LUZEN PLUS

Universal Dimmer

ZN1DI-P400
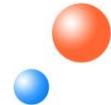
Program version: 3.0

Manual edition: a

INDEX

DOCUMENT UPDATES

Version	Modifications	Page(s)
3.0a	Changes regarding the version 2.0 of the application program: • Ability to dimmer **CFL** lamps and **LED** lamps	-
	Possibility to enable the Test mode of the Dimmer	7
	More information in section 1.3. *Installation*	6,7
	Renaming of the parameter and object "**Block**" by "**Lock**"	-

1. INTRODUCTION

1.1. LUZEN PLUS

LUZEN PLUS is an universal 1-Channel Dimmer that allows dimming the different light points connected to its channel.

Different functions available, among those that stand out:

🔹 Allowable loads: **resistive** (R), **capacitive** (C), **inductive** (L), **dimmable CFL** (low consumption fluorescent lamps) and **dimmable LED** lamps.

🔹 One output channel that admits up to **400 W** for R, C or L loads and up to **125 W** for CFL and LED loads.

🔹 **Automatic detection** of the type of conventional load (resistive, capacitive or inductive) connected to the channel.

🔹 **Timers**, **Flashing**, **Scenes** and **Sequences** configuration.

🔹 Customization of different ON/OFF, such as: **Secondary ON/OFF** and **Memory ON/OFF**.

🔹 Possibility to **lock** the channel output.

🔹 5 multi operational **logical functions** module.

Figure 1.1. LUZEN PLUS Dimmer

1.2. TYPES OF LOAD

LUZEN PLUS is able to dimmer **resistive**, **inductive** and **capacitive** loads (also known as "conventional" loads), as well as **dimmable LED** loads and **dimmable CFL** loads.

LUZEN PLUS incorporates the functionality of **automatic detection of the type of conventional load** (resistive, capacitive or inductive) connected to the channel output. This makes the Dimmer more versatile, since it is not necessary to define by parameter the type of conventional load connected, as LUZEN PLUS will identify it internally.

Ohmic loads, as well as inductive and capacitive loads ones may be connected to the Dimmer channel with a maximum wattage of approximately 400W/VA, having always on mind the following restrictions:
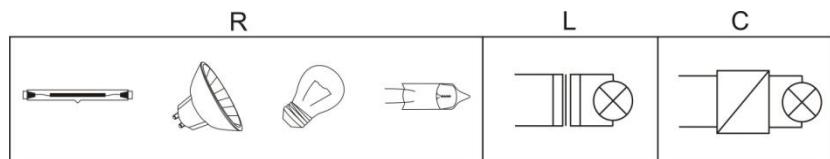

🔴 For mixed inductive loads (with conventional transformer), do not exceed a 50% share for the ohmic load:

Inductive load + ohmic load
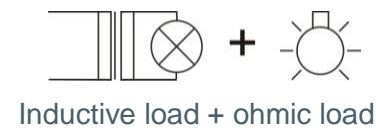
🔴 Conventional ohmic loads can be installed together with capacitive loads (electronic transformer) in any proportion.

Capacitive load + ohmic load
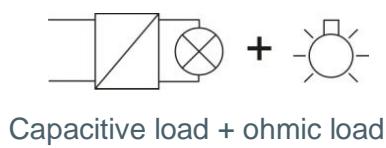
🔴 Do not connect capacitive loads and electronic transformers together with inductive loads (conventional transformers).

Inductive load + capacitive load
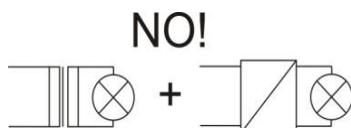
Important!

It is **not allowed** mixing dimmable CFL or LED loads with conventional loads.

In order to achieve the maximum luminosity homogeneity, it is recommended to use low consumption loads of the **same type** (CFL or LED) and from the **same manufacturer**, if possible.

1.3. INSTALLATION

In the figure 1.2, the connection scheme of LUZEN PLUS is shown:

1.- DIN rail unit clip
2.- KNX connector
3.- Test/Programming LED
4.- Test/Programming push button
5.- Insertion point of the load terminal block
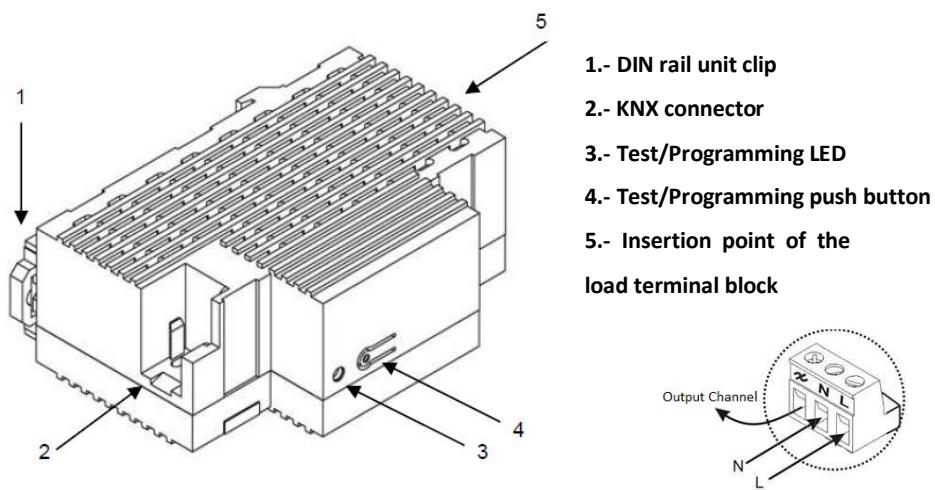
Figure 1.2. LUZEN PLUS connection scheme and load terminal block

