



USER'S MANUAL

KNX Push Buttons MSW100x-PL and MIN100x-L

Device Manipulation & ETS™ Application Description

August, 2016

Revision Sheet

| Release No. | Date | Revision Description |
|--------------------|-------------------|---|
| <i>Rev. 0</i> | <i>31/10/2013</i> | <i>User's Manual Created</i> |
| <i>Rev. 1</i> | <i>12/12/2013</i> | <i>Added Appendix D -Detailed description of Communication objects</i> |
| <i>Rev. 2</i> | <i>28/01/2014</i> | <i>Manual modified to meet the changes of the ETS DataBase.</i> |
| <i>Rev. 3</i> | <i>07/06/2014</i> | <i>Changed from draft to released.</i> |
| <i>Rev. 4</i> | <i>16/07/2016</i> | <i>Added MINI100x-L</i> |
| <i>Rev. 5</i> | <i>04/06/2018</i> | <i>Added details on the control of the OFF state brightness for touch devices</i> |

USER'S MANUAL

TABLE OF CONTENTS

| | <u>Page #</u> |
|---|---------------|
| 1 GENERAL INFORMATION..... | 6 |
| 1.1 System Overview..... | 6 |
| 1.2 Acronyms and Abbreviations..... | 6 |
| 2 SYSTEM SUMMARY..... | 8 |
| 2.1 Application Functions Overview..... | 8 |
| 2.2 Application Communication Objects..... | 9 |
| 3 GETTING STARTED..... | 12 |
| 3.1 Connecting for the first time..... | 12 |
| 3.2 Downloading application with ETS™..... | 12 |
| 4 DETAILED FUNCTIONS DESCRIPTION..... | 14 |
| 4.1 General Configuration..... | 14 |
| 4.2 Push buttons..... | 17 |
| 4.2.1 Button not used | 17 |
| 4.2.2 ON / OFF | 18 |
| 4.2.3 Toggle Switch | 21 |
| 4.2.4 Dimming | 24 |
| 4.2.5 Shutter / Blinds | 32 |
| 4.2.6 Heating | 37 |
| 4.2.7 Priority | 39 |
| 4.2.8 Scene | 44 |
| 4.2.9 Value | 46 |
| 4.2.10 2-Channel mode | 49 |

| | |
|---|-----------|
| 4.3 Logic Channels..... | 51 |
| 4.3.1 Logic Operation | 52 |
| 4.3.2 Copy and Forward | 59 |
| <i>Appendix A - Logic operations.....</i> | 64 |
| I - AND (Logical Conjunction)..... | 64 |
| II - OR (Logical Disjunction)..... | 65 |
| III - XOR (Exclusive disjunction)..... | 65 |
| IV - NOT (Negation)..... | 66 |
| <i>Appendix B - KNX Data types.....</i> | 67 |
| <i>Appendix C - LED Usage.....</i> | 70 |
| <i>Appendix D - Detailed description of Communication objects.....</i> | 72 |

1 GENERAL INFORMATION

1 GENERAL INFORMATION

1.1 System Overview

This manual refers to the following devices for KNX bus:

- **MSW1002-PL**: 2-fold Push Buttons
- **MSW1004-PL**: 4-fold Push Buttons
- **MSW1006-PL**: 6-fold Push Buttons
- **MSW1008-PL**: 8-fold Push Buttons
- **MIN1004-L**: 4-fold Binary Input with LEDs

All of the previous **MSW100x-PL** include 1 LED per button, Label Back-light and 4 configurable *Logic Channels* (each of them configurable as *Logic Operation* or *Copy and Forward*), 1 programming button and 1 programming mode indication LED. **MIN100x-L** include 1 digital input (dry contact type) with 1 output 3V3.

The *Logic Channels* are intended to provide flexibility in automation tasks, by allowing the user to reproduce a desired action upon the verification of determined situation. This module will be described in detail ahead in this manual.

The configuration for MIN100x-L is very similar to MSW100x-PL, for that reason, in the rest of the document will be always referring to MSW100x-PL; MIN100x-L will be referred just in case there's a substantial difference.

1.2 Acronyms and Abbreviations

| | |
|-------------|--|
| CO | Communication Object |
| DHW | Domestic Hot Water |
| DPT | Data Point Type |
| EIB | European Installation Bus (former name to KNX; no longer in use) |
| GA | Group Address |
| HVAC | Heating, Ventilation and Air-Conditioning |
| LED | Light Emitting Diode |

2 SYSTEM SUMMARY

2 SYSTEM SUMMARY

Table 1: Applications specifications

| Variant \ Specs | Number of Communication Objects | Maximum number of Group Addresses | Maximum number of Associations |
|--------------------|---------------------------------|-----------------------------------|--------------------------------|
| MSW1002-PLA | 85 | 250 | 250 |
| MSW1004-PLA | 113 | 250 | 250 |
| MSW1006-PLA | 141 | 250 | 250 |
| MSW1008-PLA | 169 | 250 | 250 |

2.1 Application Functions Overview

The **MSW100X-PLA/MIN100X-LA** ETS™ application provides the interface to individually configure each of the push buttons on the products **MSW100X-PL/MIN100x-L** with one of the following functions:

- Button not used;
- ON / OFF;
- Toggle Switch;
- Dimming;
- Shutter / Blinds;
- Heating;
- Priority;
- Scene;
- Value;
- 2-Channel mode.

Additionally, each of the 4 Logic Channels can be configured to one of the following modes:

- Not used;
- Logic Operation;
- Copy and Forward;

2.2 Application Communication Objects

Table 2: Communication Objects existing in each Button's Function

| Function \ Communication Object Name | Button not used | ON / OFF | Toggle Switch | Dimming | Shutter / Blinds | Heating | Priority | Scene | Value | 2-Channel mode | General |
|--|-----------------|----------|---------------|----------|------------------|----------|----------|----------|----------|----------------|----------|
| Status ind. Status ind. (ch.A) Status ind. Up / Down | | | X | X | X | | | | | X | |
| ON / OFF ON / OFF (ch.A) Up / Down | | X | X | X | X | | X | | | X | |
| Status indication (ch.B) | | | | | | | | | | X | |
| ON / OFF (ch.B) | | | | | | | | | | X | |
| Step Up / Down | | | | | X | | | | | | |
| Priority | | | | | | | X | | | | |
| Dimming | | | | X | | | | | | | |
| Scene HVAC Mode DWH Mode | | | | | | X | | X | | | |
| Percentage Angle | | | | | | | | | X | | |
| Percentage Value Indication Angle Value Indication | | | | | | | | | X | | |
| Temperature Luminosity | | | | | | | | | X | | |
| Temperature Value Indication Luminosity Value Indication | | | | | | | | | X | | |
| LED | X | X | X | X | X | X | X | X | X | X | |
| Jamming | X | X | X | X | X | X | X | X | X | X | |
| Label Back-light | | | | | | | | | | | X |

Table 3: Communication Objects existing in each Logic Channel's Function

| Function Communication Object Name | Not used | Logic Operation | Copy and Forward |
|--|----------|-----------------|------------------|
| Input 1 Input DPT1 | | X | X |
| Input 2 | | X | |
| Input 3 | | X | |
| Input 4 | | X | |
| Input DPT2 | | | X |
| Input DPT3 | | | X |
| Input DPT4/5/6 | | | X |
| Input DPT7/8/9 | | | X |
| Output ON / OFF Output DPT1 | | X | X |
| Output DPT2 | | | X |
| Output DPT3 | | | X |
| Percentage Angle Output DPT4/5/6 | | X | X |
| Temperature Luminosity Output DPT7/8/9 | | X | X |
| Jamming | | X | X |

NOTICE: For further detailed information about the Communication Objects see Appendix D - Detailed description of Communication objects.

3 GETTING STARTED

3 GETTING STARTED

3.1 Connecting for the first time

After connecting the MSW100X-PL device for the first time to the KNX/EIB bus, the user will see the buttons' LEDs turning On one at a time:

- *MSW1008-PL sequence:* 1 > 3 > 5 > 7 > 8 > 6 > 4 > 2;
- *MSW1006-PL sequence:* 1 > 3 > 5 > 6 > 4 > 2;
- *MSW1004-PL sequence:* 1 > 3 > 4 > 2;
- *MSW1002-PL sequence:* 1 > 2;

then the label back-light will toggle, the inverse sequence is preformed, the label back-light toggles, ... This behaviour means that the device hasn't been loaded with a valid ETS™ application yet. The same behaviour may be observed when an invalid application is loaded into the device.

3.2 Downloading application with ETS™

If it's the first time that the device will be programmed, you must define the Individual Address via ETS™ interface. You must also press the programming button on the device for allowing ETS™ to identify the target device. You will know that the device is in programming mode when the programming LED turns on. During programming process the programming LED and the programming mode will automatically turn off.

If the Individual Address is normally written once, however if it's necessary to re-write the Individual Address, the programming button must be pressed.

Once the device has its Individual Address, the device can be configured according to the project needs using ETS™ application, selecting “Download Application”.

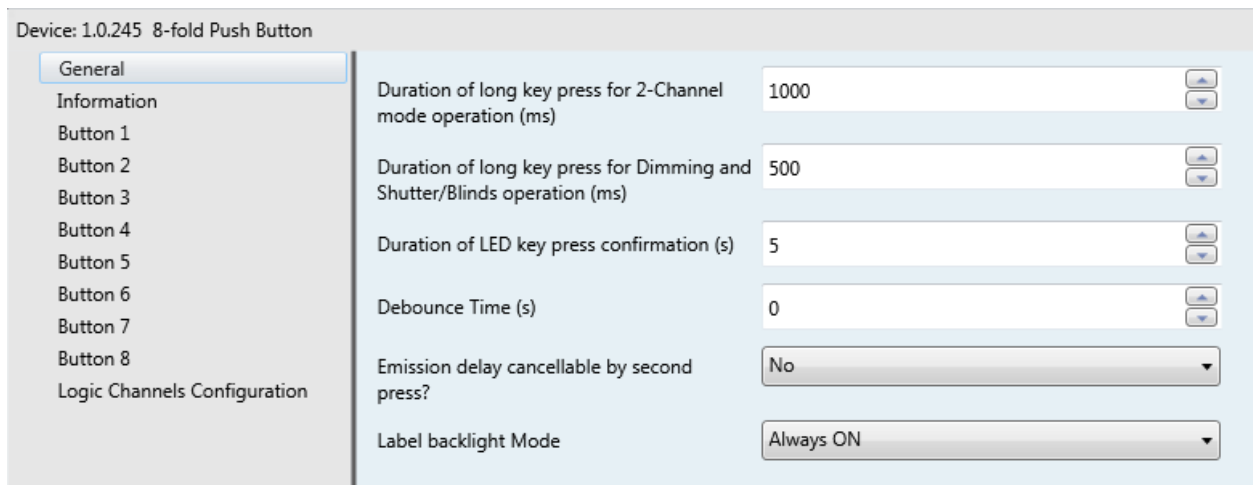
4 DETAILED FUNCTIONS DESCRIPTION

4 DETAILED FUNCTIONS DESCRIPTION

In this section all the functions will be introduced and explained in detail, as well as explained the ETS™ Product Database usage. This information should be enough for the installer to understand the device operation in any of the functions and to configure it with the ETS™ database.

4.1 General Configuration

In ETS™, when you select the general page you will see an environment similar with the one in presented in Figure 1.



The screenshot shows the 'General' configuration page for a device labeled 'Device: 1.0.245 8-fold Push Button'. The page has a sidebar menu on the left with options: General (selected), Information, Button 1, Button 2, Button 3, Button 4, Button 5, Button 6, Button 7, Button 8, and Logic Channels Configuration. The main area contains several configuration parameters:

| Parameter | Value |
|--|-----------|
| Duration of long key press for 2-Channel mode operation (ms) | 1000 |
| Duration of long key press for Dimming and Shutter/Blinds operation (ms) | 500 |
| Duration of LED key press confirmation (s) | 5 |
| Debounce Time (s) | 0 |
| Emission delay cancellable by second press? | No |
| Label backlight Mode | Always ON |

Figure 1: General Configurations page

Here you can configure some parameters that will affect all the system. All the parameters are explained in the Table 4.

Table 4: General configurations' parameters description

| Parameter | Description | Values |
|---|---|--|
| Duration of long key press for 2-Channel mode operation (ms) | Affects the buttons configured in the “2-Channel mode” function, ¹ and defines the amount of time, in milliseconds, that the buttons needs to remain pressed in order to declare the channel B. | <u>Min:</u> 0 ms <u>Max:</u> 12500 ms (12,5 s) <u>Default:</u> 1000 ms (1 s) |
| Duration of long key press for Dimming and Shutter/Blinds operation (ms) | Affects the buttons configured in “Dimming” and “Shutter / Blinds” functions, and defines the amount of time, in milliseconds, that the buttons needs to remain pressed in order to declare “Dimming” or “Up/Down”. | <u>Min:</u> 0 ms <u>Max:</u> 12500 ms (12,5 s) <u>Default:</u> 500 ms (1 s) |
| Duration of LED key press confirmation (s) | Affects the LED's configured to confirm a button press event and defines the amount of time, in seconds, that the LED should signalise the press event. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 5 s |
| Debounce Time (s) | Affects all the system and defines the amount of time that the device, after power up, will remain quiet before start writing to the bus. During debounce time the device will already receive the messages. | <u>Min:</u> 0 s <u>Max:</u> 255 s (4m15s) <u>Default:</u> 0 s |
| Emission delay cancellable by second press? | Affects all the functions making use of “emission delay” and defines whether or not the running emission delay can be cancelled by pressing the respective button again. | <u>Possible values:</u> No, Yes <u>Default:</u> No |
| Label backlight/Off state LED brightness | For MSW100x-PL affects the label back-light and defines its operation mode. For the MSW100x-TL affects the brightness of the LEDs in Off state. | <u>Possible values:</u> Always OFF, Always ON, Linked w/ Object (ON if 0), Linked w/ Object (ON if 1) <u>Default:</u> Always ON |

It's convenient to explain in more detail some of the parameters present in the General configurations' page. The “**Debounce Time (s)**” will configure the amount of time that the device will remain just in “listening mode” without sending any message to any Group Address after a power up. For example, after a bus power up, in the case that the device will request some values from KNX bus, this parameter can be used for ensuring that the devices to answer to the read requests are already communicating, and that way, all the read requests will be properly sent.

The “**Emission delay cancellable by second press?**”, if activated, allows you to cancel a running emission delay by pressing again the button. In case you configure a button to send “On” at “press event” with a “Emission delay” of 120 seconds ($T_d = 120 s$), after pressing that button, the internal timer will

¹ For better understanding the meaning of this value see 4.2.10.

start counting until 120 seconds and then the output Communication Object (CO) will send the value “On”. However, if you press the button before elapsing 120 seconds, the timer will be cancelled (see Figure 2).

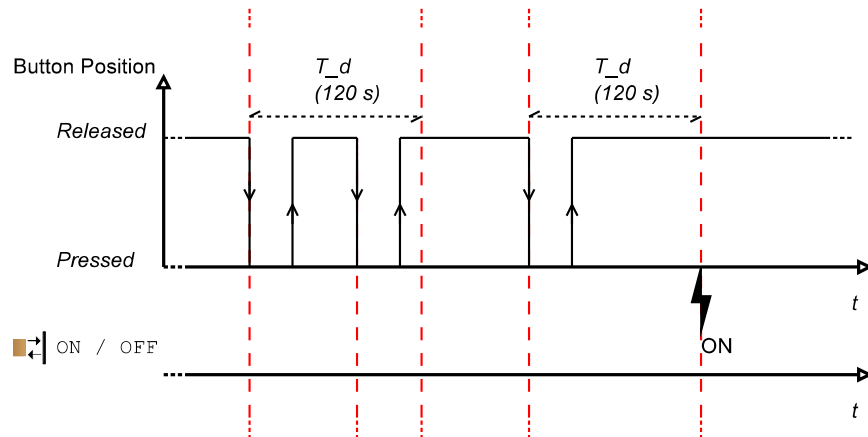


Figure 2: Example of "ON / --" with emission delay cancellable by second press

In the other hand, if you disable “Emission delay cancellable by second press?”, having the same configuration for button, when you press the button, the internal timer will count until 120 seconds, and after sends the “On” value. In the case that you press the button again before the timer has been expired, the timer will be resetted and will start to count from 0 seconds to 120 seconds (see Figure 3).

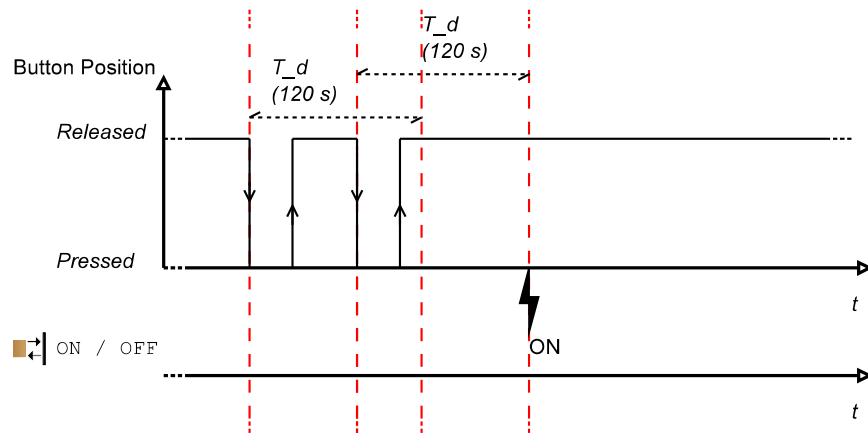


Figure 3: Example of "ON / --" without emission delay cancellable by second press

The “**Label backlight Mode**”, when configured to be “Linked with object” will make available one Communication Object:

🔗 “Label BackLight - ON / OFF”:input

With this communication object it's possible to control when the back-light is “On” or “Off” by controlling its “ON / OFF” Communication Object. If you chose “Linked w/ Object (ON = 0)”, the label will be illuminated when “ON / OFF” is “Off” (‘0’), else if you chose “Linked w/ Object (ON = 1)”, the label will be illuminated when “ON / OFF” is “On” (‘1’).

4.2 Push buttons

Here are explained the functions of the push buttons. All of the push buttons have similar behavior, reason why there's no need to differentiate the functionality for different push buttons. The default page for every button looks like the proposed in Figure 4.

4.2.1 Button not used

When you configure the button in this mode, pressing the button will produce no effect. Also the “Jamming” option has no effect. The configuration page is like the one presented in Figure 4.

Even when you configure the button to “Button not used”, you can still make use of the corresponding LED. The options available are presented in Table 5.

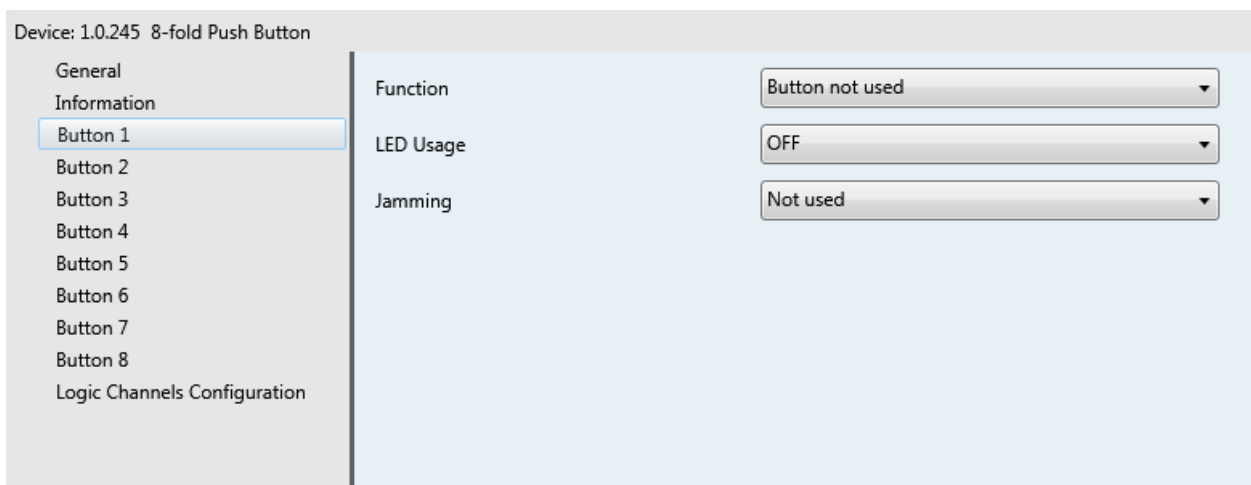


Figure 4: Button's configuration page for function "Button not used" (default configuration).

Table 5: Parameters in Button's configuration page for "Button not used" function.

| Parameter | Description | Values |
|------------------|--|--|
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1) <u>Default:</u> OFF |
| Jamming | Doesn't have any effect. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

The possible Communication Objects are:

- ↔ "LED": input
- ↔ "Jamming": input

4.2.2 ON / OFF

For "ON / OFF" function, one of six operating modes can be selected according to desired behavior at 'press' and 'release' events. The configuration page when the button is set to "ON / OFF" function is as the one suggested in Figure 5. The different modes are listed in the Table 6 and the parameters description is made in Table 7.

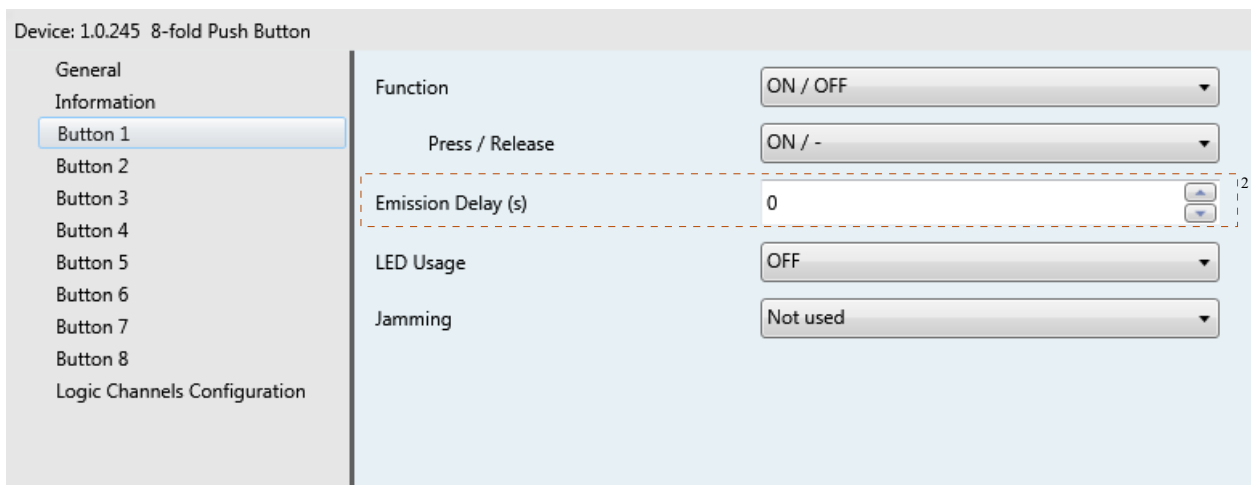


Figure 5: Button's configuration page for "ON / OFF" function.

