5 Logic Function E

Logic function E has combination function, it can combine logic A/B/C/D. For example, when logic A and logic B are both true, then turn on the light.

1.1.1 M/US05.1 > Logic function E

|                         |  |   |
|-------------------------|--|---|
| General                 | Use logical block E                              | <input type="radio"/> No <input checked="" type="radio"/> Yes         |
| Light control           | Enable logic A                                   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Function status         | Enable logic B                                   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Logic function A        | Enable logic C                                   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Logic function B        | Enable logic D                                   | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| Logic function C        | Result of logic E inverted                       | <input checked="" type="radio"/> No <input type="radio"/> Yes         |
| Logic function D        | NOTE: Logic E = A o B o C o D (o = AND/OR)       |   |
|                         | Status(True/False) of logic E to bus             | <input checked="" type="radio"/> Disable <input type="radio"/> Enable |
| <b>Logic function E</b> |  |   |
| Block E                 | <1>Use logical E function lock?                  | <input checked="" type="radio"/> No <input type="radio"/> Yes         |
| E1: Switching           | <2>Use logical E function lock?                  | <input checked="" type="radio"/> No <input type="radio"/> Yes         |
|                         | Logic E output status when logic function unlock | True  |
| Parameters              | Feedback logic E function lock status            | <input checked="" type="radio"/> No <input type="radio"/> Yes         |

- **Enable logic A/B/C/D:** Enable logic A/B/C/D as logic E input condition or not.  
Result of logic A/B/C/D inverted: Inverted the result of logic A/B/C/D or not.
- **Result of logic E inverted:** Inverted the result of logic E or not.
- **Status (True/False) of logic E to bus:** If send out the logic E status to bus or not.
- **Use logical E function lock?**
  - Use telegram via bus: If yes, then can use Big telegram or Scene telegram to lock/unlock the Logical E.
  - Logic E output status when logic function lock: Set the output status when logic lock.
  - Logic E automation unlock after logic function lock: It will auto unlock after delay time.
- **Logic E output status when logic function unlocks:**
  - Set the output status when logic unlock.
- **Feedback logic E function lock status:** If enable, it can use 1bit group address to feedback the lock status to Bus.

## 2.6 Block E

Enable the output object for logic E.

For example: Logic function E has one output (Switch controller to control single light).

1.1.1 M/US05.1 > Block E

|                  |                           |                   |
|------------------|---------------------------|-------------------|
| General          | Object output 1 (to bus)  | Switch controller |
| Light control    | Object output 2 (to bus)  | Invalid           |
| Function status  | Object output 3 (to bus)  | Invalid           |
| Logic function A | Object output 4 (to bus)  | Invalid           |
| Logic function B | Object output 5 (to bus)  | Invalid           |
| Logic function C | Object output 6 (to bus)  | Invalid           |
| Logic function D | Object output 7 (to bus)  | Invalid           |
| Logic function E | Object output 8 (to bus)  | Invalid           |
|                  | Object output 9 (to bus)  | Invalid           |
|                  | Object output 10 (to bus) | Invalid           |

**Block E**      Output repeat telegram on true       Disable     Enable

E1: Switching

Parameters / Group Objects

Output repeat telegram on true: Enable/disable the repeat telegram on true.

## 2.7 Output of Logic Function E

After enable the output objects in Block E, then it will show the output setting for logic true/false.

|  |                                     |                           |
|--|-------------------------------------|---------------------------|
| The status after bus voltage recovery    | Invalid                             | ▼                         |
| Logical block output when TRUE           | ON                                  | ▼                         |
| -> Delay time (0..17 Hours)              | 0                                   | ▲▼                        |
| -> Delay time (0..59 Minutes)            | 0                                   | ▲▼                        |
| -> Delay time (0..59 Seconds)            | 0                                   | ▲▼                        |
| -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No | <input type="radio"/> Yes |
| Logical block output when FALSE          | OFF                                 | ▼                         |
| -> Delay time (0..17 Hours)              | 0                                   | ▲▼                        |
| -> Delay time (0..59 Minutes)            | 0                                   | ▲▼                        |
| -> Delay time (0..59 Seconds)            | 10                                  | ▲▼                        |
| -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No | <input type="radio"/> Yes |

- **The status after bus voltage recovery:** Set the status after bus voltage recovery.

- **Logical block output when True:** Set the detail function when logic true.

Delay time: After delay time, will trigger the output.

Change delay time via bus (0s..17h): The delay time can be changed by bus.

- **Logical block output when False:** Set the detail function when logic false.

Delay time: After delay time, will trigger the output.

- **Change delay time via bus (0s..17h):** The delay time can be changed by bus.