Table 6: Actions in different modes of "ON /OFF" function

| Event Mode | Press | Release |
|---------------|---------|---------|
| ON / OFF | ON | OFF |
| OFF / ON | OFF | ON |
| ON / - | ON | nothing |
| OFF / - | OFF | nothing |
| - / ON | nothing | ON |
| - / OFF | nothing | OFF |

Table 7: Parameters in Button's configuration page for "ON / OFF" function.

| Parameter | Description | Values |
|---------------------------------------|---|---|
| Press / Release | Affects the value to sent by each event (see Table 6). | <u>Possible values:</u> ON / OFF, OFF / ON, ON / -, OFF / -, - / ON, - / OFF <u>Default:</u> ON / OFF |
| Emission Delay (s)² | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the value to be sent and defines if the "ON / OFF" CO can be prevented from sending the value when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

² This parameter is not present for the modes "ON / OFF" and "OFF / ON".

The following Figures 6 to 11 depicts the different modes operation:

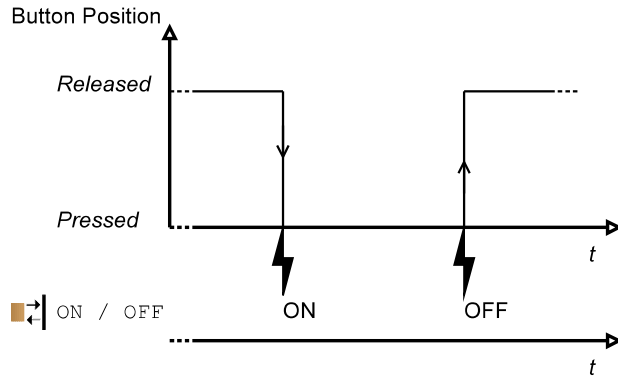


Figure 6: ON / OFF mode

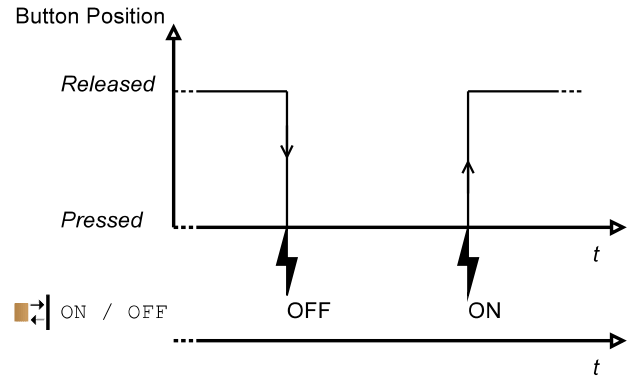


Figure 7: OFF / ON mode

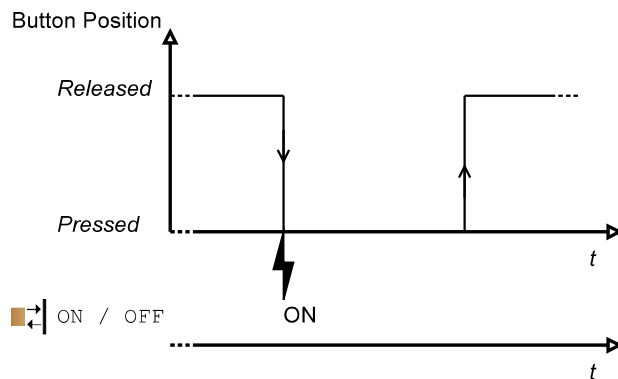


Figure 8: ON / - mode

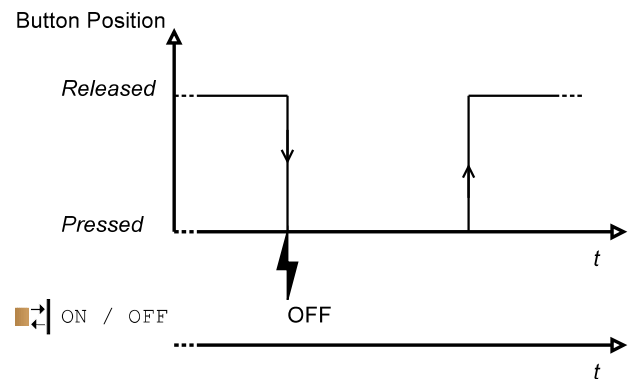


Figure 9: OFF / - mode

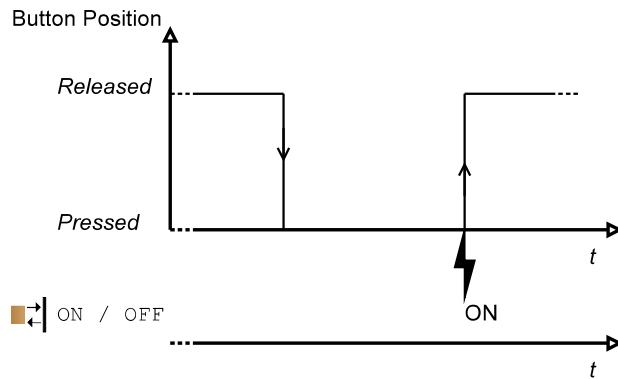


Figure 10: - / ON mode

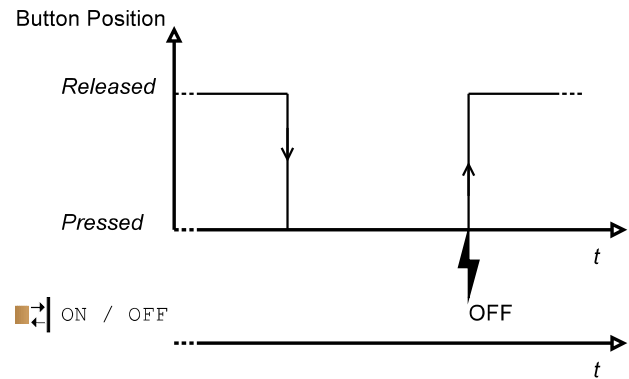


Figure 11: - / OFF mode

The possible Communication Objects are:

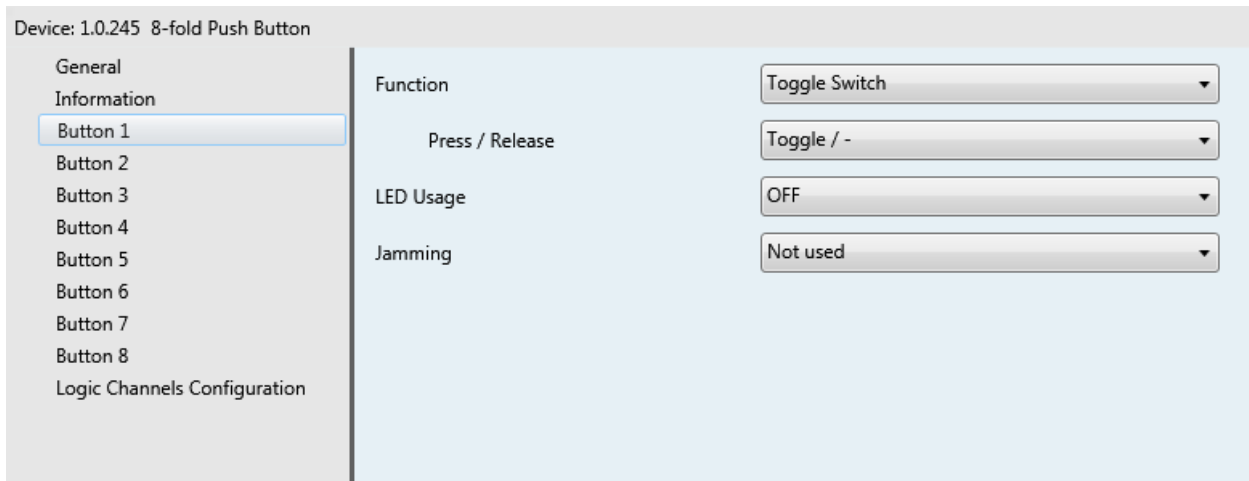
- ↔ "ON / OFF": Output
- ↔ "LED": input
- ↔ "Jamming": input

4.2.3 Toggle Switch

The toggle switch function allows the user to switch between "On" and "Off" with only one button. This can be configured to occur at button *'press'* or at button *'release'* events.

At toggle, the Communication Object "ON / OFF" will take inverse value of the "Value to toggle". The "Value to toggle" is modified in two situations: when toggle event occurs (at button *'press'* or button *'release'*) **and** when the Communication Object "Status indication" value changes. This way, if the Communication Object "Status indication" is not used (not assigned to any GA), no values will be received from it, so "Value to toggle" is only affected by button *'press'*/*'release'* events, and always will have the last "ON / OFF" output value sent, so the output Communication Object "ON / OFF", at toggle event, will always send the the inverse of the previously sent (no matter the state of the controlled device).

The configuration page for the function "Toggle Switch" is as presented in Figure 12. The parameters are described in Table 8.



| Device: | 1.0.245 8-fold Push Button |
|------------------------------|-----------------------------|
| General | |
| Information | |
| Button 1 | Function: Toggle Switch |
| Button 2 | Press / Release: Toggle / - |
| Button 3 | LED Usage: OFF |
| Button 4 | Jamming: Not used |
| Button 5 | |
| Button 6 | |
| Button 7 | |
| Button 8 | |
| Logic Channels Configuration | |

Figure 12: Button's configuration page for "Toggle Switch" function.

Table 8: Parameters in Button's configuration page for "Toggle Switch" function.

| Parameter | Description | Values |
|------------------------|---|---|
| Press / Release | Affects the value to be sent by each event. | <u>Possible values:</u> Toggle / -, ³ Toggle/Toggle, - / Toggle <u>Default:</u> Toggle / - |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, W/ Status (ON if 1), W/ Status (ON if 0), W/ Status (Blink if 1), W/ Status (Blink if 0), Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the value to be sent and defines if the "ON / OFF" CO can be prevented from sending the value when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

The Figure 14 and Figure 13 shows the operation in both modes. In both pictures it's possible to see the effect of "Status indication" changing its value due to other's activity, making the "ON / OFF" CO to send the same value in to consecutive events due to "Status indication" been changed.

The example of Figure 14 can be interpreted as follows: initially the light was "Off", then the button was pressed, toggling the light "On" ("Status indication" will also change its value to "On" in case it is properly assigned to the actuator status indicator CO). By pressing again the button, the light will be toggled "Off" (because its "Value to toggle" is "On"). Now, from other source, the light is switched "Off", causing the "Value to toggle" to become "On". Now, by pressing again the button, its "ON / OFF" CO will take again the value "Off", because the "Value to toggle" has been changed by another device.

In the case of Figure 13 the analysis must be similar to the one made before.

Notice that the "Value to toggle" is affected by the "Status indication", and in case the "Status indication" doesn't change "Value to toggle" depends only on the last sent value.

³ This option is just available in the MIN100x-L devices.

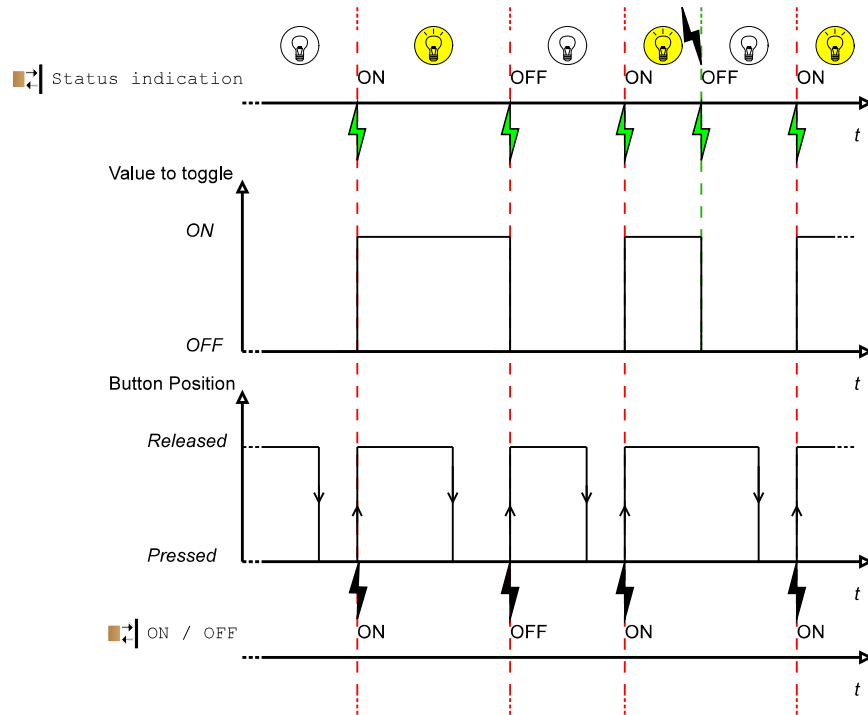


Figure 13: Toggle switch at release event

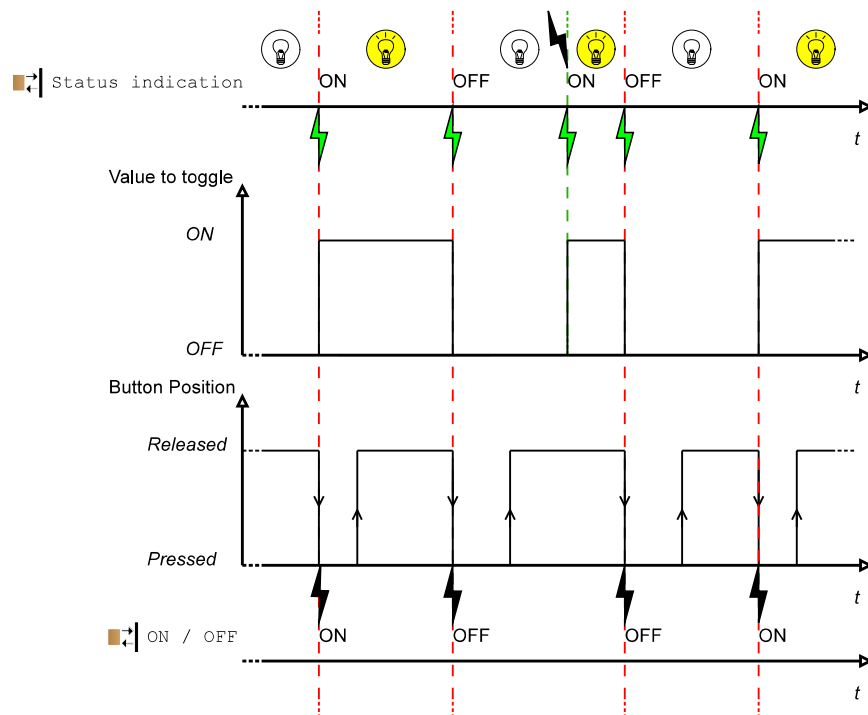


Figure 14: Toggle switch at press event

When configured in any of the two modes (*'toggle at press'* or *'toggle at release'*), the possible Communication Objects are available:

- ↔ "ON / OFF": output
- ↔ "Status indication": input
- ↔ "LED": input
- ↔ "Jamming": input

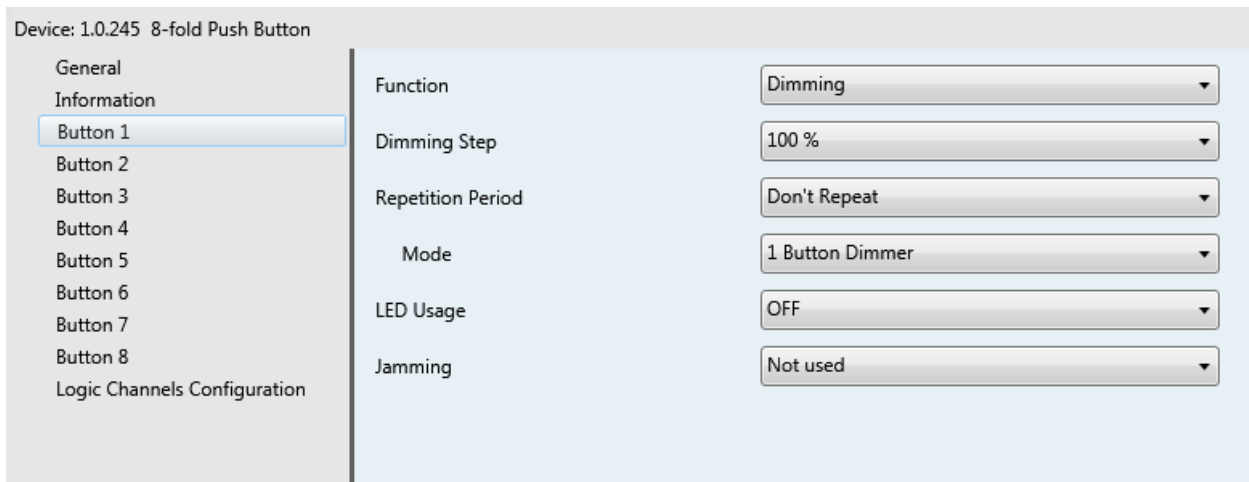
4.2.4 Dimming

The dimming function is divided in two major modes, "1 Button Dimmer" and "2 Button Dimmer", depending on the mode you choose.

a) 1 Button Dimmer

In this mode one button can perform all the actions to control a dimmer actuator by sending "On", "Off", "Increase" and "Decrease". For achieving this, two kinds of "button pressed" events are distinguished, the "short press" and the "long press" (the amount of time for declaring "long press" is configurable in the "General" configuration page by changing the value of the parameter "Duration of long key press for Dimming and Shutter/Blinds operation (ms)", see 4.1).

The configuration page for the mode "1 Button Dimmer" is presented in Figure 15. In Table 9 the configurable parameters for "1 Button Dimmer" mode are described in detail.



The screenshot shows a configuration interface for a device labeled "Device: 1.0.245 8-fold Push Button". On the left, a sidebar lists "General Information" and "Button 1" through "Button 8", with "Button 1" selected. The main area displays configuration options for "Button 1":

| | |
|-------------------|-----------------|
| Function | Dimming |
| Dimming Step | 100 % |
| Repetition Period | Don't Repeat |
| Mode | 1 Button Dimmer |
| LED Usage | OFF |
| Jamming | Not used |

Figure 15: Button's configuration page for "Dimming" function, "1 Button Dimmer" mode.

Table 9: Parameters in Button's configuration page for "Dimming" function, "1 Button Dimmer" mode.

| Parameter | Description | Values |
|--------------------------|--|---|
| Dimming Step | Affects the value to be sent and defines the relative amount of brightness that the actuator should increase/decrease. | <u>Possible values:</u> 100%, 50%, 25%, 12,5%, 6,25%, 3%, 1,5% <u>Default:</u> 100% |
| Repetition Period | Affects the "Dimming " CO and defines if the value to send must be repeated while the button is pressed, and in case of repetition, at which rate. | <u>Possible values:</u> Don't Repeat, 0,5s, 1,0s 1,5s ... 5,0s <u>Default:</u> Don't Repeat |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, W/ Status (ON if 1), W/ Status (ON if 0), W/ Status (Blink if 1), W/ Status (Blink if 0), Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

When the button is configured in this way, the Communication Objects possible to be available are:

- ↔ "Status indication": input
- ↔ "ON / OFF": output
- ↔ "Dimming": output
- ↔ "LED": input
- ↔ "Jamming": input

When configured in this mode, one Communication Object reacts to a "short key press", the "ON / OFF" CO, and other Communication Object reacts to a "long key press", the "Dimming" CO.

The "On" and "Off" behavior is similar with the one described in Toggle Switch (see 4.2.3), making use of the "Status indication" Communication Object. The "Increase" and "Decrease" control will be sequentially toggled, being "Increase" the first value to be sent. This means that if you dimmed brighter once before, the next time the lights will be dimmed darker and vice-versa. By "long pressing" the key will cause "Dimming" CO to send the "Dimming Step" value with the variation direction (increase / decrease), and if "Repetition Period" is set, "Dimming" CO will re-send the "Dimming Step" every time the "Repetition Period" expires, while the button is pressed. When the button is released after a "long press", "Decrease, Break", or "Increase, Break" will be sent via "Dimming" CO.

In Figure 16 is suggested a operation condition example: The MSW100X-PL is supposed to be configured as "1 Button Dimmer", with a "Dimming Step" of 100% and without "Repetition Period". The dimmer actuator is supposed to have a increase/decrease time, and configured to at "On" value to set its brightness to maximum.

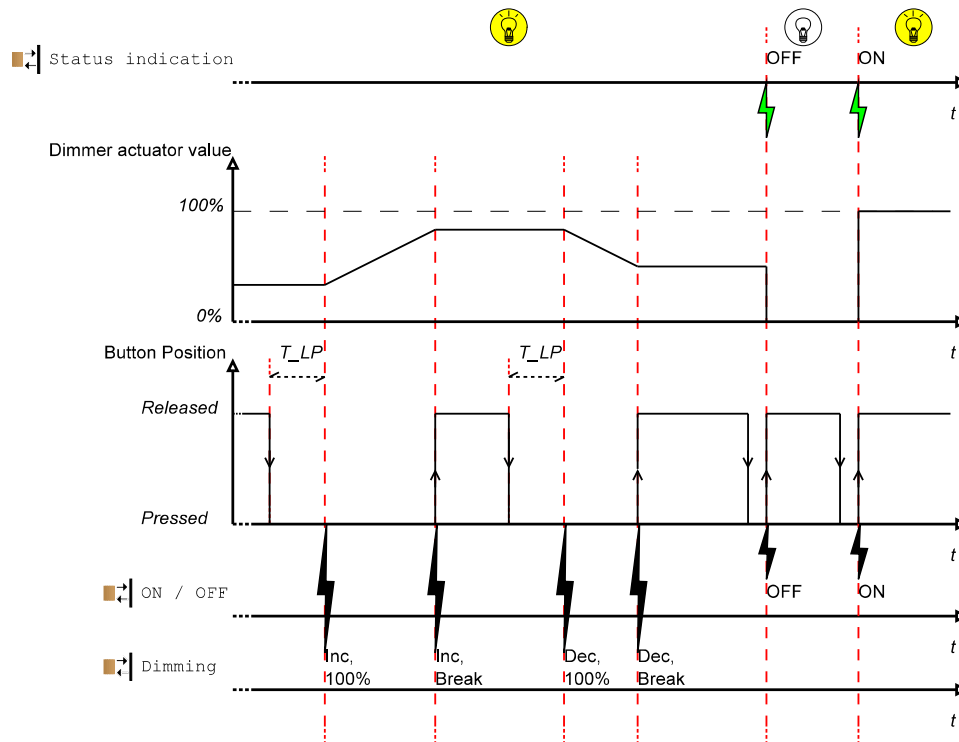


Figure 16: "1 Button Dimmer" operation example (a).