## 3 Examples

### 3.1 Single movement control one light

- (1) Enable Logic function A and select Single mode.

1.1.1 M/US05.1 > Logic function A

|                  |                                  |  |
|------------------|----------------------------------|--|
| General          | Use logical block A              | <input type="radio"/> No <input checked="" type="radio"/> Yes  |
| Light control    | (1)Enable Movement sensor        | Single mode(independent sensor)  |
| Function status  | ->Movement sensor status         | <input type="radio"/> Movement sensor detected is False,else is...<br><input checked="" type="radio"/> Movement sensor detected is True,else is F... |
| Logic function A | (2)Enable brightness(Lux) sensor | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
| Block A          | (3)Enable temperature sensor     | <input checked="" type="radio"/> Disable <input type="radio"/> Enable  |
| A1: Switching    | (4)Enable external telegram 1    | Disable  |
| Logic function B | (5)Enable external telegram 2    | Disable  |

(2) Enable one output object, because control one light turns on/off, so we can use Switch controller type.

1.1.1 M/US05.1 > Block A

|                  |                          |                   |
|------------------|--------------------------|-------------------|
| General          | Object output 1 (to bus) | Switch controller |
| Light control    | Object output 2 (to bus) | Invalid           |
| Function status  | Object output 3 (to bus) | Invalid           |
| Logic function A | Object output 4 (to bus) | Invalid           |
| Block A          | Object output 5 (to bus) | Invalid           |
|                  | Object output 6 (to bus) | Invalid           |

Enable one output object

(3) Set the detailed function for output.

1.1.1 M/US05.1 > A1: Switching

|                  |  |   |
|------------------|--|---|
| General          | The status after bus voltage recovery    | Invalid   |
| Light control    | Logical block output when TRUE           | ON  |
| Function status  | -> Delay time (0..17 Hours)              | 0   |
| Logic function A | -> Delay time (0..59 Minutes)            | 0   |
| Block A          | -> Delay time (0..59 Seconds)            | 0   |
| A1: Switching    | -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No <input type="radio"/> Yes |
| Logic function B | Logical block output when FALSE          | OFF   |
| Logic function C | -> Delay time (0..17 Hours)              | 0   |
| Logic function D | -> Delay time (0..59 Minutes)            | 0   |
|                  | -> Delay time (0..59 Seconds)            | 10  |
|                  | -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No <input type="radio"/> Yes |

(4) Link the group address to light. It means when it detects a movement, it will turn on relay1; when there is no detection in 10s, it will turn off relay1.

| Topology Backbone | Number | Name             | Object Function    | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|------------------|--------------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 1      | General          | Heartbeat telegram |             |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 1 Sensor          | 61     | Object output A1 | Switching          | relay 1     | 1/1/1         | 1 bit  | C | R | - | T | - | switch    | Low      |

| Topology Backbone | Number | Name     | Object Function | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|----------|-----------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 10     | Output A | Channel output  | relay 1     | 1/1/1         | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1 Sensor          | 30     | Output B | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1 M-US05.1      | 50     | Output C | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1.1 M/US05.1    | 70     | Output D | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |

### 3.2 Master/Slave movement control one light

Some projects will use two sensors to control same light. One of sensors has detection, will turn on the light; If master sensor no detection for 10s and slave sensor not sent '1' in 10s, will turn off relay1.

- 1) Master sensor enable Logic function A and select Master/Slave mode (Master sensor).

The screenshot shows the configuration for Logic function A in the software. The 'General' tab is active, showing 'Use logical block A' set to 'Yes'. Under 'Light control', '(1) Enable Movement sensor' is set to 'Master/Slave mode(Master sensor)'. The 'Logic function A' section shows 'Block A' set to 'A1: Switching'. The '(1) Enable Movement sensor' section has 'Movement sensor detected is True, else is F...' selected. The '(2) Enable brightness(Lux) sensor' is set to 'Disable'. The '(3) Enable temperature sensor' is set to 'Disable'. A red text annotation 'Status from slave sensor' points to the 'Slave value-'1'' radio button.

- 2) Master sensor enable one output object, because control one light turns on/off, so we can use Switch controller type.

1.1.1 M/US05.1 > Block A

**Enable one output object**

|                  |                          |                   |
|------------------|--------------------------|-------------------|
| General          | Object output 1 (to bus) | Switch controller |
| Light control    | Object output 2 (to bus) | Invalid           |
| Function status  | Object output 3 (to bus) | Invalid           |
| Logic function A | Object output 4 (to bus) | Invalid           |
|                  | Object output 5 (to bus) | Invalid           |
| Block A          | Object output 6 (to bus) | Invalid           |

3) Set the detailed function for master sensor output.