In this case the details related with "Toggle Switch" are omitted (see 4.2.3). Initially the dimmer is at certain value and the MSW100X-PL dimmer button is "long pressed" (see 4.1) during T_{LP} , what causes

“Dimming” CO to send “Increase 100%” to the dimmer actuator. When the button is released, “Dimming” CO sends “Increase Break”, that causes the dimmer actuator to stop increasing the brightness (otherwise would increase until 100%, moment which after “Increase Break” wouldn't create any reaction). “Long pressing” again the button will make “Dimming” CO to invert its direction to “Decrease 100%”, and releasing the button causes it to send “Decrease Break”.

In Figure 17 it's suggested a different operation condition example, in which the MSW100X-PL is supposed to be configured as “1 Button Dimmer”, with a “Dimming Step” of 25% and with “Repetition Period” of T_R .

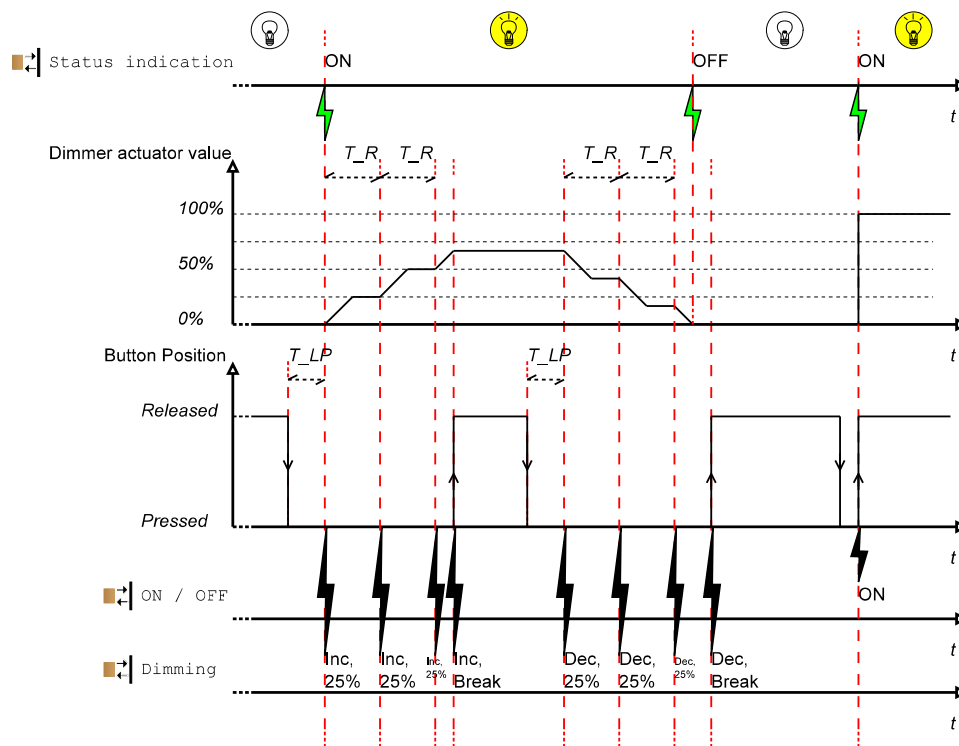


Figure 17: "1 Button Dimmer" operation example (b).

After the button being “long pressed” (after T_{LP}) the “Dimming” CO will send “Increase 25%”, making the dimmer actuator to relatively increase its brightness in 25%. Keeping the button pressed for at least T_R more seconds will cause “Dimming” CO to send again “Increase 25%”. When the button is released, “Dimming” CO sends “Increase Break” for the dimmer actuator to stop any in progress brightness increment. “Long pressing” again the button will create a similar effect, but in the opposite direction.

With this configuration, even if the dimming step is not 100%, it's possible to dim from 0% to 100%, or 100% to 0% by keeping the button pressed long enough, causing consecutive dimming telegrams to be sent.

b) "2 Button Dimmer"

In this mode, one button can preform only one set of functions, "Increase" and "On", or "Decrease" and "Off". With the same button, for allowing two values to be sent, two events are considered, the "short press", that will cause "ON / OFF" CO to react, and the "long press" that will cause the "Dimming" CO to react (the amount of time for declaring "long press" is configurable, see 4.1).

The configuration page for the mode "2 Button Dimmer" is presented in Figure 18. In Table 10 the configurable parameters for "2 Button Dimmer" mode are described in detail.

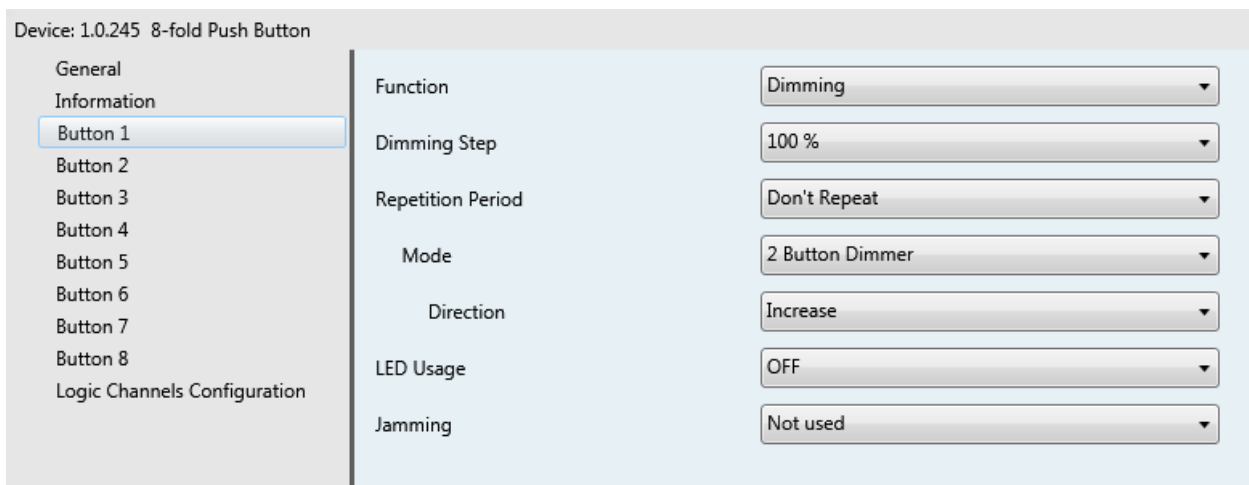


Figure 18: Button's configuration page for "Dimming" function, "2 Button Dimmer" mode.

When the button is configured in this way, the Communication Objects made available are:

- ↔ "ON / OFF": output
- ↔ "Dimming": output
- ↔ "LED": input
- ↔ "Jamming": input

Table 10: Parameters in Button's configuration page for "Dimming" function, "2 Button Dimmer" mode.

| Parameter | Description | Values |
|--------------------------|--|---|
| Dimming Step | Affects the value to sent and defines the relative amount that the actuator should increase/decrease. | <u>Possible values:</u> 100%, 50%, 25%, 12,5%, 6,25%, 3%, 1,5% <u>Default:</u> 100% |
| Repetition Period | Affects the "Dimming " CO and defines if the value to send must be repeated while the button is pressed, and in case of repetition, at which rate. | <u>Possible values:</u> Don't Repeat, 0,5s, 1,0s 1,5s ... 5,0s <u>Default:</u> Don't Repeat |
| Direction | Affects the "Dimming" and "ON / OFF" values and defines if the button operates to increase or decrease brightness. | <u>Possible values:</u> Increase, Decrease <u>Default:</u> Increase |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

If the button is configured with "Direction" to be "Increase", by "short pressing" the button the "ON / OFF" CO will react sending "On". If the button is "long pressed" the CO "Dimming" will react sending "Increase" with the value of the "Dimming Step". After a "long press", when the button is released "Dimming" reacts sending "Increase Break".

Configuring the button to “Decrease”, a “short press” makes “ON / OFF” to send “Off”, and a “long press” makes “Dimming” to send “Decrease” with the value of the “Dimming Step”, and sends “Decrease Break” when the button is released after a “long press”.

In Figure 18 is suggested one operation example: the MSW100X-PL has button 1 configured in “2 Button Dimmer”, with “Direction” set to “Increase”, “Dimming Step” of 25% and “Repetition Period” of T_{R1} . Initially the dimmer actuator is configured to, at “On” event, set the brightness to 100%; the button 2 is configured in same way, except “Direction” is “Decrease”, and “Repetition Period” is T_{R2} .

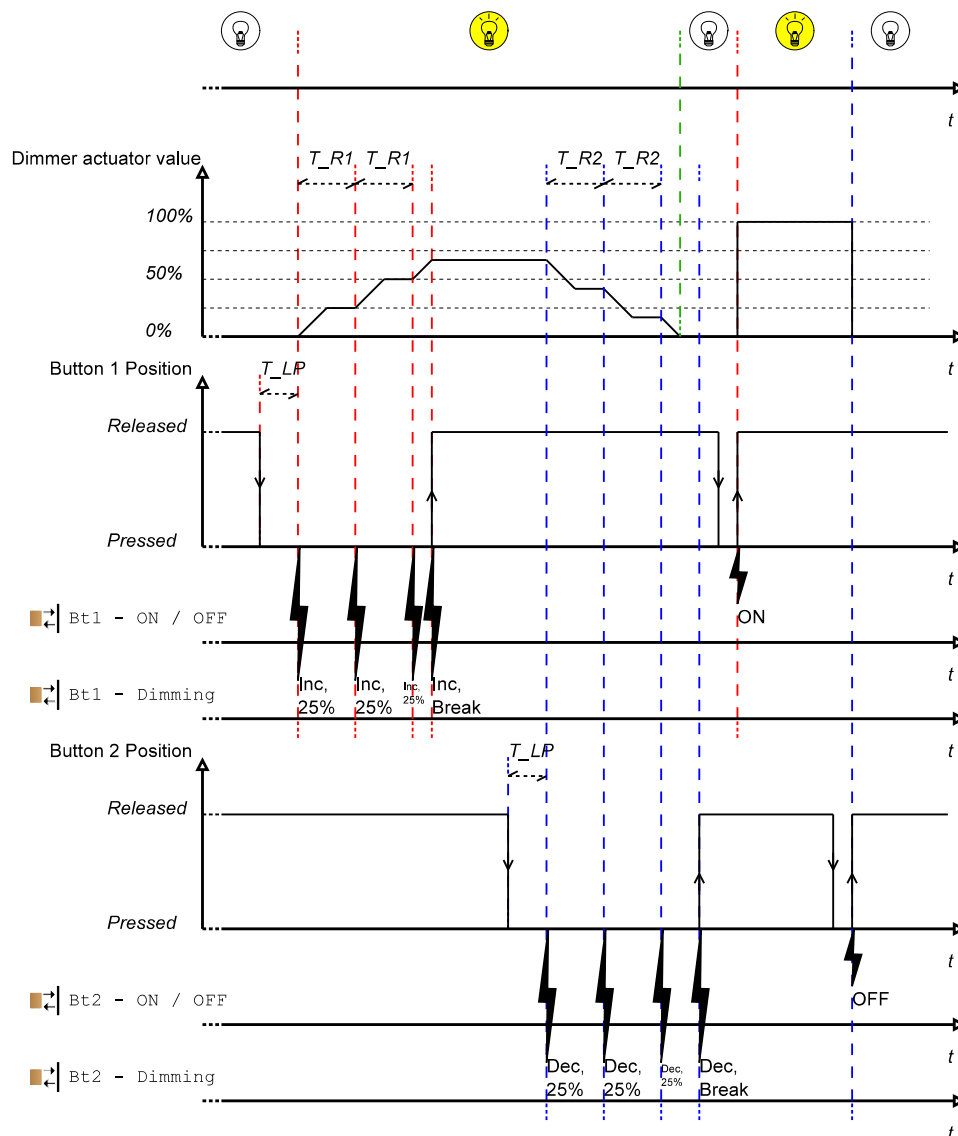


Figure 19: "2 Button Dimmer" operation example (a).

In Figure 20 is suggested another operation example: the MSW100X-PL has the button 1 configured for dimming function in “2 Button Dimmer”, with “Direction” set to “Increase”, “Dimming Step” of 100% without “Repetition Period”. Initially the dimming actuator is “Off” and is configured to, at “On” event, set the brightness to 100%; the button 2 configured in same way, except “Direction” is “Decrease”.

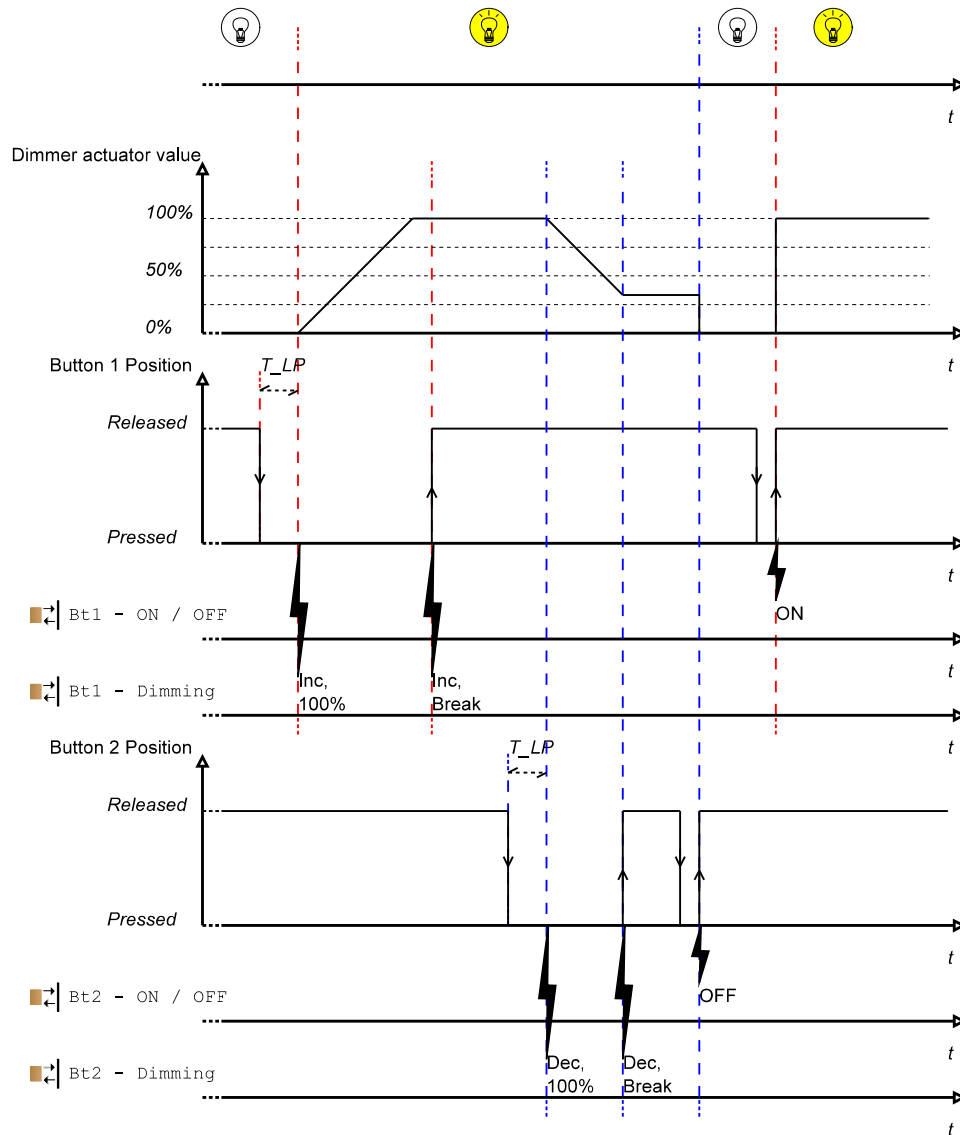


Figure 20: "2 Button Dimmer" operation example (b).

4.2.5 Shutter / Blinds

The “Shutter / Blinds” function is divided into three main modes, “1 Button Shutter/Blinds”, “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

a) 1 Button Shutter/Blinds

In this mode one button can perform all the actions to control Shutter or Blinds actuator by sending "Up", "Down", "Step Up" and "Step Down". For achieving this, movement commands are intercalated with stop commands.

The configuration page for the mode “1 Button Shutter/Blinds” is presented in Figure 21. In Table 11 the configurable parameters for “1 Button Shutter/Blinds” mode are described in detail.

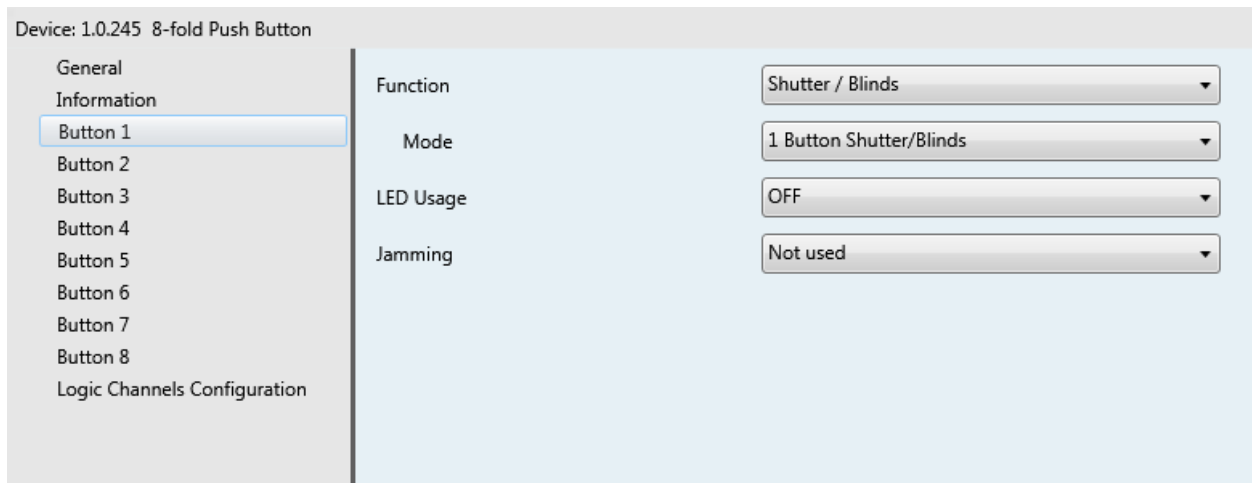


Figure 21: Button's configuration page for "Shutter / Blinds" function, "1 Button Shutter/Blinds" mode.

When configured in this mode the Communication Objects possible are:

- ↔ "State Up / Down": input
- ↔ "Up / Down": output
- ↔ "Step Up / Down": output
- ↔ "LED": input
- ↔ "Jamming": input

Table 11: Parameters in Button's configuration page for "Shutter / Blinds" function, "1 Button Shutter/Blinds" mode.

| Parameter | Description | Values |
|------------------|---|---|
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

When configured in this mode, both "Step Up / Down" and "Up / Down" COs reacts to the "button pressed" event. However, this reaction occurs in a cyclical way: after a "Up / Down" command it'll come a "Step Up / Down" command in order to stop the on-going movement. For the "1 Button Shutter/Blinds" mode, the CO "State Up / Down" is intended to be used to invert the last occurred movement, even if ordered by another device. In case "State Up / Down" is not used, the value "Step Up / Down" sends is always the opposite of the previously sent, instead of inverting the last executed movement by the actuator.

In Figure 22 is suggested a operation example for "1 Button Shutter/Blinds". One interpretation of the depicted situation can be: initially the shutters are closed, the button is pressed, making the "Up / Down" CO to send "Up". Pressing again the button, "Step Up / Down" will send "Step Down" in order to stop the up movement of the shutter. Upon a new press, "Up / Down" CO will send "Down", causing down movement of the shutters that will be interrupted by pressing the button again, that makes "Step Up / Down" to send "Step Up". After is supposed the shutter actuator to be controlled by another device, ordering the shutters to go up and changing the value in "State Up / Down" to "Up". A new press on the button causes "Up / Down" CO to send "Down", since "State Up / Down" holds the value "Up". For terminating the descending movement, the button may be pressed again sending "Step Up" via "Step Up / Down" CO.

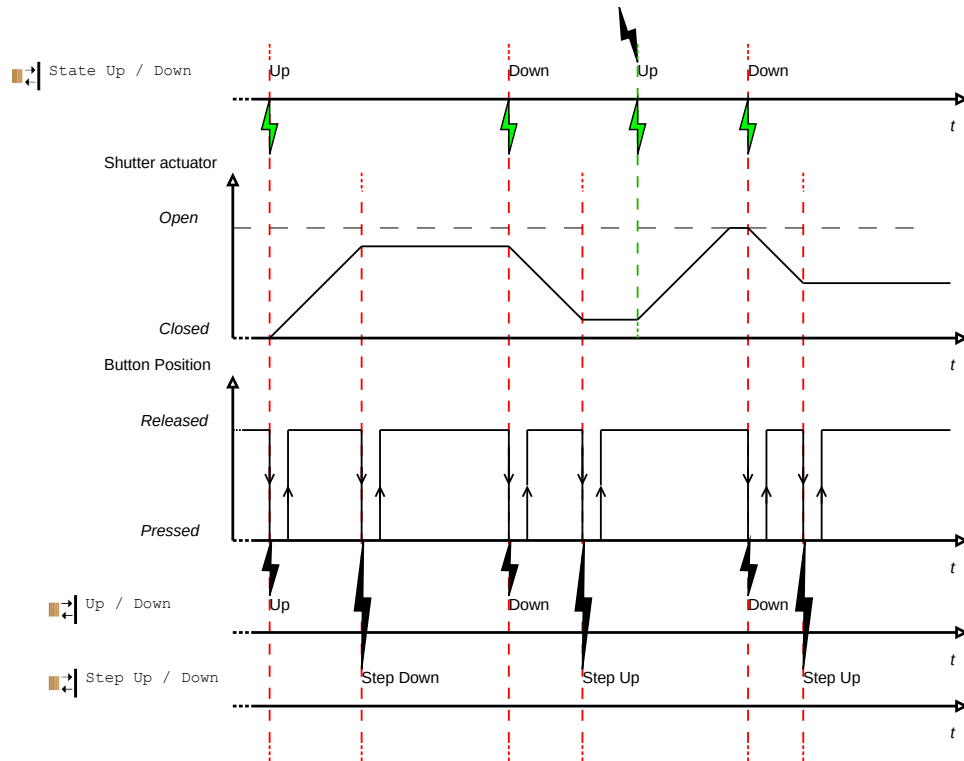


Figure 22: "1 Button Shutter/Blinds" operation example.

b) 2 Button Shutter/Blinds

In this mode, one button can control one direction of shutter or blinds actuators. Like that, one button may send "Up" and "Step Down" or "Down" and "Step Up", depending on the configured direction.

The configuration page for the mode "2 Button Shutter/Blinds" is presented in Figure 23. In Table 12 the configurable parameters for "2 Button Shutter/Blinds" mode are described in detail.

When configured in this mode the Communication Objects possible are:

- ↔ "Up / Down": output
- ↔ "Step Up / Down": output
- ↔ "LED": input
- ↔ "Jamming": input

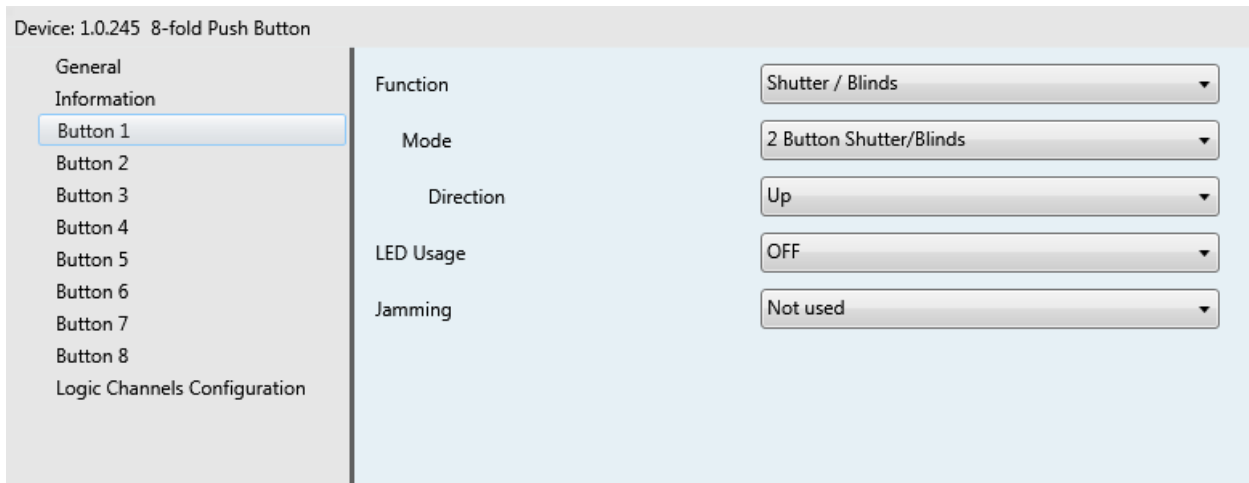


Figure 23: Button's configuration page for "Shutter / Blinds" function, "2 Button Shutter/Blinds" mode.

Table 12: Parameters in Button's configuration page for "Shutter / Blinds" function, "2 Button Shutter/Blinds" mode.

| Parameter | Description | Values |
|------------------|--|---|
| Direction | Affects "Up / Down" and "Step Up / Down" COs and defines the direction that the button should operate the shutter/blinds movement. | <u>Possible values:</u> Up, Down <u>Default:</u> Up |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

In this mode, two events are used for shutter/blinds actuator operation, the "Up / Down" reacts to "long press" events and "Step Up / Down" reacts to "short press" events.

A possible operation chart is presented in Figure 24, where two buttons are configured to operate in opposite directions.

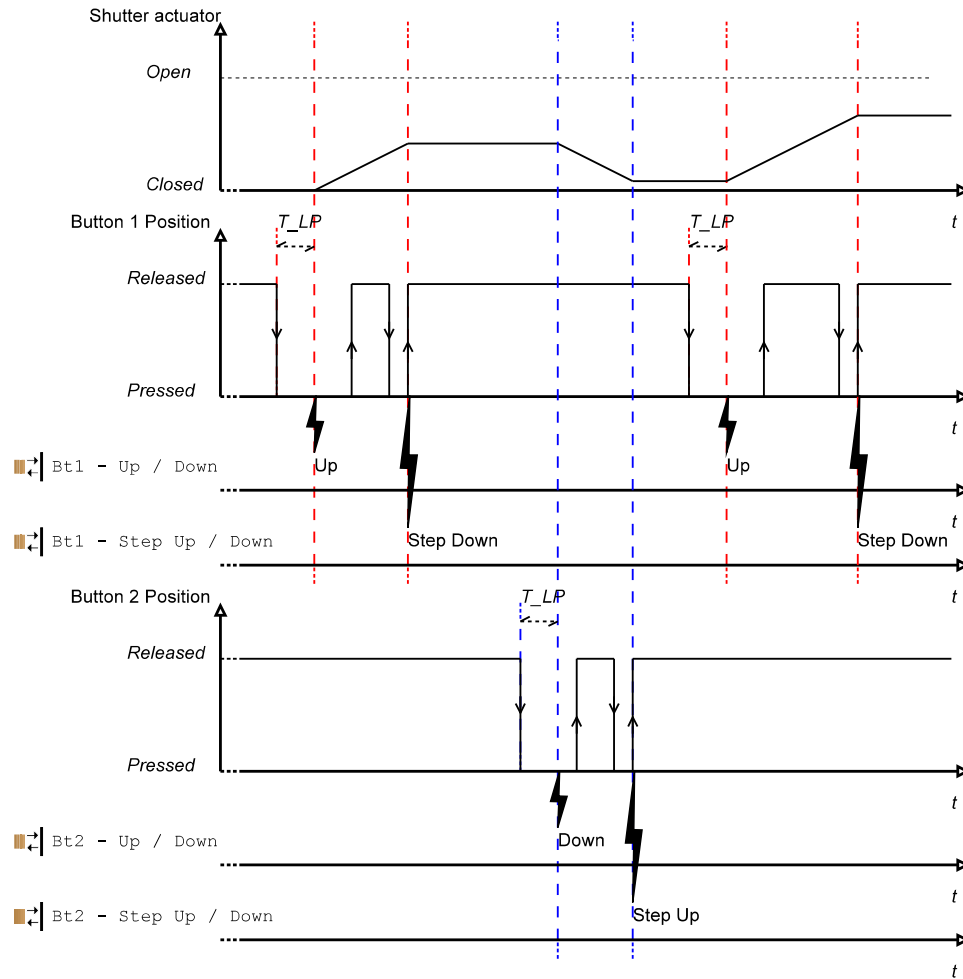


Figure 24: "2 Button Shutter/Blinds" operation example.

c) 2 Button Shutter/Blinds while pressed

This operation mode is similar to "2 Button Shutter/Blinds", so you're recommended to read 4.2.5b. The difference of this mode is that "Up / Down" CO reacts to "key press" instead to "long press" events, and "Step Up / Down" CO reacts to "button release" event, instead to "short press" event. This means that the shutter/blinds will move as long as the button is pressed, and when the button is released a "Stop" ("Step Up" or "Step Down") command will be sent in order to stop the movement.

In Figure 25 is shown a possible operation of the device with the buttons configured in "2 Button Shutter/Blinds while pressed" with opposite directions.

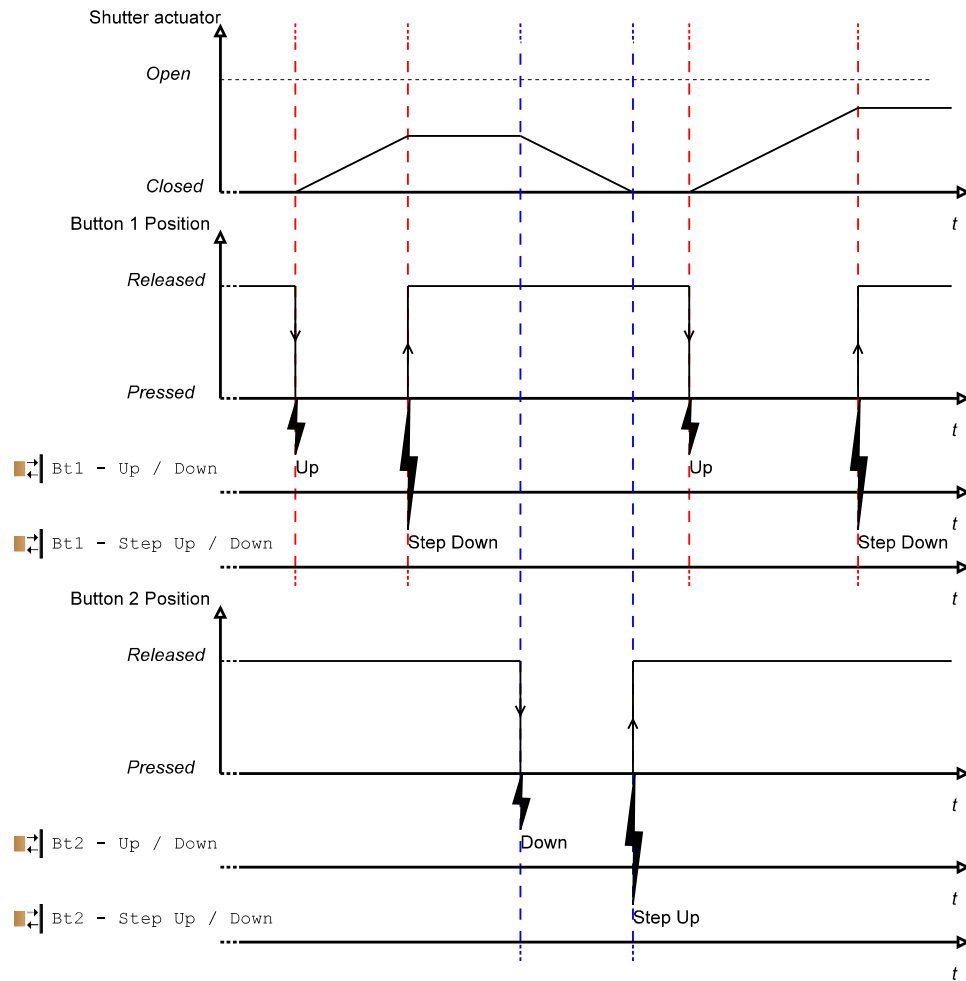


Figure 25: “2 Button Shutter/Blinds while pressed” operation example.

4.2.6 Heating

The “Heating” function is divided into two main modes, depending on the controlled system, “HVAC” or “DHW”, for controlling “Heating, Ventilation and Air-Conditioning” or “Domestic Hot Water”, respectively. Operationally these two modes don't differentiate, only the sent values are different.

In Figure 26 is presented the configuration page for the case of “Heating” function in “HVAC” (for “DHW” the page aspect is similar). In Table 13 the parameters of “Heating” function are described in detail.

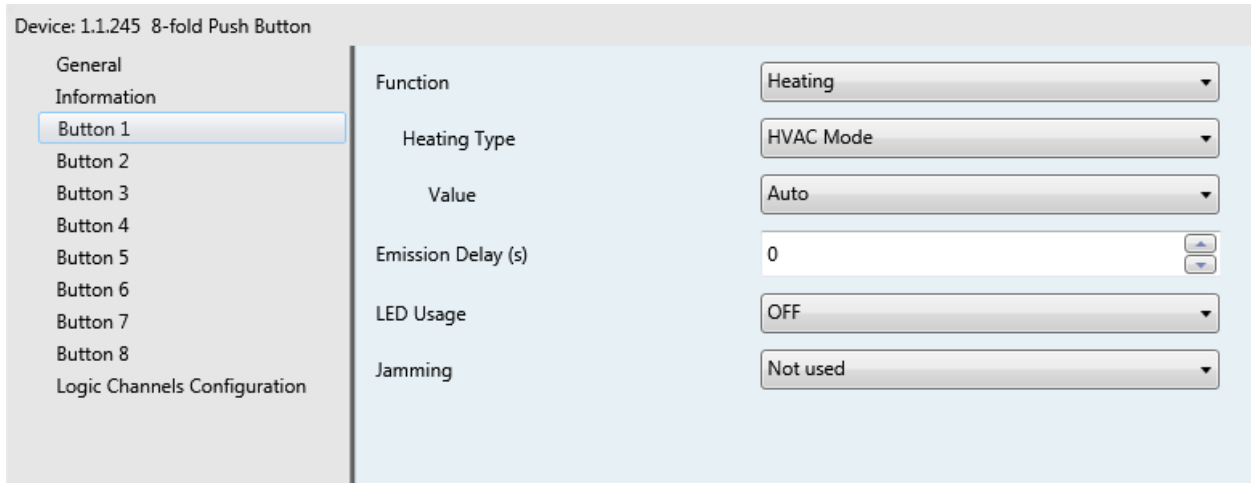


Figure 26: Button's configuration page for "Heating" function.

When configured in this mode the Communication Objects possible are:

- ↔ "HVAC Mode": output
- ↔ "DHW Mode": output
- ↔ "LED": input
- ↔ "Jamming": input

In this function, "HVAC Mode" / "DHW Mode" CO reacts to "button press" events by sending the configured value. If the button is configured in "HVAC Mode Type" with value "Economy", Figure 27 can be an example of operation.

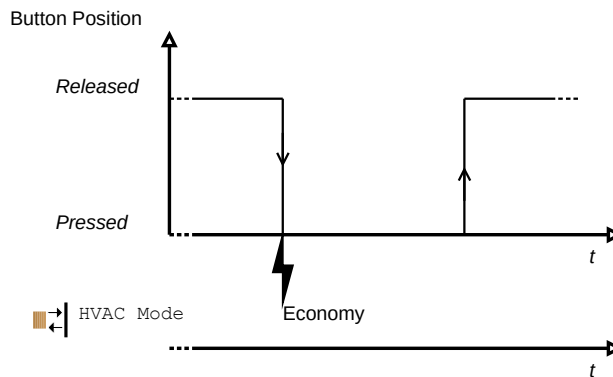


Figure 27: "Heating" function operation example for "HVAC".

Table 13: Parameters in Button's configuration page for "Heating" function.

| Parameter | | Description | Values |
|---------------------------|-------------|---|---|
| Mode | | Defines the type of system to be controlled. | <u>Possible values:</u> HVAC, DHW <u>Default:</u> HVAC |
| Value | HVAC | Affects the "HVAC Mode" / "DHW Mode" value, and defines the value to be sent at event trigger. | <u>Possible values:</u> Building Protection, Comfort, Economy, Auto, Standby <u>Default:</u> Auto |
| | DHW | | <u>Possible values:</u> Off / FrostProtect, LegioProtect, Reduced, Auto, Normal <u>Default:</u> Auto |
| Emission Delay (s) | | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| LED Usage | | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

4.2.7 Priority

This function is intended for applications offering a priority control that has precedence over the normal (manual) operation. In other words, if an actuator is switched via its priority CO, switching via its usual CO is disabled.

The function priority has two operation modes: "1 channel mode" and "2 channel mode". In the first, with one button you can simply operate the "Priority" CO, with the second you can operate

“Priority” and “ON / OFF” COs. For the “2 channel mode”, two different types of “button press” events are distinguished: “short press” and “long press” (see 4.1).

a) 1 channel mode

In this mode “Priority” CO reacts to “button press” events, sending “No priority, On / Off” and “Priority, On / Off”.

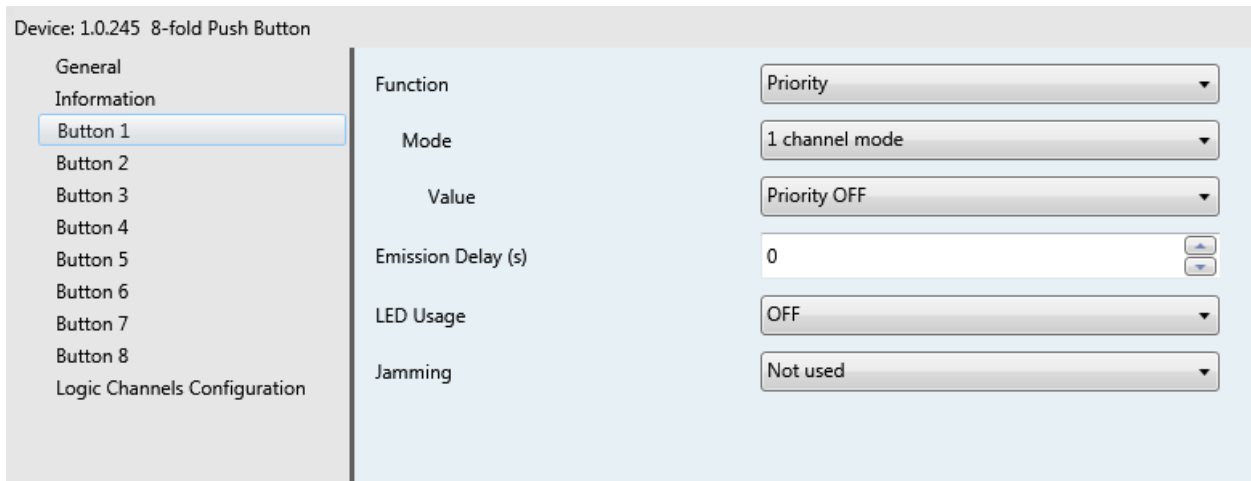
Consecutive button presses will be activating and deactivating the priority (by setting and clearing the priority bit).

You will know that the priority is activated when the button's LED is blinking being ON during 0,5 seconds and OFF for 3 seconds (see Appendix C -LED Usage).

The configuration page for the mode “1 channel” is presented in Figure 28. In Table 14 the configurable parameters for “1 channel” mode are described in detail.

When configured in this mode the Communication Objects possible are:

- ↔ “Priority”: output
- ↔ “LED”: input
- ↔ “Jamming”: input



Device: 1.0.245 8-fold Push Button

| | | |
|------------------------------|--------------------|----------------|
| General | Function | Priority |
| Information | Mode | 1 channel mode |
| Button 1 | Value | Priority OFF |
| Button 2 | Emission Delay (s) | 0 |
| Button 3 | LED Usage | OFF |
| Button 4 | Jamming | Not used |
| Button 5 | | |
| Button 6 | | |
| Button 7 | | |
| Button 8 | | |
| Logic Channels Configuration | | |

Figure 28: Button's configuration page for "Priority" function, "1 channel mode".

Table 14: Parameters in Button's configuration page for "Priority" function in "1 channel mode".

| Parameter | Description | Values |
|------------------------------|---|---|
| Value | Affects "Priority" CO and defines the control to be performed. | <u>Possible values:</u> Priority OFF, Priority ON <u>Default:</u> Priority OFF |
| Emission Delay (s) | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| LED Usage⁴ | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

In Figure 29 is suggested a example of button's operation. It's supposed the button to be configured without emission delay, and "Value" set to "Priority ON".

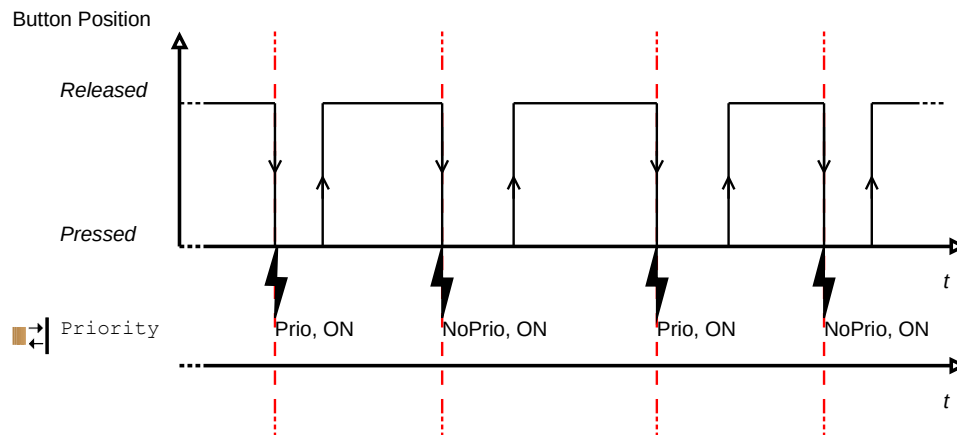


Figure 29: "Priority" function, "1 channel mode" operation example.

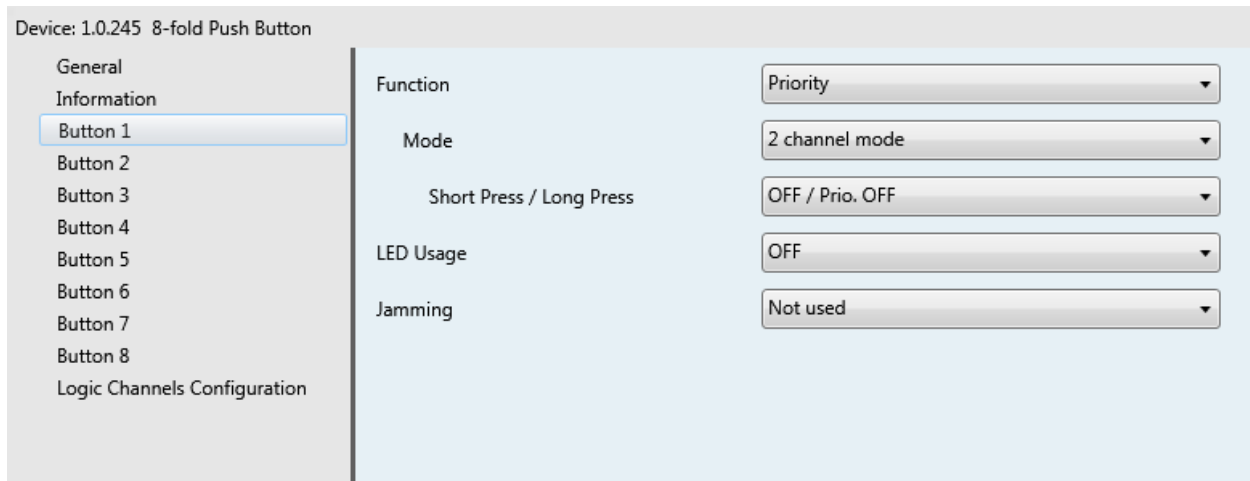
4 You must notice that the LED has a non configurable behavior for when the button is in priority (0,5s ON, 3 s OFF), that will run, no matter the configuration done in "LED" parameter.

b) 2 channel mode

This mode is intended to allow the user to, with the same button, control ON / OFF Communication Objects and also Priority Communication Objects, making use for that, two types of “button press” events: “short press” and “long press” (see 4.1).

You will know that the priority is activated when the button's LED is blinking being ON during 0,5 seconds and OFF for 3 seconds.

In the configuration page you can choose which event controls which CO, and which value to send. The configuration page is shown in Figure 30. In Table 15 the parameters of “Priority” function, “2 channel mode” are described in detail.



The screenshot shows a configuration interface for a device labeled "Device: 1.0.245 8-fold Push Button". On the left, a sidebar lists menu items: "General Information", "Button 1" (highlighted), "Button 2", "Button 3", "Button 4", "Button 5", "Button 6", "Button 7", "Button 8", and "Logic Channels Configuration". The main area displays configuration options for "Button 1":

| | |
|--------------------------|-----------------|
| Function | Priority |
| Mode | 2 channel mode |
| Short Press / Long Press | OFF / Prio. OFF |
| LED Usage | OFF |
| Jamming | Not used |

Figure 30: Button's configuration page for "Priority" function, "2 channel mode".

When configured in this mode the Communication Objects possible are:

- ↔ "Priority": output
- ↔ "ON / OFF": output
- ↔ "LED": input
- ↔ "Jamming": input

In Figure 31 is presented a suggestion of operation of a button configured in “2 channel mode”. The button is supposed to be configured as “ON / Prio. ON”, where a “short press” causes “ON / OFF” CO to send “On” and a “long press” causes “Priority” to activate/deactivate “Priority On”, and, in the general configurations, having the “Duration of long key press for 2-Channel mode operation” set to T_{2Ch} .