1.1.1 M/US05.1 > A1: Switching

|                  |  |   |
|------------------|--|---|
| General          | The status after bus voltage recovery    | Invalid   |
| Light control    | Logical block output when TRUE           | ON  |
| Function status  | -> Delay time (0..17 Hours)              | 0   |
|                  | -> Delay time (0..59 Minutes)            | 0   |
| Logic function A | -> Delay time (0..59 Seconds)            | 0   |
| Block A          | -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No <input type="radio"/> Yes |
| A1: Switching    | Logical block output when FALSE          | OFF   |
| Logic function B | -> Delay time (0..17 Hours)              | 0   |
| Logic function C | -> Delay time (0..59 Minutes)            | 0   |
| Logic function D | -> Delay time (0..59 Seconds)            | 10  |
|                  | -> Change delay time via bus (0 s..17 h) | <input checked="" type="radio"/> No <input type="radio"/> Yes |

4) Link the movement status from bus (other sensor's status), and link the address to light. That means current sensor or other sensor has detection, will turn on relay1; when master sensor no detection for 10s and slave sensor not sent '1' in 10s, will turn off relay1.

| Topology Backbone | Number | Name             | Object Function              | Description  | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|------------------|------------------------------|--------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 1      | General          | Heartbeat telegram           |              |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 1 Sensor          | 16     | Function status  | Slave status to bus          |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1 M-US05.1      | 20     | Function status  | Slave status to bus(Logic A) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.1 M/US05.1    | 23     | Function status  | Slave status to bus(Logic B) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
|                   | 24     | Function status  | Slave status to bus(Logic C) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
|                   | 25     | Function status  | Slave status to bus(Logic D) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.2 M/R4.10.1   | 41     | Object input A   | Movement status from bus     | Slave sensor | 0/0/2         | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1.1.3 M/US05.1    | 61     | Object output A1 | Switching                    | relay 1      | 1/1/1         | 1 bit  | C | R | - | T | - | switch    | Low      |

| Topology Backbone | Number | Name     | Object Function | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|----------|-----------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 10     | Output A | Channel output  | relay 1     | 1/1/1         | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1 Sensor          | 30     | Output B | Channel output  | Light       |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1 M-US05.1      | 50     | Output C | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1.1 M/US05.1    | 70     | Output D | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1.2 M/R4.10.1   |        |          |                 |             |               |        |   |   |   |   |   |           |          |

5) Slave sensor reports the status to bus via group address.

**Topology Backbone** | 1.1.3 M/US05.1 > Function status

Dynamic Folders

- 1 Sensor
  - 1.1 M-US05.1
    - 1.1.1 M/US05.1 → **Master sensor**
    - 1.1.2 M/R4.10.1
    - 1.1.3 M/US05.1 → **Slave sensor**

**Function status**

Logic function A

(1) Slave Movement sensor status report  No  Yes

-> Transmit telegram value when Movement sensor detected  Slave value-'0'  Slave value-'1'

(2) Brightness report  No  Yes

(3) Temperature report  No  Yes

| Topology Backbone | Number | Name             | Object Function              | Description  | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|------------------|------------------------------|--------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 1      | General          | Heartbeat telegram           |              |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 1 Sensor          | 16     | Function status  | Slave status to bus          | Slave sensor | 0/0/2         | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1 M-US05.1      | 20     | Function status  | Slave status to bus(Logic A) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.1 M/US05.1    | 23     | Function status  | Slave status to bus(Logic B) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.2 M/R4.10.1   | 24     | Function status  | Slave status to bus(Logic C) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.3 M/US05.1    | 25     | Function status  | Slave status to bus(Logic D) |              |               | 1 bit  | C | - | W | T | - | switch    | Low      |
|                   | 41     | Object input A   | Movement status from bus     |              |               | 1 bit  | C | - | W | T | U | switch    | Low      |
|                   | 61     | Object output A1 | Switching                    |              |               | 1 bit  | C | R | - | T | - | switch    | Low      |

### 3.3 Light Control 1 (Fully-automatic/Normal)

Use movement and brightness as logic input. When the brightness is under preset value and has detection, then turn on light. If there is no detection after delay time, turn off the light.

1) Enable normal mode, set the delay time and object type.