Table 15: Parameters in Button's configuration page for "Priority" function in "2 channel mode".

| Parameter | Description | Values |
|--------------------------|---|---|
| Short Press / Long Press | Affects "Priority" and "ON / OFF" CO and defines the control to be performed. | Possible values: OFF / Prio. OFF, ON / Prio. ON, Prio. OFF / OFF, Prio. ON / ON Default: OFF / Prio. OFF |
| LED Usage ⁵ | Affects the LED associated with the respective button and defines the function of the LED. | Possible values: OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press Default: OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | Possible values: Not used, If '1', If '0' Default: Not used |

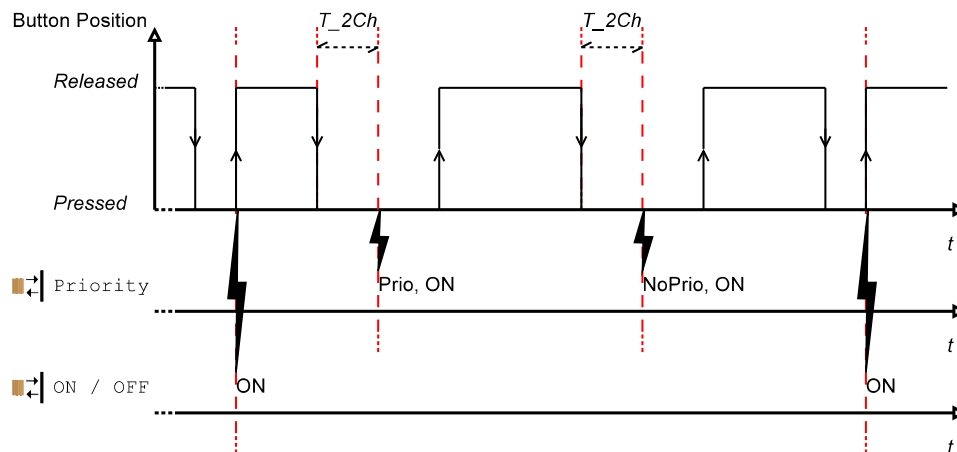


Figure 31: "Priority" function, "2 channel mode" operation example.

5 You must notice that the LED has a non configurable behavior for when the button is in priority (0,5s ON, 3 s OFF), that will run, no matter the configuration done in "LED" parameter.

4.2.8 Scene

This function is intended to control scenarios of diverse actuators at once. This can be configured to just send the scene number or to send the scene number and at “long press” (same period of 2 channel mode, see 4.1) send “scene save” to the actuators⁶.

The configuration page is displayed in Figure 32. In Table 16 the parameters of this function are described in detail.

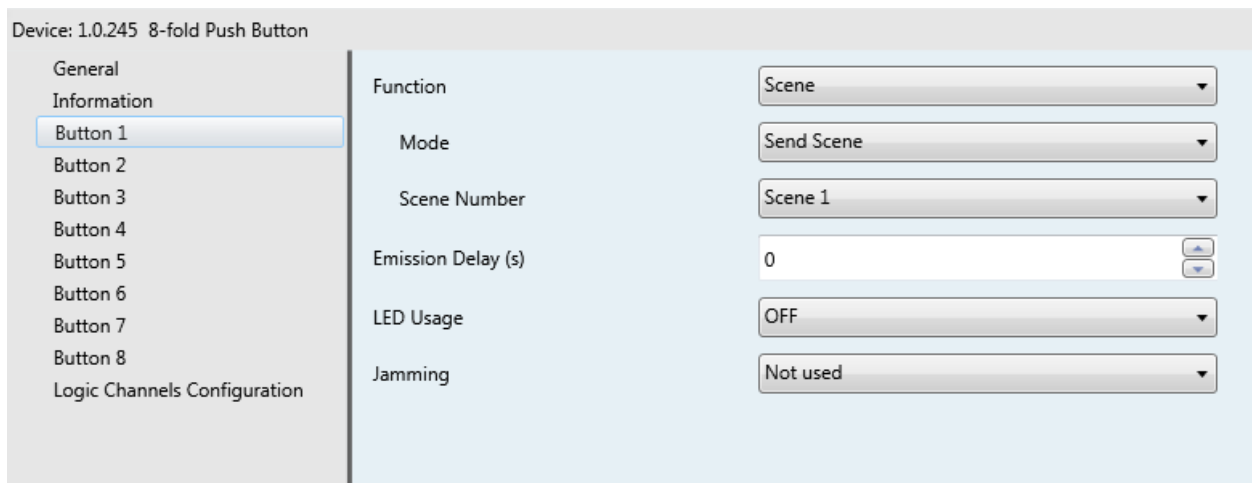


Figure 32: Button's configuration page for "Scene" function.

When configured in this mode the Communication Objects possible are:

- ↔ "Scene Control": output
- ↔ "LED": input
- ↔ "Jamming": input

In Figure 34 is presented a possible case of operation in the case the button is configured to “Send Scene and Save at long press”, without emission delay and with “Scene Number” set to “Scene 5”. In this case, by short pressing the button, “Scene Control” CO will send the scene number value. By pressing the button by more than T_{2Ch} (“long press”), “Scene Control” CO will send a “save request”, making the actuators (if allowed in the actuator) to memorise its current configuration.

Shall you notice that in “Send Scene and Save at long press”, when “Emission Delay” is defined for a value different than 0 seconds, it will not affect the save request. Save request is executed as soon as “long press” is declared.

⁶ The controlled device must be configured for allowing “scene save” commands, otherwise the control command will reproduce no effect.

Table 16: Parameters in Button's configuration page for "Scene" function.

| Parameter | Description | Values |
|---------------------------------------|---|---|
| Mode | Affects "Scene Control" CO and defines if it can send "save request" upon "long press". | <u>Possible values:</u> Send Scene, Send Scene and Save at long press <u>Default:</u> Send Scene |
| Emission Delay (s)⁷ | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| Scene Number⁸ | Affects "Scene Control" CO and defines the scene number to be sent to the actuators. | <u>Min:</u> Scene 1 <u>Max:</u> Scene 64 <u>Default:</u> Scene 1 |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

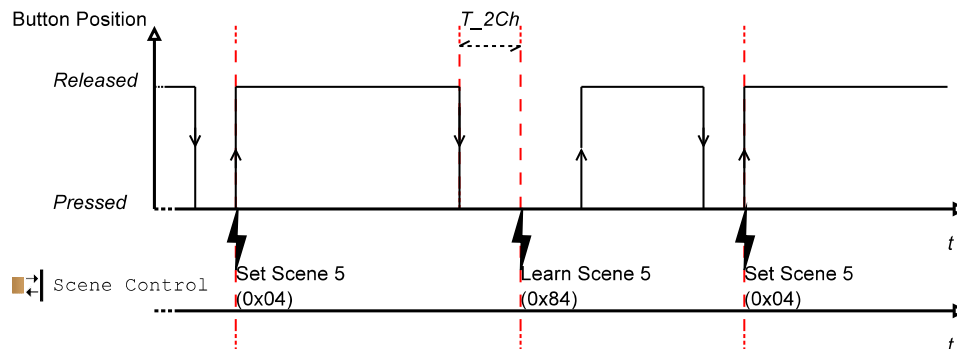


Figure 33: "Scene" function, "Send Scene and Save at long press" operation example.

7 Doesn't affect the "save request". That is sent immediately.

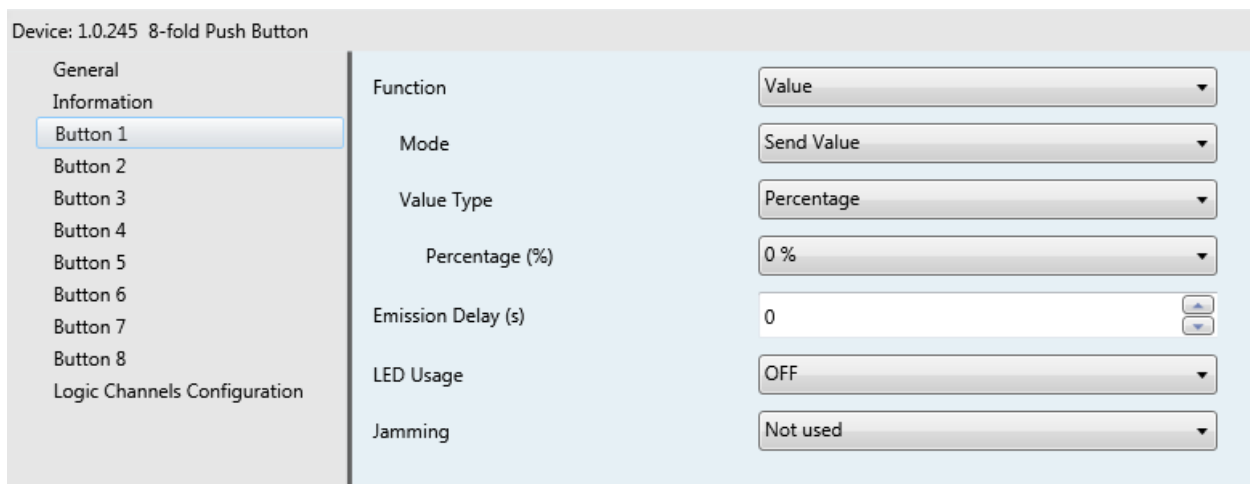
8 According to KNX Association, the scene numbers are between 0 and 63, however, since most devices make the numeration from 1 to 64, here the numeration is 1 to 64. It must be taken into account that the first scenario is "Scene 1", that corresponds to number 0.

4.2.9 Value

In this function it's possible to configure the button to send a predefined value. This value can be selected from the “Value Type” menu. Two different modes are distinguished within this function: “Send Value” and “Send Value and Save at long press”. By comparison with the same modes from “Scene” function, there is a major difference in the “Send Value and Save at long press” mode: in “Value” function the save action will send a read request to the Group Address in which the Communication Object is, and upon a response, the new value will be written on the MSW100x-PL's memory.

NOTICE: if configured in “Send Value and Save at long press” mode, the selected value will be overwritten at save request.

In Figure 34 you can see the configuration page for “Value” function. In Table 17 the configurable parameters are described in more detail.



| Parameter | Value |
|--------------------|------------|
| Function | Value |
| Mode | Send Value |
| Value Type | Percentage |
| Percentage (%) | 0 % |
| Emission Delay (s) | 0 |
| LED Usage | OFF |
| Jamming | Not used |

Figure 34: Button's configuration page for "Value" function.

In Figure 34 you can see that the “Value Type” selected is “Percentage”, reason why the value to be selected is “Percentage (%)”. This field changes according to the “Value Type” selected.

When using “Send Value and Save at long press” mode, another CO will be available, the respective “Value Indication” CO. This value must be in the same group address of the sending value indication of the actuator, in order to be able to request the current value.

The Communication Objects possible in this function are:

- ↔ "Percentage": output
- ↔ "Temperature": output
- ↔ "Luminosity": output
- ↔ "Angle": output
- ↔ "Percentage Value Indication": input
- ↔ "Temperature Value Indication": input
- ↔ "Luminosity Value Indication": input
- ↔ "Angle Value Indication": input
- ↔ "Jamming": input
- ↔ "LED": input

In Figure 35 is presented a possible operation case for a button configured in "Value" function, "Send Value and Save at long press" mode. This case can be interpreted as follows: the button is configured with "Value Type" set to "Percentage", and initially the "Value" is set to 3.9% (0x0A). By "short pressing" the button, the configured value will be send on the bus via "Percentage" CO. Lets admit that due to others device operation the value controlled is changed, let's suppose to 5.9% (0x0F). When the button is subject to a "long press" event, "Percentage Value Indication" will send a read request to its Group Address, and the devices on the same Group Address will send a response with their current value. Upon response telegram reception the newly received⁹ value, 5.9% (0x0F), will be written on the device's memory. When the button is "shortly pressed" the new value 5.9% (0x0F) will be sent via "Percentage" CO.

You can know the device took the response value and wrote it into the memory when the respective button's LED blinks at 1Hz for the period of around 3 seconds (blinks 3 times).

⁹ If more than one device answers, the first received answer is considered.

Table 17: Parameters in Button's configuration page for "Value" function.

| Parameter | Description | Values |
|--|---|--|
| Mode | Affects the sender CO and defines if it can send "save request" upon "long press". | <u>Possible values:</u> Send Value, Send Value and Save at long press <u>Default:</u> Send Value |
| Value Type | Affects the sender CO and defines the type of the value to be sent. | <u>Possible values:</u> Percentage, Temperature, Luminosity, Angle <u>Default:</u> Percentage |
| Percentage | Affects the sender CO and defines the value to be sent. | <u>Possible values:</u> 0%(0x00), 0,4%(0x01), 0,8%(0x02) ... 100(0xFF)% <u>Default:</u> 0% (0x00) |
| Temperature | | <u>Possible values:</u> 0°C, 0,5°C, 1°C, ... 40°C <u>Default:</u> 0°C |
| Luminosity | | <u>Possible values:</u> 0 lux, 50 lux, ... 1000 lux <u>Default:</u> 0 lux |
| Angle | | <u>Possible values:</u> 0°(0x00) , 1,41°(0x01), 2,82 °(0x02), ... 360°(0xFF) <u>Default:</u> 0°(0x00) |
| Emission Delay (s)¹⁰ | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF; ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink), Confirm Press <u>Default:</u> OFF |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

¹⁰ Doesn't affect the "save request". That is sent immediately.

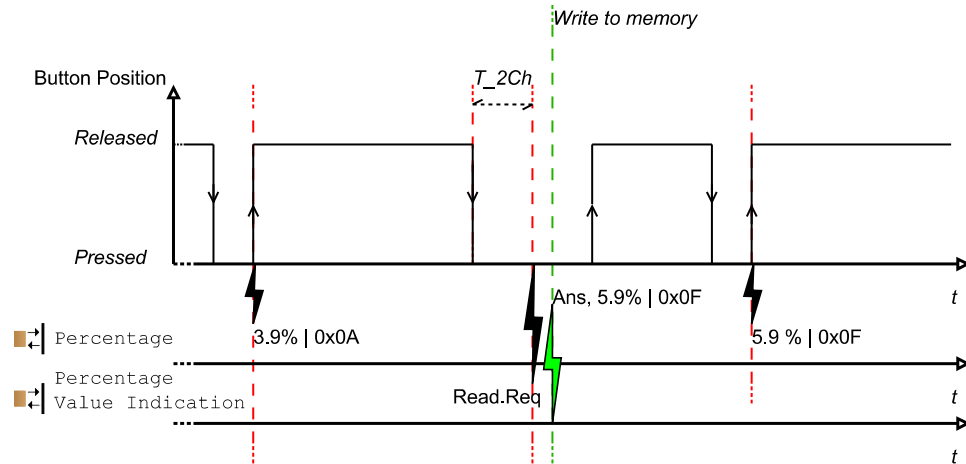


Figure 35: “Value” function, “Send Value and Save at long press” operation example.

4.2.10 2-Channel mode

This function is intended to, with one button, operate two independent channels. This is achieved by distinguishing two different events in button pressing: “short press” and “long press” (see 4.1).

Each of the channels can be configured for a different action, and each channel has its own CO. In Figure 36 is presented the configuration page for “2-Channel mode” function. In Table 18 the configurable parameters are described in detail.

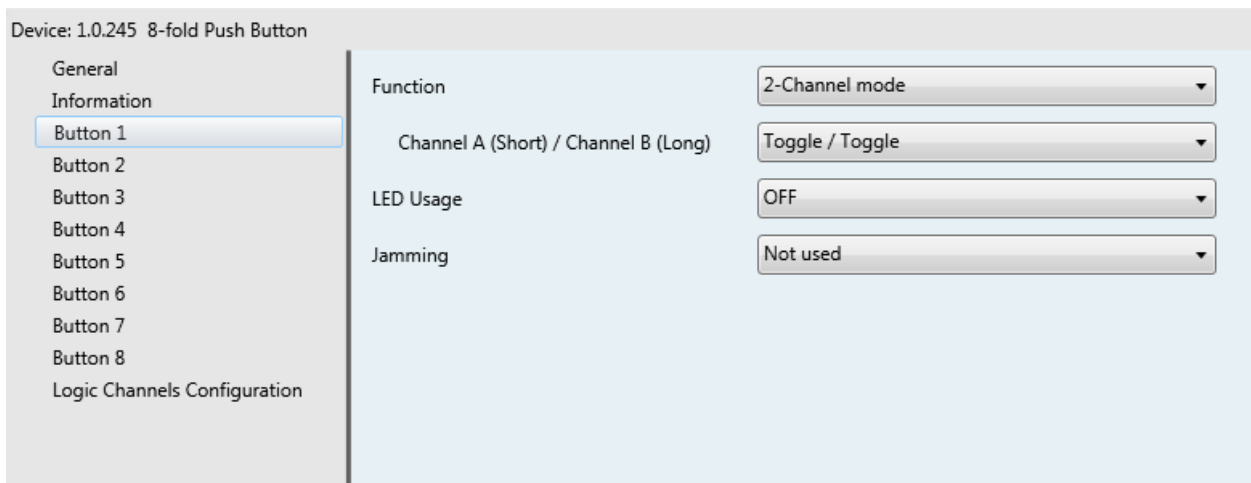


Figure 36: Button's configuration page for "2-Channel mode" function.

In this function the possible Communication Objects are:

- ↔ "ON / OFF ChA": output
- ↔ "Status indication ChA": input
- ↔ "ON / OFF ChB": output
- ↔ "Status indication ChB": input
- ↔ "LED": input
- ↔ "Jamming": input

For better understanding the way the "Toggle" action operates, you must read 4.2.3. In this section no further explanations about "toggle switch" will be made.

Table 18: Parameters in Button's configuration page for "2-Channel mode" function.

| Parameter | Description | Values |
|---|--|---|
| Channel A (Short) / Channel B (Long) | Affects the sender COs and defines the action to perform for each channel. At short press Channel A action is performed and at long press the Channel B action is performed. | <u>Possible values:</u> Toggle / Toggle, Toggle / ON, Toggle / OFF, ON / Toggle, ON / ON, ON / OFF, OFF / Toggle, OFF / ON, OFF / OFF <u>Default:</u> Toggle / Toggle |
| LED Usage | Affects the LED associated with the respective button and defines the function of the LED. | <u>Possible values:</u> OFF, ON, Linked w/ Obj (ON if 0), Linked w/ Obj (ON if 1), Linked w/ Obj (Blink if 0), Linked w/ Obj (Blink if 1), Confirm Press(Blink). Confirm Press <u>Default:</u> OFF |
| Jamming¹¹ | Affects the values to be sent and defines if the COs can be prevented from sending their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |

In Figure 37 is proposed an operation example: button configured with "Toggle" to Channel A ("short press" event) and "OFF" to Channel B ("long press" event). In this example, every time that the button is "short pressed", the "ON / OFF ChA" CO will toggle its value (please refer to 4.2.3 for understanding

¹¹ The jamming affects the button, and both channels are jammed at once.

the toggle function operation), and always that the button is “long pressed” the “ON / OFF ChB” CO will send “Off”.

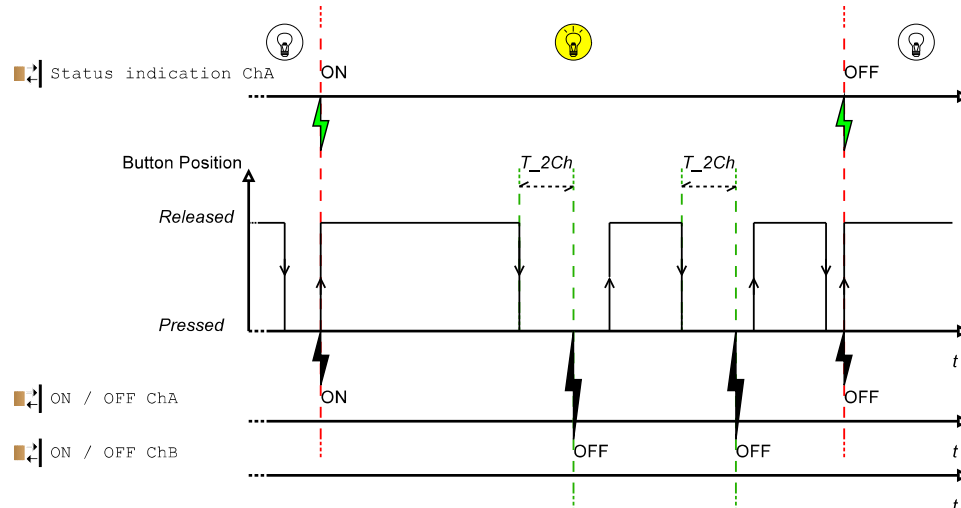


Figure 37: “2-Channel mode” function, “Toggle / OFF” operation example.

4.3 Logic Channels

Every MSW100X-PL device has four logical channels that can be configured in one of two modes:

- Logical Operation;
- Copy and Forward.

The configuration of the mode to be used is made in “Logic Channels Configuration” page, and the selected mode is independently selected for each channel, making possible to configure one of the channels in “Logic Operation” mode and other in “Copy and Forward” mode. By default all the channels are set to “Not used”. Once a mode is selected a new configuration page is created for the activated channel. This configuration pages are different according to the selected mode.

The logic channels are completely independent of the buttons operation (you can, however, associate some of its GO to the buttons operation).

In Figure 38 it's possible to see the “Logical Channels Configuration” page with Channel A and D set to “Logic Operation” and Channels B and C set to “Copy and Forward”.

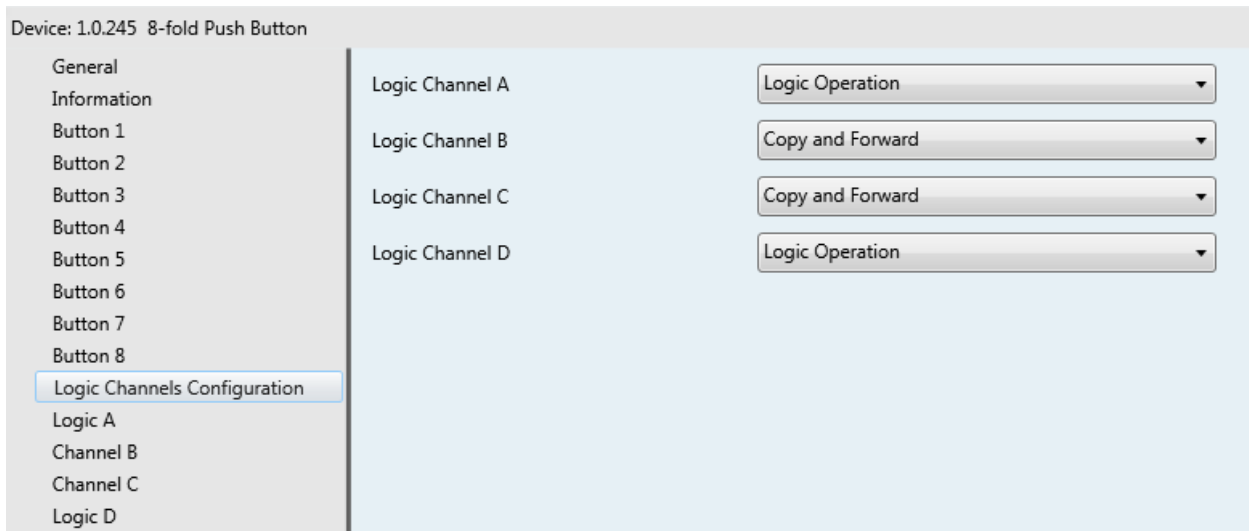


Figure 38: Configuration page for "Logical Channels".

4.3.1 Logic Operation

This mode is intended to proportionate you the possibility of create actions when a group of COs verify a set of conditions that you predefined. The value to be sent can be selected via "Function" parameter and the sending condition is defined by defining the "Send Condition" and "Logic Operation". In addition you need to select the inputs you want to used (also defining if its value should be negated or not).

With this mode you can define one action to happen always that a logical operation is verified, allowing you to introduce some automation to your KNX installation.

In Figure 39 is shown the default configuration page for the Logic Channels. In Table 19 the parameters are explained in detail. The possible Communication Objects in this mode are:

- ➡ "ON / OFF": output
- ➡ "Scene": output
- ➡ "Percentage": output
- ➡ "Temperature": output
- ➡ "Angle": output
- ➡ "Luminosity": output
- ➡ "Input 1": input
- ➡ "Input 2": input
- ➡ "Input 3": input
- ➡ "Input 4": input
- ➡ "Jamming": input

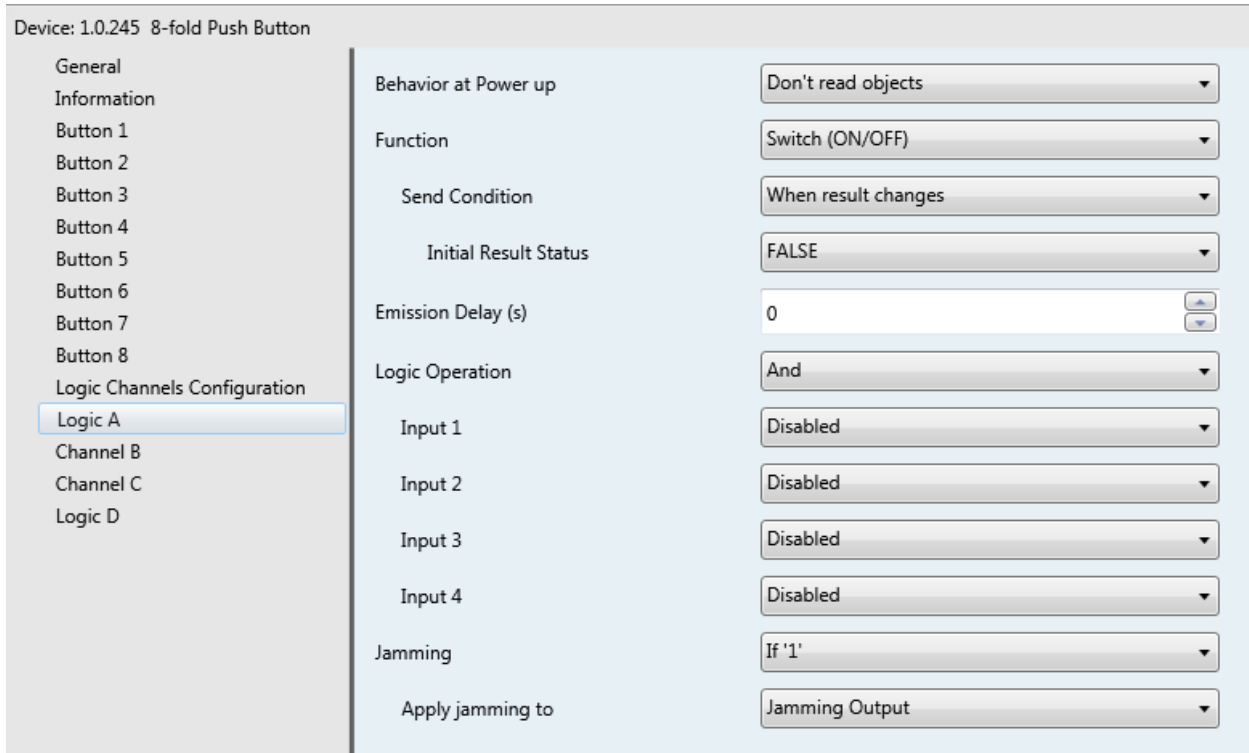


Figure 39: Logic Channel's "Logic Operation" configuration page.

Shall it be noticed that the parameter “**Emission Delay (s)**” applies just to the last event, this means, if one emission delay is in progress but a new value to the output CO comes, the ongoing emission delay is cancelled and a new one is set for the new value (resembling the buttons operability, but without the emission cancellable by second press (see Figure 3 in 4.1 to understand the effect of having new output value for emission delay before the previous being sent)). In case “Jamming” is applied to “Output”, in case output has a value to be sent after jamming, the value is sent after emission delay after jamming end.

Also important to notice the difference in the “**Jamming**” operation. In this function, when the jamming is used, you can choose if just the output is prevented to send while the jamming is set (meaning that when the jamming is cleared the output, if the value changed, will update its value on the bus) or if also the inputs are prevented from receiving its values while jamming is set (meaning that when jamming is cleared the logical channel is in the same condition that it was before the jamming).

The parameter “**Initial Result Status**” is used just for the power-up situation when the “Send condition” is “When result changes”, this because, at power up the “Result” is not yet defined what would creat and ambiguous situation. If you set “Initial Result Status” to NONE, whatever the result of first operation, it considers that the result changed and the value is sent to the bus.

Table 19: Parameters in Logic Channel's configuration page for "Logic Operation".

| Parameter | Description | Values |
|---|--|--|
| Behavior at Power up | Affects the input COs, and defines if, at power up, the inputs should send a read request. When at power up the objects must be read, you may consider to use "Debounce Time" (see 4.1). | <u>Possible values:</u> Don't read objects, Read objects <u>Default:</u> Don't read objects |
| Function¹² | Affects the output CO and defines the action to be executed. | <u>Possible values:</u> Switch (ON/OFF), Scene, Value <u>Default:</u> Switch (ON/OFF) |
| Send Condition | Affects the output CO and defines in which condition must the output be sent to the bus. | <u>Possible values:</u> When result changes, When input changes <u>Default:</u> When result changes |
| Initial Result Status¹³ | Affects the initial conditions and defines which must be the initial value of "result". | <u>Possible values:</u> FALSE, TRUE, NONE <u>Default:</u> FALSE |
| Emission Delay (s) | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| Logic Operation | Affects the operation between the inputs, affecting the result. | <u>Possible values:</u> And, Or, Xor <u>Default:</u> And |
| Input #¹⁴ | Affects each of the input COs and defines if it's disabled or used. | <u>Possible values:</u> Disabled, Normal, Inverted <u>Default:</u> Disabled |
| Jamming | Affects the values to be sent and defines if the COs can be prevented from sending/receiving their values when an event trigger occurs. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |
| Apply jamming to¹⁵ | Affects the inputs and the outputs and defines to which COs must the jamming be applied to. | <u>Possible values:</u> Jamming Output, Jamming Output + Inputs <u>Default:</u> Jamming Output |

12 Depending on the function selected. other parameters to be configured may appear. For "Scene" function and "Value Function" please refer to 4.2.8 and 4.2.9 respectively.

13 Just present when the send condition is "When result changes".

14 The "Input 1" to "Input 4" parameters have the same options.

15 This parameter is visible just if "Jamming" is different than "Not used".

As a title of example lets consider the following situation: in one home it's intended to turn “On” a small lamp when the kitchen, hall and living room lights are turned off at the same time, but whenever one is turned “On”, the small lamp must be turned “Off”. For this kind of situations you may use MSW100X-PL Logic Channels configured in “Logic Operation” mode for achieving the solution.

For accomplish the previous described example, you could set the Logic Channel's function to “Switch (ON/OFF)”, with “Send Condition” set to “When result changes” and “Initial Result Status” set to “FALSE” (meaning that the first message will be sent to the bus when the lamp must be turned “On”). You would also allocate one of the inputs per state of light actuator channel (one in Kitchen status indication (I_1), other in Hall status indication (I_2) and other in Living Room status indication(I_3)). As we want “Result” to be “TRUE” when all the lights are “OFF” (“FALSE”), the logic operation to preform must be the logical AND of the inverse of the inputs:

$$Result = \neg I_1 \wedge \neg I_2 \wedge \neg I_3$$

where ' \wedge ' is the logical conjunction operator (AND), and ' \neg ' is the logical negation (NOT) (see Appendix A -Logic operations). Having this, we can consider the truth table of our example (see Table 20).

Table 20: Truth table for 3 inputs

| I_1 | I_2 | I_3 | $\neg I_1$ | $\neg I_2$ | $\neg I_3$ | $\neg I_1 \wedge \neg I_2 \wedge \neg I_3$ |
|-------|-------|-------|------------|------------|------------|--|
| 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 |

In Figure 40 is presented a possible operation case for the described situation above. The situation can be interpreted as follows: initially the lights of Kitchen and Living Room are “On” and the lights of the Hall are “Off”. Let's consider that the device has configured to “Read objects” at power up. When the the bus is powered up the inputs will make read requests, and later will receive their answers, but since the initial result status was configured to “FALSE”, and the result after taking the answers is still “FALSE”, no message is sent to the bus. Later the Kitchen's light is turned “Off”, but since the Living Room's light still “On”, the result is still “FALSE”. When later the Living Room's light is turned “Off”, all the lights are “Off”, which fulfils our condition to turn “On” the small lamp. In this moment the result becomes

“TRUE” what makes “ON /OFF” CO to send “On” to the small lamp. If any lamp is tuned “On”, say the Hall's light, the result becomes “FALSE” and “ON / OFF” CO sends “Off” to the small lamp.

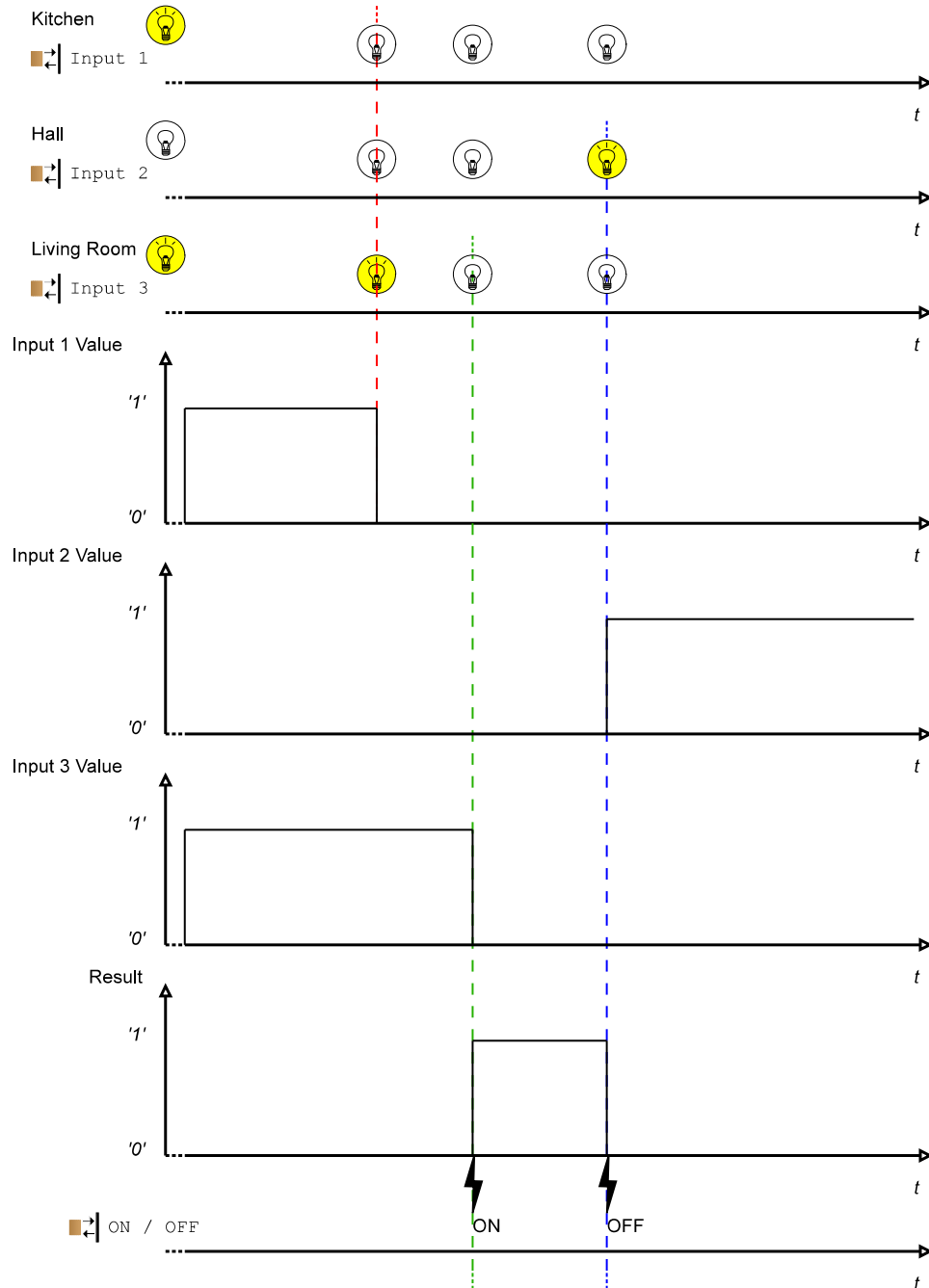


Figure 40: Operation example of "Logic Operation".

Let's suppose now that there's a control button for the small lamp, and it's wanted that when the lamp is turned “On” manually, no matter which is the status of the rest of the lightning, the small lamp must remain “On”. For achieving this the Logic Channel's “Jamming” CO may be used. For simplicity let's consider only the Kitchen and Hall's lights as inputs. Is also wanted to make the small lamp to become again controlled according to the Kitchen and Hall's lightning, taking in that moment the value according to the current lightning status. In this way, the small lamp must be controlled via two Group Addresses: one for the manual control (which will send only “On” commands) and other for the logic channel control. For this, you may change “Jamming” to “If '1” and “Apply jamming to” set to “Jamming Output”. When the jamming is applied to the output, the result is kept updating, however the output CO will not send any messages, but as soon as jamming is cleared, if result has changed since it's state before being jammed, the output CO will send its new value, if the result value is still the same the output CO will not send its value.

Please refer to Table 21 for a possible association of COs that would accomplish the solution for the previously exposed problem.

Table 21: Possible communication object association for the example.

| GA_1 | GA_2 | GA_3 |
|--|---|--|
| <ul style="list-style-type: none"> ➡ Kitchen - ON/OFF: input ➡ Button1 - ON/OFF: output | <ul style="list-style-type: none"> ➡ Hall - ON/OFF: input ➡ Button2 - ON/OFF: output | <ul style="list-style-type: none"> ➡ SmallLamp - ON/OFF: input ➡ LogicA - ON/OFF: output |
| GA_4 ¹⁶ | GA_5 ¹⁶ | GA_6 |
| <ul style="list-style-type: none"> ➡ SmallLamp - ON/OFF: input ➡ Button3 - ON/OFF ChA: output ➡ LogicA - Jamming: input | <ul style="list-style-type: none"> ➡ Button3 - ON/OFF ChB: output ➡ LogicA - Jamming: input | <ul style="list-style-type: none"> ➡ Kitchen - Status: output ➡ LogicA - Input1: input |
| GA_7 | | |
| <ul style="list-style-type: none"> ➡ Hall - Status: output ➡ LogicA - Input2: input | | |

In Figure 41 is shown a operation example for the previously described case. In this Figure just the COs related with the logic channel have been considered.

16 The Button3, if from MSW100X-PL, would, for example, be configured in “2-Channel mode” set with “ON” to Channel A and “OFF” to Channel B.

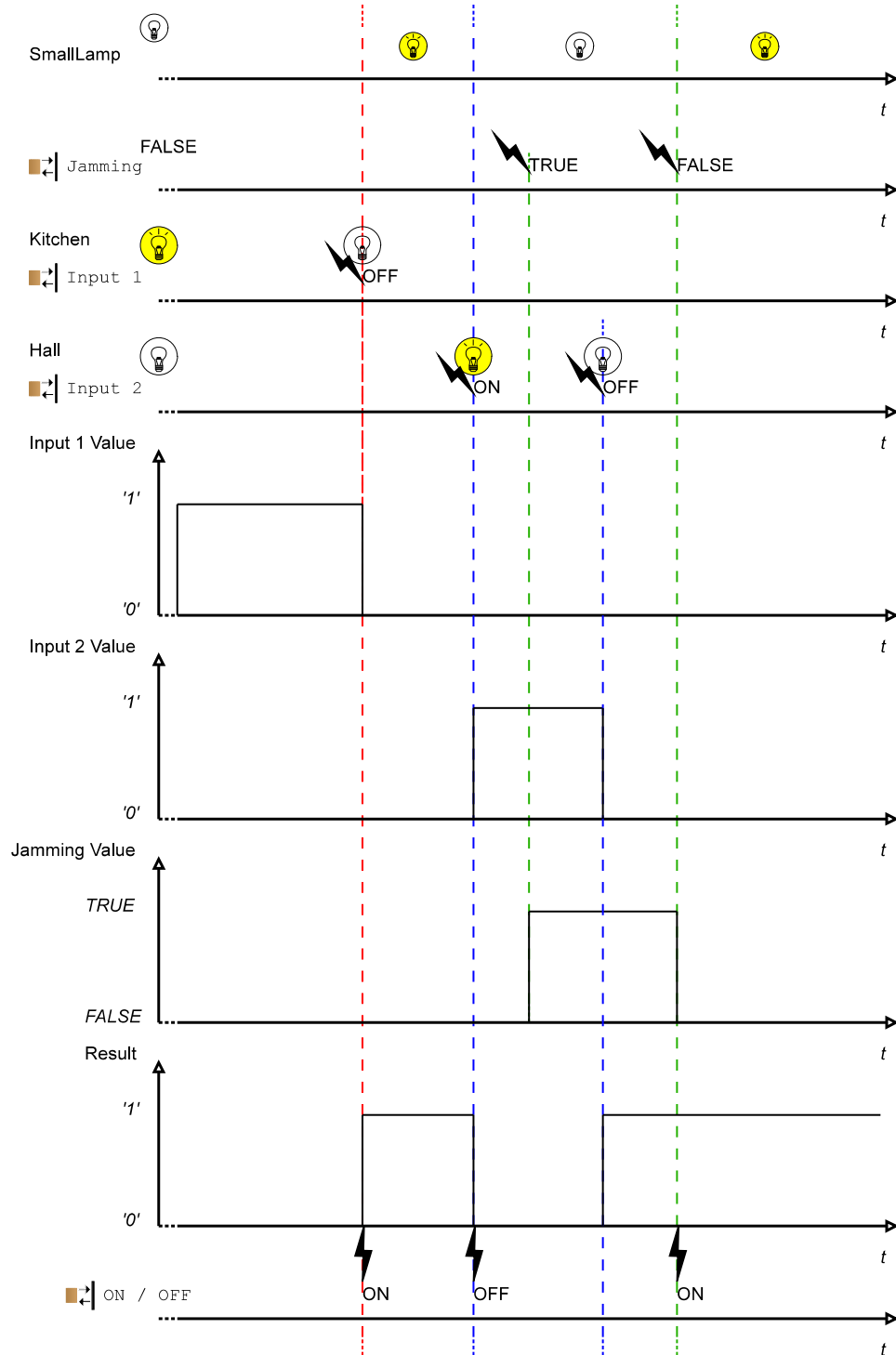


Figure 41: Logic Operation example.

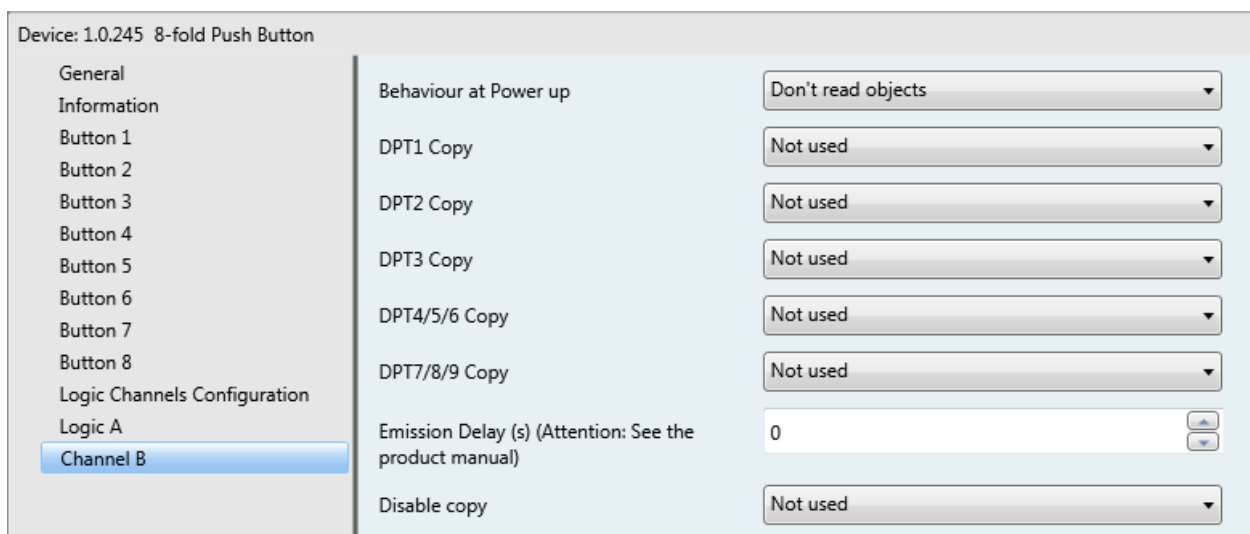
4.3.2 Copy and Forward

This mode is intended to proportionate you, in certain way, to have one CO sending for more than one Group Address. As defined in KNX standard, one CO can send only to one Group Address. In this way, to allow you to have one CO sending to more than one Group Address it was implemented the “Copy and Forward” function in the Logic Channels.

When assigning the COs to their Group Addresses you should place the input CO in the Group Address from where you want to copy, and place the output in the Group Address to which you want the value to be copied to.

In Figure 42 is presented the configuration page for this function. In Table 22 all the parameters are described in detail.