1.1.1 M/US05.1 > Light control

General Use light channel 1?  No  Yes

Light control Operation mode  Normal  semi-automatic

Function status -Follow-up time seconds 0

Logic function A -Follow-up time minutes 1

Logic function B -Follow-up time hours 0

Logic function C -Follow-up time change via object?  No  Yes

Logic function D Threshold value brightness 500

Logic function E -Threshold value brightness via object?  No  Yes

Use brightness shutdown?  No  Yes

Output =====

-Object type  1bit  1byte

-Value when detection  OFF-"0"  ON-"1"

-Value when non-detection time out  OFF-"0"  ON-"1"

Safety time(seconds) 0

Group Objects Parameters

If no detection after 1 minutes, turn off the light

Output 1 bit object

2) Link the output of light channel 1.

| Topology Backbone | Number | Name                           | Object Function          | Description       | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|--------------------------------|--------------------------|-------------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 1      | General                        | Heartbeat telegram       |                   |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 1 Sensor          | 26     | Light channel 1 slave input    | Movement status from bus |                   |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1 M-US05.1      | 27     | Light channel 1 external input | External telegram        | External telegram | 0/0/3         | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.1 M/US05.1    | 31     | Light channel 1 output         | Switching                | relay 1           | 1/1/1         | 1 bit  | C | R | - | T | - | switch    | Low      |

| Topology Backbone | Number | Name     | Object Function | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|----------|-----------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 10     | Output A | Channel output  | relay 1     | 1/1/1         | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1 Sensor          | 30     | Output B | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1 M-US05.1      | 50     | Output C | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1.1 M/US05.1    | 70     | Output D | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |

Light

Result:

a) Now is in normal mode, no matter it has external telegram or not, the logic will start by automation. If has group address for external telegram:

When receive External telegram '1', will turn on the light directly.

When receive External telegram '0', will turn off the light directly.

b) When the brightness is less than 50 lux and has movement, then turn on the light.

- c) When there is no movement after 1 minute, turn off the light.

### 3.4 Light Control 1 (Semi-automatic)

Use movement and button as logic input. When press the button, sensor will turn on the light,

If there is no detection for preset time or the brightness are in preset value for a time, will turn off the light.

- 1) Enable semi-automatic mode, set the delay time and object type.

The screenshot shows the configuration page for '1.1.1 M/US05.1 > Light control'. The 'Light control' section is highlighted in yellow. The 'Operation mode' is set to 'semi-automatic'. The 'Follow-up time' settings are: seconds (0), minutes (1), and hours (0). A red box highlights these three fields with the text: 'If there is no detection during this time, it will turn off the light'. Other settings include 'Threshold value brightness' (500), 'Use brightness shutdown?' (Yes), 'Calculate delay time(1..50minutes)' (1), and 'Threshold value brightness' (400). The 'Object type' is set to '1bit' and 'Value when detection' is set to 'ON-1\*'. The 'Output' section shows a series of dashes representing a bit stream.

- 2) Link the group address for sensor/relay/button.

| Topology Backbone | Number | Name                           | Object Function          | Description       | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|--------------------------------|--------------------------|-------------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 1      | General                        | Heartbeat telegram       |                   |               | 1 bit  | C | - | - | T | - | enable    | Low      |
| 1 Sensor          | 26     | Light channel 1 slave input    | Movement status from bus |                   |               | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1 M-US05.1      | 27     | Light channel 1 external input | External telegram        | External telegram | 0/0/3         | 1 bit  | C | - | W | T | - | switch    | Low      |
| 1.1.1 M/US05.1    | 31     | Light channel 1 output         | Switching                | relay 1           | 1/1/1         | 1 bit  | C | R | - | T | - | switch    | Low      |

Sensor

| Topology Backbone | Number | Name     | Object Function | Description | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|----------|-----------------|-------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 10     | Output A | Channel output  | relay 1     | 1/1/1         | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1 Sensor          | 30     | Output B | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1 M-US05.1      | 50     | Output C | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |
| 1.1.1 M/US05.1    | 70     | Output D | Channel output  |             |               | 1 bit  | C | - | W | - | U | switch    | Low      |

Light

| Topology Backbone | Number | Name           | Object Function | Description       | Group Address | Length | C | R | W | T | U | Data Type | Priority |
|-------------------|--------|----------------|-----------------|-------------------|---------------|--------|---|---|---|---|---|-----------|----------|
| Dynamic Folders   | 40     | Rocker A short | Switching       | External telegram | 0/0/3         | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1 Sensor          | 41     | Rocker A long  | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1.1 M-US05.1      | 50     | Rocker B short | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1.1.1 M/US05.1    | 51     | Rocker B long  | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1.1.2 M/R4.10.1   | 60     | Rocker C short | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
| 1.1.3 M/DLP04.1   | 61     | Rocker C long  | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
|                   | 70     | Rocker D short | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |
|                   | 71     | Rocker D long  | Switching       |                   |               | 1 bit  | C | - | W | T | U | switch    | Low      |

Button

Result:

- 1: When press the button, the light will turn on.
- 2: If there is no detection for 1 minute, sensor will turn off the light. Or the brightness from dark to 400lux and over 400lux for 1minute, will turn off the light.