IMPORTANT: if “Emission Delay (s)” is set to a value different than 0s, and more than one “DPT# Copy” is in use (in the same logic channel), than you must be aware that, the emission delay will count from the last received input, and once expired send all waiting “DPT# Copy”. If “DPT[X] Copy” and “DPT[Y] Copy” are in use in the same Logic Channel (say Channel A): “Input DPT[X]” receives a message, starting the timer for emission delay (T_D); meanwhile, before T_D , “Input DPT[Y]” takes a message, what will make the timer to reset, starting a new count to T_D ; when the timer expires both “Output DPT[X]” and “Output DPT[Y]” are sent. In case you want different timers for different COs you should set one Logic Channel per “DPT# Copy”.



| Device: 1.0.245 8-fold Push Button | |
|--|--------------------|
| General | |
| Information | |
| Button 1 | |
| Button 2 | |
| Button 3 | |
| Button 4 | |
| Button 5 | |
| Button 6 | |
| Button 7 | |
| Button 8 | |
| Logic Channels Configuration | |
| Logic A | |
| Channel B | |
| Behaviour at Power up | Don't read objects |
| DPT1 Copy | Not used |
| DPT2 Copy | Not used |
| DPT3 Copy | Not used |
| DPT4/5/6 Copy | Not used |
| DPT7/8/9 Copy | Not used |
| Emission Delay (s) (Attention: See the product manual) | 0 |
| Disable copy | Not used |

Figure 42: Logic Channel's configuration page for "Copy and Forward" function.

Table 22: Parameters in Logic Channel's configuration page for "Copy and Forward".

| Parameter | Description | Values |
|--|--|--|
| Behavior at Power up | Affects the input COs, and defines if, at power up, the inputs should send a read request. When at power up the objects must be read, you may consider to use "Debounce Time" (see 4.1). | <u>Possible values:</u> Don't read objects, Read objects <u>Default:</u> Don't read objects |
| DPT# Copy¹⁷ | Affects both, input and output COs and defines if it's activated or not. | <u>Possible values:</u> Not used, Use <u>Default:</u> Use |
| Emission Delay (s)¹⁸ | Affects the value to be sent and defines the amount of time, in seconds, that the CO will wait until sending the value. | <u>Min:</u> 0 s <u>Max:</u> 65535 s (~18,2 h) <u>Default:</u> 0 s |
| Disable copy | Affects the values to be sent and defines if the copy and forward must occur or not. | <u>Possible values:</u> Not used, If '1', If '0' <u>Default:</u> Not used |
| When Copy Re-enabled¹⁹ | Affects the output CO and defines its behavior when the "copy" is re-enabled. | <u>Possible values:</u> Do nothing, Send if new <u>Default:</u> Do nothing |

From Table 22 must be noticed the effect of "**When Copy Re-enabled**". By setting this to "Send if new", it means that, if while the "DPT# Copy" is disabled via "Copy Disable" the input value changes, when the copy is re-enabled (via "Copy Disable" CO) the output CO will send the last value received; otherwise, if "**When Copy Re-enabled**" is set to "Do nothing", after copy being re-enabled the output will not send the last received value.

The possible Communication Objects in this mode are:

- ↔ "Input DPT1 (1bit)": input
- ↔ "Input DPT2 (2bit)": input
- ↔ "Input DPT3 (4bit)": input
- ↔ "Input DPT4/5/6 (1byte)": input
- ↔ "Input DPT7/8/9 (2byte)": input
- ↔ "Output DPT1 (1bit)": output

17 All of the DPT# Copy parameters have the same configuration options.

18 The emission delay applies to all of the DPT CO and counts from the last received.

19 Just present if "Disable copy" is different than "Not used".

- ➡ "Output DPT2 (2bit)": output
- ➡ "Output DPT3 (4bit)": output
- ➡ "Output DPT4/5/6 (1byte)": output
- ➡ "Output DPT7/8/9 (2byte)": output
- ➡ "Copy Disable (if 1)": input
- ➡ "Copy Disable (if 0)": input

When more than one "DTP# Copy" CO is activated and emission delay is set to a value different than 0 seconds, all the COs are affected by the same value, and counts from the moment that the last input received a message.

As an example, lets imagine that's intended to control two lights via dimmer actuator. The lights can be switched "On" and "Off" independently, but the dimming is wanted to be controlled at the same time to all the lights, but just if the light is "On". Normally this can't be achieved because both lights' dimming COs would be in the same Group Address and by controlling the dimming value both lights would be affected and would turn "On" a light that had been previously turned "Off" via its "ON / OFF" CO. Thanks to this function, it's made possible to achieve such a lightning control. For that one "DTP3 Copy" should be activated per light (you should notice that Control Dimming Data Point Type is 3.007, a 4 bit value). Also the "Copy Disable" should be set to "If '0'" and "When Copy Re-enabled" must be set to "Do nothing". Consider the CO associations presented in Table 23.

Table 23: Possible communication object association for the example.

| GA_1 | GA_2 | GA_3 |
|---|---|---|
| <ul style="list-style-type: none"> ➡ Light1 - ON/OFF: input ➡ Button1 - ON/OFF: output | <ul style="list-style-type: none"> ➡ Light2 - ON/OFF: input ➡ Button2 - ON/OFF: output | <ul style="list-style-type: none"> ➡ ChannelA - Input DPT3: input ➡ ChannelB - Input DPT3: input ➡ Button3 - Dimming: output |
| GA_4 | GA_5 | GA_6 |
| <ul style="list-style-type: none"> ➡ Light1 - Dimming: input ➡ LogicA - Dimming: output | <ul style="list-style-type: none"> ➡ Light2 - Dimming: input ➡ LogicB - Dimming: output | <ul style="list-style-type: none"> ➡ Light1 - Status: output ➡ LogicA - Copy Disable: input |
| GA_7 | | |
| <ul style="list-style-type: none"> ➡ Ligth2 - Status: output ➡ LogicB - Copy Disable: input | | |

In Table 23 the GA_3 is the “source” from where we want to copy (the dimming value coming from the user interface), so we place both inputs. The GA_4 is the Group Address of the dimming of one of the lights, where we should place on of the logic channel's output; GA_5 controls the other light, so we place the other logic channel's output.

In Figure 43 it's suggested a possible operation of the previously described installation having “When Copy Re-enable” set to “Send if new”. Just the COs from the Logic Channels are evidenced.

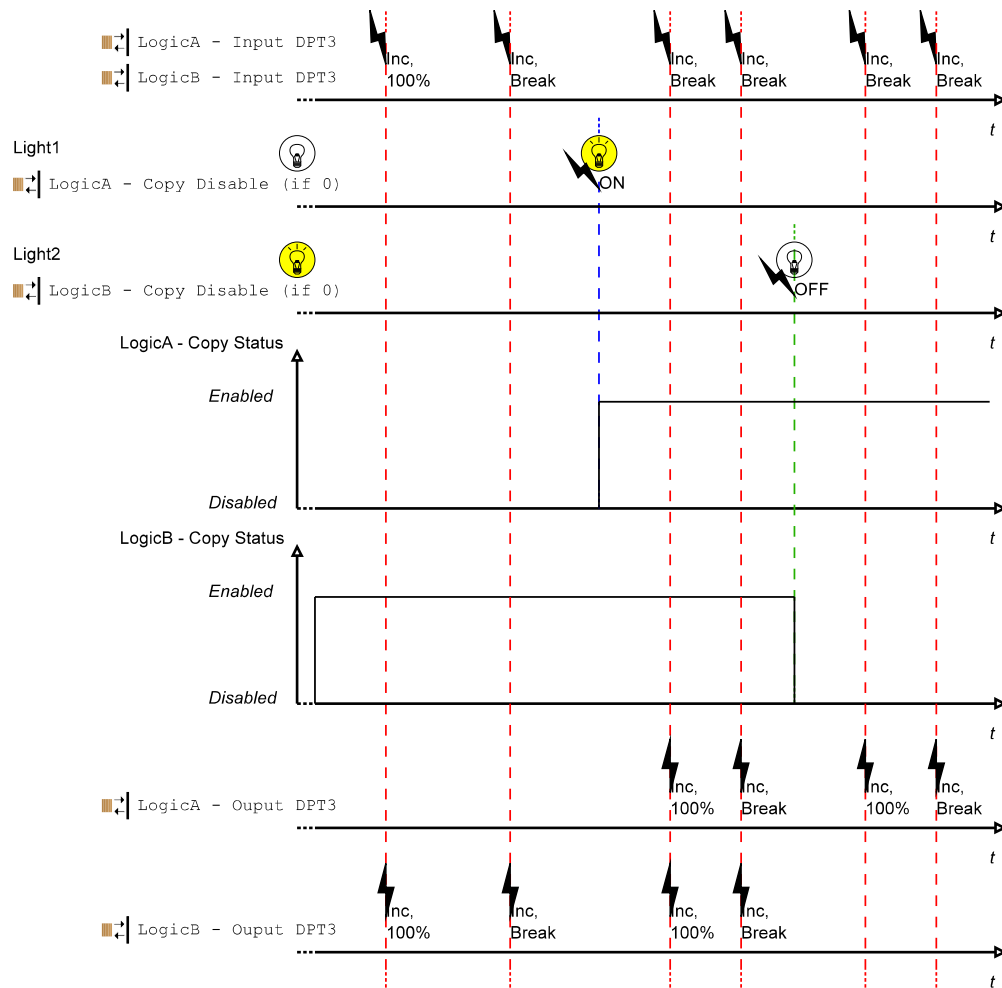


Figure 43: Copy and Forward example.

APPENDIXES

APPENDIX A - LOGIC OPERATIONS

Three logic operations are available to be used with up to four binary inputs (see 4.3.1), plus one more (logic NOT) that can be applied to each input independently. In here, useful theoretical information about the four logic operations will be presented.

These functions belongs to the algebra's subarea Boolean algebra, in which the values of the variables are the truth values *TRUE* and *FALSE*, that commonly are denoted by '1' and '0', respectively.

I - AND (Logical Conjunction)

This operator can be represented by the symbol “ \wedge ”. A n -place logical operator AND results *TRUE* if n of its operands are *TRUE*, otherwise the value is *FALSE*.

Main properties:

- Commutativity: $A \wedge B \Leftrightarrow B \wedge A$;
- Associativity: $A \wedge (B \wedge C) \Leftrightarrow (A \wedge B) \wedge C$;
- Distributivity: $A \wedge (B \vee C) \Leftrightarrow (A \wedge B) \vee (A \wedge C)$;

Table 24: Truth tables for Conjunction Operation

| Input | | | Output |
|-------|---|--------------|--------|
| A | B | A \wedge B | |
| 0 | 0 | 0 | |
| 0 | 1 | 0 | |
| 1 | 0 | 0 | |
| 1 | 1 | 1 | |

| Input | | | | Output |
|-------|---|---|-------------------------|--------|
| A | B | C | A \wedge B \wedge C | |
| 0 | 0 | 0 | 0 | |
| 0 | 0 | 1 | 0 | |
| 0 | 1 | 0 | 0 | |
| 0 | 1 | 1 | 0 | |
| 1 | 0 | 0 | 0 | |
| 1 | 0 | 1 | 0 | |
| 1 | 1 | 0 | 0 | |
| 1 | 1 | 1 | 1 | |

| Input | | | | | Output |
|-------|---|---|---|------------------------------------|--------|
| A | B | C | D | A \wedge B \wedge C \wedge D | |
| 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 1 | 0 | |
| 0 | 0 | 1 | 0 | 0 | |
| 0 | 0 | 1 | 1 | 0 | |
| 0 | 1 | 0 | 0 | 0 | |
| 0 | 1 | 0 | 1 | 0 | |
| 0 | 1 | 1 | 0 | 0 | |
| 0 | 1 | 1 | 1 | 0 | |
| 1 | 0 | 0 | 0 | 0 | |
| 1 | 0 | 0 | 1 | 0 | |
| 1 | 0 | 1 | 0 | 0 | |
| 1 | 0 | 1 | 1 | 0 | |
| 1 | 1 | 0 | 0 | 0 | |
| 1 | 1 | 0 | 1 | 0 | |
| 1 | 1 | 1 | 0 | 0 | |
| 1 | 1 | 1 | 1 | 1 | |

II - OR (Logical Disjunction)

This operator can be represented by the symbol “ \vee ”. A n -place logical operator AND results *TRUE* if at least 1 of n operands is *TRUE*, if n operands are *FALSE*, then the result is *FALSE*.

Main properties:

- Commutativity: $A \vee B \Leftrightarrow B \vee A$;
- Associativity: $A \vee (B \vee C) \Leftrightarrow (A \vee B) \vee C$;
- Distributivity: $A \vee (B \wedge C) \Leftrightarrow (A \vee B) \wedge (A \vee C)$;

Table 25: Truth tables for Disjunction Operation

| Input | | Output |
|-------|---|------------|
| A | B | $A \vee B$ |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

| Input | | | Output |
|-------|---|---|-------------------|
| A | B | C | $A \vee B \vee C$ |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

| Input | | | | Output |
|-------|---|---|---|--------------------------|
| A | B | C | D | $A \vee B \vee C \vee D$ |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

III - XOR (Exclusive disjunction)

This operator can be represented by the symbol “ \oplus ”. A n -place logical operator XOR results *TRUE* if a odd number of operands is *TRUE*, otherwise then the result is *FALSE*.

Main properties:

- Commutativity: $A \oplus B \Leftrightarrow B \oplus A$;
- Associativity: $A \oplus (B \oplus C) \Leftrightarrow (A \oplus B) \oplus C$;

Table 26: Truth tables for Exclusive Disjunction Operation

| Input | | Output |
|-------|---|--------------|
| A | B | $A \oplus B$ |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

| Input | | | Output |
|-------|---|---|-----------------------|
| A | B | C | $A \oplus B \oplus C$ |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

| Input | | | | Output |
|-------|---|---|---|--------------------------------|
| A | B | C | D | $A \oplus B \oplus C \oplus D$ |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

IV - NOT (Negation)

This operator can be represented by the symbol “ \neg ”. Negation is unary (single-argument) logical operator. Negation function takes *Falsity* to *Truth* and vice versa.

Main properties:

- Double negation: $\neg\neg A \Leftrightarrow A$ and $\neg\neg\neg A \Leftrightarrow \neg A$;
- Distributivity (Morgan's law): $\neg(A \vee B) \Leftrightarrow (\neg A \wedge \neg B)$ and $\neg(A \wedge B) \Leftrightarrow (\neg A \vee \neg B)$;

Table 27: Truth table for NOT Operation

| A | $\neg A$ |
|---|----------|
| 0 | 1 |
| 1 | 0 |

APPENDIX B - KNX DATA TYPES

Table 28: Some of the KNX Data Points Types

| DPT_ID | DPT_Name | Size (bits) |
|--------|-------------------------|-------------|
| 1.001 | DPT_Switch | 1 |
| 1.002 | DPT_Bool | 1 |
| 1.003 | DPT_Enable | 1 |
| 1.004 | DPT_Ramp | 1 |
| 1.005 | DPT_Alarm | 1 |
| 1.006 | DPT_BinaryValue | 1 |
| 1.007 | DPT_Step | 1 |
| 1.008 | DPT_UpDown | 1 |
| 1.009 | DPT_OpenClose | 1 |
| 1.010 | DPT_Start | 1 |
| 1.011 | DPT_State | 1 |
| 1.012 | DPT_Invert | 1 |
| 1.013 | DPT_DimSendStyle | 1 |
| 1.014 | DPT_InputSource | 1 |
| 1.015 | DPT_Reset | 1 |
| 1.016 | DPT_Ack | 1 |
| 1.017 | DPT_Trigger | 1 |
| 1.018 | DPT_Occupancy | 1 |
| 1.019 | DPT_Window_Door | 1 |
| 1.021 | DPT_LogicalFunction | 1 |
| 1.022 | DPT_Scene_AB | 1 |
| 1.023 | DPT_ShutterBlinds_Mode | 1 |
| 1.100 | DPT_eat/Cool | 1 |
| 2.001 | DPT_Switch_Control | 2 |
| 2.002 | DPT_Bool_Control | 2 |
| 2.003 | DPT_Enable_Control | 2 |
| 2.004 | DPT_Ramp_Control | 2 |
| 2.005 | DPT_Alarm_Control | 2 |
| 2.006 | DPT_BinaryValue_Control | 2 |
| 2.007 | DPT_Step_Control | 2 |
| 2.008 | DPT_Direction1_Control | 2 |
| 2.009 | DPT_Direction2_Control | 2 |
| 2.010 | DPT_Start_Control | 2 |
| 2.011 | DPT_State_Control | 2 |
| 2.012 | DPT_Invert_Control | 2 |
| 3.007 | DPT_Control_Dimming | 4 |

| | | |
|-------|-----------------------|----|
| 3.008 | DPT_Control_Blinds | 4 |
| 4.001 | DPT_Char_ASCII | 8 |
| 4.002 | DPT_Char_8859_1 | 8 |
| 5.001 | DPT_Scaling | 8 |
| 5.003 | DPT_Angle | 8 |
| 5.004 | DPT_Percent_U8 | 8 |
| 5.005 | DPT_DecimalFactor | 8 |
| 5.010 | DPT_Value_1_Ucount | 8 |
| 6.001 | DPT_Percent_V8 | 8 |
| 6.010 | DPT_Value_1_Count | 8 |
| 6.020 | DPT_Status_Mode3 | 8 |
| 7.001 | DPT_Value_2_Ucount | 16 |
| 7.002 | DPT_TimePeriodMsec | 16 |
| 7.003 | DPT_TimePeriod10MSec | 16 |
| 7.004 | DPT_TimePeriod100MSec | 16 |
| 7.005 | DPT_TimePeriodSec | 16 |
| 7.006 | DPT_TimePeriodMin | 16 |
| 7.007 | DPT_TimePeriodrs | 16 |
| 7.010 | DPT_PropDataType | 16 |
| 7.011 | DPT_Length_mm | 16 |
| 7.012 | DPT_UEICurrentmA | 16 |
| 7.013 | DPT_Brightness | 16 |
| 8.001 | DPT_Value_2_Count | 16 |
| 8.002 | DPT_DeltaTimeMsec | 16 |
| 8.003 | DPT_DeltaTime10MSec | 16 |
| 8.004 | DPT_DeltaTime100MSec | 16 |
| 8.005 | DPT_DeltaTimeSec | 16 |
| 8.006 | DPT_DeltaTimeMin | 16 |
| 8.007 | DPT_DeltaTimers | 16 |
| 8.010 | DPT_Percent_V16 | 16 |
| 8.011 | DPT_Rotation_Angle | 16 |
| 9.001 | DPT_Value_Temp | 16 |
| 9.002 | DPT_Value_Tempd | 16 |
| 9.003 | DPT_Value_Tempa | 16 |
| 9.004 | DPT_Value_Lux | 16 |
| 9.005 | DPT_Value_Wsp | 16 |
| 9.006 | DPT_Value_Pres | 16 |
| 9.007 | DPT_Value_umidity | 16 |
| 9.008 | DPT_Value_AirQuality | 16 |
| 9.010 | DPT_Value_Time1 | 16 |
| 9.011 | DPT_Value_Time2 | 16 |

| | | |
|-------|-----------------------|-----|
| 9.020 | DPT_Value_Volt | 16 |
| 9.021 | DPT_Value_Curr | 16 |
| 9.022 | DPT_PowerDensity | 16 |
| 9.023 | DPT_KelvinPerPercent | 16 |
| 9.024 | DPT_Power | 16 |
| 9.025 | DPT_Value_Volume_Flow | 16 |
| ... | ... | ... |

APPENDIX C - LED USAGE

The LED usage options vary according to the function of the corresponding button. The maps the LEDs usage options according to the button's function.

Table 29: LED Usage options per Button Function

| Button Function | LED Usage | Not used | ON / OFF | Toggle Switch | Dimming | | Shutter / Blinds | Heating | Priority | Scene | Value | | 2 Channel Mode |
|----------------------------|-----------|----------|----------|---------------|-----------------|-----------------|------------------|---------|----------|-------|------------|-----------------------------------|----------------|
| | | | | | 1 Button Dimmer | 2 Button Dimmer | | | | | Send Value | Send Value and save at long press | |
| ON | | X | X | X | X | X | X | X | X | X | X | X | X |
| OFF | | X | X | X | X | X | X | X | X | X | X | X | X |
| W/ Status (ON if 1) | | | | X | X | | | | | | | | |
| W/ Status (ON if 0) | | | | X | X | | | | | | | | |
| W/ Status (Blink if 1) | | | | X | X | | | | | | | | |
| W/ Status (Blink if 0) | | | | X | X | | | | | | | | |
| Linked w/ Obj (ON if 0) | | X | X | X | X | X | X | X | X | X | X | X | X |
| Linked w/ Obj (ON if 1) | | X | X | X | X | X | X | X | X | X | X | X | X |
| Linked w/ Obj (Blink if 0) | | X | X | X | X | X | X | X | X | X | X | X | X |
| Linked w/ Obj (Blink if 1) | | X | X | X | X | X | X | X | X | X | X | X | X |
| Confirm Press(Blink) | | | X | X | X | X | X | X | X | X | X | X | X |
| Confirm Press | | | X | X | X | X | X | X | X | X | X | X | X |
| *Priority Signalisation | | | | | | | | | X | | | | |
| *Value Save Confirmation | | | | | | | | | | | | X | |

Shall you notice that “**Priority Signalisation**” and “**Value Save Confirmation**” options are not user selectable. Those modes will preform no matter is the usage selected for the LED.

“**Priority Signalisation**” is just used when the button is configured in “Priority” function and is used to signalise that the buttons priority is activated. The signalisation consists in periodically, while the button's priority is activated, turn On the LED for 0.5 seconds and turn it Off for 3 seconds (see Figure 44).

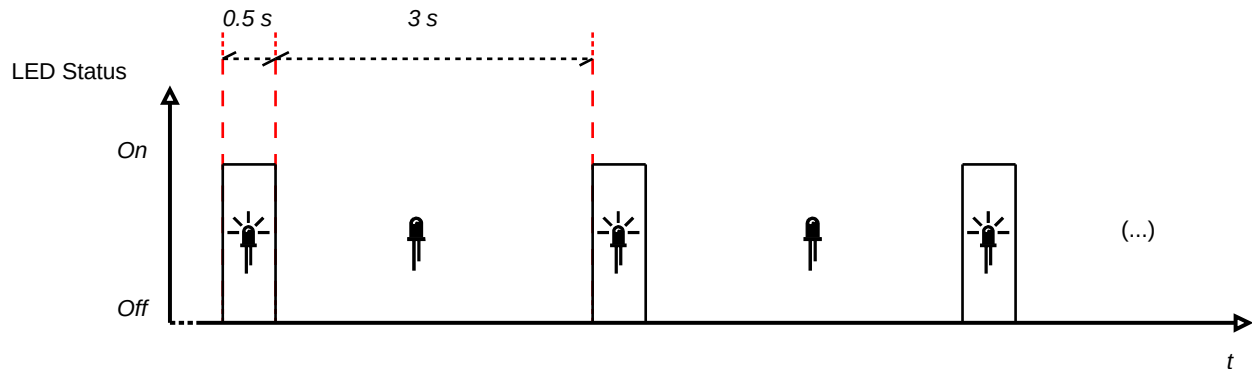


Figure 44: LED signalisation for Priority activated.

“**Value Save Confirmation**” occurs only if the device is configured to “Send value and Save at long press” and is intended to inform that the value to save as been received and saved. The signalisation consists in blinking the LED at 1Hz for 3 seconds (turns ON 3 times for the period of 0.5 seconds) (see Figure 45).

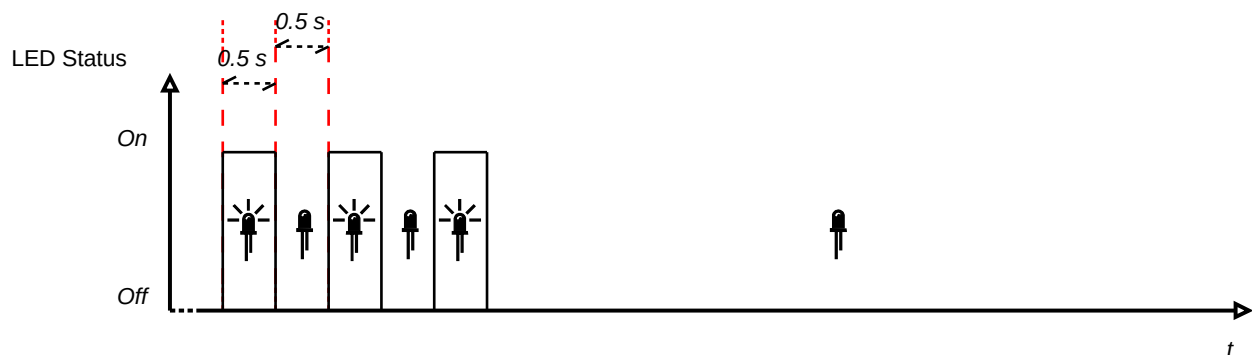


Figure 45: LED signalisation for Value Save Confirmation.

APPENDIX D - DETAILED DESCRIPTION OF COMMUNICATION OBJECTS

Depending on the device, the number of COs differs, and so it does some of their numbers. However, the numbers, from device to device change according to a offset (Δ):

- MSW1002-PL: $\Delta = 28$
- MSW1004-PL: $\Delta = 56$
- MSW1006-PL: $\Delta = 84$
- MSW1008-PL: $\Delta = 112$

Table 30: General: Label Back-light COs specifications

| Function | #GO ²⁰ | GO Name | IN/OUT | DPT |
|-------------------------|-------------------|----------------------|--------|-------|
| Linked w/ Obj (ON if 0) | $\Delta+56$ | ON / OFF (ON if '0') | IN | 1.001 |
| Linked w/ Obj (ON if 1) | $\Delta+56$ | ON / OFF (ON if '1') | IN | 1.001 |

Table 31: Button 1 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 9 | LED | IN | 1.001 |
| 11 | Jamming | IN | 1.002 |

Table 32: Button 2 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 23 | LED | IN | 1.001 |
| 25 | Jamming | IN | 1.002 |

Table 33: Button 3 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 37 | LED | IN | 1.001 |
| 39 | Jamming | IN | 1.002 |

Table 34: Button 4 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 51 | LED | IN | 1.001 |
| 53 | Jamming | IN | 1.002 |

²⁰ First CO is the number 0, according to ETSTTM.

Table 35: Button 5 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 65 | LED | IN | 1.001 |
| 67 | Jamming | IN | 1.002 |

Table 36: Button 6 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 79 | LED | IN | 1.001 |
| 81 | Jamming | IN | 1.002 |

Table 37: Button 7 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 93 | LED | IN | 1.001 |
| 95 | Jamming | IN | 1.002 |

Table 38: Button 8 common (existing for all functions) COs' specification

| #GO | GO Name | IN/OUT | DPT |
|-----|---------|--------|-------|
| 107 | LED | IN | 1.001 |
| 109 | Jamming | IN | 1.002 |

Table 39: Button 1 function specific COs' description

| Function | | #GO ²¹ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 1 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 0 | Status indication | IN | 1.001 | |
| | | 1 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 0 | Status indication | IN | 1.001 | |
| | | 1 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 4 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 0 | State Up/Down | IN | 1.008 | |
| | | 1 | Up / Down | OUT | 1.008 | |
| | 2 Button ²² | 2 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 5 | HVAC Mode | OUT | 20.102 | |
| | DHW | 5 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 1 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 3 | Priority | OUT | 2.001 | |
| Scene ²³ | | 5 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 12 | Percentage Value Indication | IN | 5.001 |
| | | Send | 6 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 13 | Temperature Value Indication | IN | 9.001 |
| | | Send | 10 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 13 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 10 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 12 | Angle Value Indication | IN | 5.003 |
| | | Send | 6 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 0 | Status Indication ChA | IN | 1.001 | |
| | | 1 | ON / OFF ChA | OUT | 1.001 | |
| | | 7 | Status Indication ChB | IN | 1.001 | |
| | | 8 | ON / OFF ChB | OUT | 1.001 | |

21 First CO is the number 0, according to ETS™.

22 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

23 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 40: Button 2 function specific COs' description

| Function | | #GO ²⁴ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 15 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 14 | Status indication | IN | 1.001 | |
| | | 15 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 14 | Status indication | IN | 1.001 | |
| | | 15 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 18 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 14 | State Up/Down | IN | 1.008 | |
| | | 15 | Up / Down | OUT | 1.008 | |
| | 2 Button ²⁵ | 16 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 19 | HVAC Mode | OUT | 20.102 | |
| | DHW | 19 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 15 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 17 | Priority | OUT | 2.001 | |
| Scene ²⁶ | | 19 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 26 | Percentage Value Indication | IN | 5.001 |
| | | Send | 20 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 27 | Temperature Value Indication | IN | 9.001 |
| | | Send | 24 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 27 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 24 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 26 | Angle Value Indication | IN | 5.003 |
| | | Send | 20 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 14 | Status Indication ChA | IN | 1.001 | |
| | | 15 | ON / OFF ChA | OUT | 1.001 | |
| | | 21 | Status Indication ChB | IN | 1.001 | |
| | | 22 | ON / OFF ChB | OUT | 1.001 | |

24 First CO is the number 0, according to ETS™.

25 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

26 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 41: Button 3 function specific COs' description²⁷

| Function | | #GO ²⁸ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 29 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 28 | Status indication | IN | 1.001 | |
| | | 29 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 28 | Status indication | IN | 1.001 | |
| | | 29 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 32 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 28 | State Up/Down | IN | 1.008 | |
| | | 29 | Up / Down | OUT | 1.008 | |
| | 2 Button ²⁹ | 30 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 33 | HVAC Mode | OUT | 20.102 | |
| | DHW | 33 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 29 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 31 | Priority | OUT | 2.001 | |
| Scene ³⁰ | | 33 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 40 | Percentage Value Indication | IN | 5.001 |
| | | Send | 34 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 41 | Temperature Value Indication | IN | 9.001 |
| | | Send | 38 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 41 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 38 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 40 | Angle Value Indication | IN | 5.003 |
| | | Send | 34 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 28 | Status Indication ChA | IN | 1.001 | |
| | | 29 | ON / OFF ChA | OUT | 1.001 | |
| | | 35 | Status Indication ChB | IN | 1.001 | |
| | | 36 | ON / OFF ChB | OUT | 1.001 | |

27 Just available in MSW1008-PL, MSW1006-PL and MSW1004-PL

28 First CO is the number 0, according to ETS™.

29 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

30 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 42: Button 4 function specific COs' description³¹

| Function | | #GO ³² | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 43 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 42 | Status indication | IN | 1.001 | |
| | | 43 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 42 | Status indication | IN | 1.001 | |
| | | 43 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 46 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 42 | State Up/Down | IN | 1.008 | |
| | | 43 | Up / Down | OUT | 1.008 | |
| | 2 Button ³³ | 44 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 47 | HVAC Mode | OUT | 20.102 | |
| | DHW | 47 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 43 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 45 | Priority | OUT | 2.001 | |
| Scene ³⁴ | | 47 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 54 | Percentage Value Indication | IN | 5.001 |
| | | Send | 48 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 55 | Temperature Value Indication | IN | 9.001 |
| | | Send | 52 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 55 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 52 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 54 | Angle Value Indication | IN | 5.003 |
| | | Send | 48 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 42 | Status Indication ChA | IN | 1.001 | |
| | | 43 | ON / OFF ChA | OUT | 1.001 | |
| | | 49 | Status Indication ChB | IN | 1.001 | |
| | | 50 | ON / OFF ChB | OUT | 1.001 | |

31 Just available in MSW1008-PL, MSW1006-PL and MSW1004-PL

32 First CO is the number 0, according to ETS™.

33 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

34 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 43: Button 5 function specific COs' description³⁵

| Function | | #GO ³⁶ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 57 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 56 | Status indication | IN | 1.001 | |
| | | 57 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 56 | Status indication | IN | 1.001 | |
| | | 57 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 60 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 56 | State Up/Down | IN | 1.008 | |
| | | 57 | Up / Down | OUT | 1.008 | |
| | 2 Button ³⁷ | 58 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 61 | HVAC Mode | OUT | 20.102 | |
| | DHW | 61 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 57 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 59 | Priority | OUT | 2.001 | |
| Scene ³⁸ | | 61 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 68 | Percentage Value Indication | IN | 5.001 |
| | | Send | 62 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 69 | Temperature Value Indication | IN | 9.001 |
| | | Send | 66 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 69 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 66 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 68 | Angle Value Indication | IN | 5.003 |
| | | Send | 62 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 56 | Status Indication ChA | IN | 1.001 | |
| | | 57 | ON / OFF ChA | OUT | 1.001 | |
| | | 63 | Status Indication ChB | IN | 1.001 | |
| | | 64 | ON / OFF ChB | OUT | 1.001 | |

35 Just available in MSW1008-PL and MSW1006-PL

36 First CO is the number 0, according to ETS™.

37 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

38 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 44: Button 6 function specific COs' description³⁹

| Function | | #GO ⁴⁰ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 71 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 70 | Status indication | IN | 1.001 | |
| | | 71 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 70 | Status indication | IN | 1.001 | |
| | | 71 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 74 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 70 | State Up/Down | IN | 1.008 | |
| | | 71 | Up / Down | OUT | 1.008 | |
| | 2 Button ⁴¹ | 72 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 75 | HVAC Mode | OUT | 20.102 | |
| | DHW | 75 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 71 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 73 | Priority | OUT | 2.001 | |
| Scene ⁴² | | 75 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 82 | Percentage Value Indication | IN | 5.001 |
| | | Send | 76 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 83 | Temperature Value Indication | IN | 9.001 |
| | | Send | 80 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 83 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 80 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 82 | Angle Value Indication | IN | 5.003 |
| | | Send | 76 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 70 | Status Indication ChA | IN | 1.001 | |
| | | 71 | ON / OFF ChA | OUT | 1.001 | |
| | | 77 | Status Indication ChB | IN | 1.001 | |
| | | 78 | ON / OFF ChB | OUT | 1.001 | |

39 Just available in MSW1008-PL and MSW1006-PL

40 First CO is the number 0, according to ETS™.

41 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

42 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 45: Button 7 function specific COs' description⁴³

| Function | | #GO ⁴⁴ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 85 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 84 | Status indication | IN | 1.001 | |
| | | 85 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 84 | Status indication | IN | 1.001 | |
| | | 85 | ON / OFF | OUT | 1.001 | |
| | 2 Button | 88 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 84 | State Up/Down | IN | 1.008 | |
| | | 85 | Up / Down | OUT | 1.008 | |
| | 2 Button ⁴⁵ | 86 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 89 | HVAC Mode | OUT | 20.102 | |
| | DHW | 89 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 85 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 87 | Priority | OUT | 2.001 | |
| Scene ⁴⁶ | | 89 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 96 | Percentage Value Indication | IN | 5.001 |
| | | Send | 90 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 97 | Temperature Value Indication | IN | 9.001 |
| | | Send | 94 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 97 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 94 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 96 | Angle Value Indication | IN | 5.003 |
| | | Send | 90 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 84 | Status Indication ChA | IN | 1.001 | |
| | | 85 | ON / OFF ChA | OUT | 1.001 | |
| | | 91 | Status Indication ChB | IN | 1.001 | |
| | | 92 | ON / OFF ChB | OUT | 1.001 | |

43 Just available in MSW1008-PL

44 First CO is the number 0, according to ETS™.

45 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

46 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 46: Button 8 function specific COs' description⁴⁷

| Function | | #GO ⁴⁸ | GO Name | IN/OUT | DPT | |
|---------------------|------------------------|-----------------------------|-----------------------|------------------------------|--------|-------|
| ON / OFF | | 99 | ON / OFF | OUT | 1.001 | |
| Toggle Switch | | 98 | Status indication | IN | 1.001 | |
| | | 99 | ON / OFF | OUT | 1.001 | |
| Dimming | 1 Button | 98 | Status indication | IN | 1.001 | |
| | 2 Button | 99 | ON / OFF | OUT | 1.001 | |
| | | 102 | Dimming | OUT | 3.007 | |
| Shutter / Blinds | 1 Button | 98 | State Up/Down | IN | 1.008 | |
| | 2 Button ⁴⁹ | 99 | Up / Down | OUT | 1.008 | |
| | | 100 | Step Up / Down | OUT | 1.007 | |
| Heating | HVAC | 103 | HVAC Mode | OUT | 20.102 | |
| | DHW | 103 | DHW Mode | OUT | 20.103 | |
| Priority | 2 channel | 99 | ON / OFF | OUT | 1.001 | |
| | 1 channel | 101 | Priority | OUT | 2.001 | |
| Scene ⁵⁰ | | 103 | Scene Control | OUT | 18.001 | |
| Value | Percentage | Send and save at long press | 110 | Percentage Value Indication | IN | 5.001 |
| | | Send | 104 | Percentage | OUT | 5.001 |
| | Temperature | Send and save at long press | 111 | Temperature Value Indication | IN | 9.001 |
| | | Send | 108 | Temperature | OUT | 9.001 |
| | Luminosity | Send and save at long press | 111 | Luminosity Value Indication | IN | 9.004 |
| | | Send | 108 | Luminosity | OUT | 9.004 |
| | Angle | Send and save at long press | 110 | Angle Value Indication | IN | 5.003 |
| | | Send | 104 | Angle | OUT | 5.003 |
| 2-Channel Mode | | 98 | Status Indication ChA | IN | 1.001 | |
| | | 99 | ON / OFF ChA | OUT | 1.001 | |
| | | 105 | Status Indication ChB | IN | 1.001 | |
| | | 106 | ON / OFF ChB | OUT | 1.001 | |

47 Just available in MSW1008-PL

48 First CO is the number 0, according to ETS™.

49 Both modes “2 Button Shutter/Blinds” and “2 Button Shutter/Blinds while pressed”.

50 Both modes “Send Scene” and “Send Scene and Save at long press”.

Table 47: Logic Channel A function specific COs' description

| Function | | #GO ⁵¹ | GO Name | IN/OUT | DPT | | |
|------------------|--|------------------------|--------------------|----------|----------------|--------|-------|
| Logic Operation | | Δ+13 | Jamming | IN | 1.002 | | |
| | | Δ | Input 1 | IN | 1.x | | |
| | | Δ+1 | Input 2 | IN | 1.x | | |
| | | Δ+2 | Input 3 | IN | 1.x | | |
| | | Δ+3 | Input 4 | IN | 1.x | | |
| | | Switch (ON/OFF) | Δ+8 | ON / OFF | OUT | 1.001 | |
| | | Scene | Δ+11 | Scene | OUT | 17.001 | |
| | | Value | Percentage | Δ+11 | Percentage | OUT | 5.001 |
| | | | Temperature | Δ+12 | Temperature | OUT | 9.001 |
| | | | Luminosity | Δ+12 | Luminosity | OUT | 9.004 |
| | | | Angle | Δ+11 | Angle | OUT | 5.003 |
| Copy and Forward | | Δ | Input DPT1 | IN | 1.xxx | | |
| | | Δ+4 | Input DPT2 | IN | 2.xxx | | |
| | | Δ+5 | Input DPT3 | IN | 3.xxx | | |
| | | Δ+6 | Input DPT4/5/6 | IN | 4.xxx to 6.xxx | | |
| | | Δ+7 | Input DPT7/8/9 | IN | 7.xxx to 9.xxx | | |
| | | Δ+8 | Output DPT1 | OUT | 1.xxx | | |
| | | Δ+9 | Output DPT2 | OUT | 2.xxx | | |
| | | Δ+10 | Output DPT3 | OUT | 3.xxx | | |
| | | Δ+11 | Output DPT4/5/6 | OUT | 4.xxx to 6.xxx | | |
| | | Δ+12 | Output DPT7/8/9 | OUT | 7.xxx to 9.xxx | | |
| | | Δ+13 | Copy Disable | IN | 1.002 | | |

51 First CO is the number 0, according to ETS™.

Table 48: Logic Channel B function specific COs' description

| Function | | #GO ⁵² | GO Name | IN/OUT | DPT | | |
|-----------------|--|------------------------|--------------------|------------|----------------|--------|-------|
| Logic Operation | | Δ+14 | Jamming | IN | 1.002 | | |
| | | Δ+15 | Input 1 | IN | 1.x | | |
| | | Δ+16 | Input 2 | IN | 1.x | | |
| | | Δ+17 | Input 3 | IN | 1.x | | |
| | | Δ+22 | Input 4 | IN | 1.x | | |
| | | Switch (ON/OFF) | Δ+25 | ON / OFF | OUT | 1.001 | |
| | | Scene | Δ+25 | Scene | OUT | 17.001 | |
| | | Value | Percentage | Δ+26 | Percentage | OUT | 5.001 |
| | | | Temperature | Δ+26 | Temperature | OUT | 9.001 |
| | | | Luminosity | Δ+25 | Luminosity | OUT | 9.004 |
| | | | Angle | Δ+25 | Angle | OUT | 5.003 |
| | | | Δ+18 | Input DPT1 | IN | 1.xxx | |
| | | | Δ+19 | Input DPT2 | IN | 2.xxx | |
| | | Δ+20 | Input DPT3 | IN | 3.xxx | | |
| | | Δ+21 | Input DPT4/5/6 | IN | 4.xxx to 6.xxx | | |
| | | Δ+22 | Input DPT7/8/9 | IN | 7.xxx to 9.xxx | | |
| | | Δ+23 | Output DPT1 | OUT | 1.xxx | | |
| | | Δ+24 | Output DPT2 | OUT | 2.xxx | | |
| | | Δ+25 | Output DPT3 | OUT | 3.xxx | | |
| | | Δ+26 | Output DPT4/5/6 | OUT | 4.xxx to 6.xxx | | |
| | | Δ+27 | Output DPT7/8/9 | OUT | 7.xxx to 9.xxx | | |
| | | Δ+14 | Copy Disable | IN | 1.002 | | |

52 First CO is the number 0, according to ETS™.

Table 49: Logic Channel C function specific COs' description

| Function | | #GO ⁵³ | GO Name | IN/OUT | DPT | | |
|------------------|--------------|------------------------|--------------------|----------|----------------|--------|-------|
| Logic Operation | | Δ+28 | Jamming | IN | 1.002 | | |
| | | Δ+29 | Input 1 | IN | 1.x | | |
| | | Δ+30 | Input 2 | IN | 1.x | | |
| | | Δ+31 | Input 3 | IN | 1.x | | |
| | | Δ+36 | Input 4 | IN | 1.x | | |
| | | Switch (ON/OFF) | Δ+39 | ON / OFF | OUT | 1.001 | |
| | | Scene | Δ+39 | Scene | OUT | 17.001 | |
| | | Value | Percentage | Δ+40 | Percentage | OUT | 5.001 |
| | | | Temperature | Δ+40 | Temperature | OUT | 9.001 |
| | | | Luminosity | Δ+39 | Luminosity | OUT | 9.004 |
| | Angle | | Δ+39 | Angle | OUT | 5.003 | |
| Copy and Forward | | Δ+32 | Input DPT1 | IN | 1.xxx | | |
| | | Δ+33 | Input DPT2 | IN | 2.xxx | | |
| | | Δ+34 | Input DPT3 | IN | 3.xxx | | |
| | | Δ+35 | Input DPT4/5/6 | IN | 4.xxx to 6.xxx | | |
| | | Δ+36 | Input DPT7/8/9 | IN | 7.xxx to 9.xxx | | |
| | | Δ+37 | Output DPT1 | OUT | 1.xxx | | |
| | | Δ+38 | Output DPT2 | OUT | 2.xxx | | |
| | | Δ+39 | Output DPT3 | OUT | 3.xxx | | |
| | | Δ+40 | Output DPT4/5/6 | OUT | 4.xxx to 6.xxx | | |
| | | Δ+41 | Output DPT7/8/9 | OUT | 7.xxx to 9.xxx | | |
| | | Δ+28 | Copy Disable | IN | 1.002 | | |

⁵³ First CO is the number 0, according to ETS™.

Table 50: Logic Channel D function specific COs' description

| Function | | #GO ⁵⁴ | GO Name | IN/OUT | DPT | | |
|------------------|--------------|------------------------|--------------------|----------|----------------|--------|-------|
| Logic Operation | | Δ+42 | Jamming | IN | 1.002 | | |
| | | Δ+43 | Input 1 | IN | 1.x | | |
| | | Δ+44 | Input 2 | IN | 1.x | | |
| | | Δ+45 | Input 3 | IN | 1.x | | |
| | | Δ+50 | Input 4 | IN | 1.x | | |
| | | Switch (ON/OFF) | Δ+53 | ON / OFF | OUT | 1.001 | |
| | | Scene | Δ+53 | Scene | OUT | 17.001 | |
| | | Value | Percentage | Δ+54 | Percentage | OUT | 5.001 |
| | | | Temperature | Δ+54 | Temperature | OUT | 9.001 |
| | | | Luminosity | Δ+53 | Luminosity | OUT | 9.004 |
| | Angle | | Δ+53 | Angle | OUT | 5.003 | |
| Copy and Forward | | Δ+46 | Input DPT1 | IN | 1.xxx | | |
| | | Δ+47 | Input DPT2 | IN | 2.xxx | | |
| | | Δ+48 | Input DPT3 | IN | 3.xxx | | |
| | | Δ+49 | Input DPT4/5/6 | IN | 4.xxx to 6.xxx | | |
| | | Δ+50 | Input DPT7/8/9 | IN | 7.xxx to 9.xxx | | |
| | | Δ+51 | Output DPT1 | OUT | 1.xxx | | |
| | | Δ+52 | Output DPT2 | OUT | 2.xxx | | |
| | | Δ+53 | Output DPT3 | OUT | 3.xxx | | |
| | | Δ+54 | Output DPT4/5/6 | OUT | 4.xxx to 6.xxx | | |
| | | Δ+55 | Output DPT7/8/9 | OUT | 7.xxx to 9.xxx | | |
| | | Δ+42 | Copy Disable | IN | 1.002 | | |

54 First CO is the number 0, according to ETS™.