The LUZEN PLUS Dimmer connects to the KNX bus via the bus connecting terminal included with the device, at point 2.

The cable to the load and the main voltage are connected via plug-in terminals with a screw connection (provided with the Dimmer) in the corresponding insertion point (5). These cables can be screwed onto the terminal block before installing the device and then inserted at a later date.

Note: *All the devices that are installed next to the dimming actuator must at least be equipped with basic insulation.*

Once the Dimmer is provided with power supply from the KNX bus, both the physical address and the associated application program can be downloaded.

After connecting the load to the Dimmer and this to the KNX bus, a flashing on the connected load is observed (if this is resistive or capacitive); for the inductive loads, this initial flashing is not observed, so the Dimmer internally knows the connected load is inductive. This is the way LUZEN PLUS carries out the process of **automatic detection of the conventional load** connected to its output. (**Note:** *When connecting CFL or LED loads, this flashing also appears*).

Through the Test/Programming push button (4), it will be possible to set the programming mode, by a short pressing. When doing so, the associated LED (2) will light red. (**Note**: *If this button is held while plugging the device into de KNX bus, LUZEN PLUS goes into secure mode.* The LED blinks red every 0.5 seconds).

A long press over this button, of at least 3 seconds (until the associated LED light green), will make the Dimmer go into **test mode**.

The test mode allows switching On and Off the load connected to the Dimmer´s output, by successive short pressings over the test/programming push button. I.e., once the Dimmer is on this test mode, a short press over this button will switch the load on (if it was off); the next short press, will switch off the load, and so on. This testing process can be carried out as many times as desired and may be useful for checking that the connections in the installation have been properly made.

To leave the test mode, it is necessary to long press (at least for 3 seconds) the test/programming push button, until the test/programming LED switches of (**Note**: *Keep the test/programming push button pressed until the LED changes its color from green to red; at this moment, release the pressing. The LED will switch off, thus showing the exit from the test mode*).

To obtain a more detailed information about the technical features of LUZEN PLUS, as well as security and installation information, please read the Dimmer **Datasheet**, included in the original package of the device and also available at: http://www.zennio.com.

2. CONFIGURATION

LUZEN PLUS allows controlling and dimming light sources of different type connected to its output. Moreover, it will be possible to configure a set of additional functionalities, which make the Dimmer a very versatile device:

- **ON/OFF:** basic ON/OFF and possibility of configuring a secondary ON/OFF and a memory ON/OFF. All of them can be dimmer immediately or smoothly (progressive dimming).

- **Simple timer and Flashing:** timer ON/OFF of the Dimmer output.

- **Scenes:** possibility of configuring up to 5 different scenes, in order to create the luminosity ambient defined by parameter.

- **Sequences:** possibility of enabling up to 5 different sequences and configuring each of their 4 steps to create different luminosity ambients.

- **Lock:** option to enable/disable the control over the Dimmer output.

- **Auto OFF:** this functionality allows an auto switch off of the load connected to the Dimmer output when its brightness percentage is lower than a threshold level (established by parameter) during a predefined time.

- **Error identification:** LUZEN PLUS is able to detect some anomalous situations that may occur in the load connected to the output channel: Opened circuit, Short circuit, Overload, Overtemperature, Voltage surge and Anomalous frequency.

- **Initial Settings:** this functionality allows customizing the configuration of the brightness status of the load connected to LUZEN PLUS on bus voltage recovery and also on load voltage recovery, as well as parameterizing a sending (immediate or with delay) of that status to the KNX bus.

- **Logical Functions:** module to enable and configure up to 5 logical functions, which can carry put up to 4 different binary operations each.

3. ETS PARAMETERIZATION

For starting to parameterize the Dimmer LUZEN PLUS it is necessary, once the ETS program has been opened, importing the data base of the product (version 3.0 of the application program).

Next, the device is added to the project where desired. Click the right mouse button on the device and select "Edit parameters" for starting with the configuration.

In the following sections there is a detailed explanation about each of the different functionalities of LUZEN PLIS in ETS.

3.1. DEFAULT CONFIGURATION

This section shows the default configuration from which the device parameterization starts.

Number	Name	Object Function	Length
⬛0	On/Off (at once)	0=Off; 1=On	1 bit
⬛1	On/Off (smooth)	0=Off; 1=On	1 bit
⬛2	Light Dimming (smooth)	4 bits dimmer ctrl	4 bit
⬛3	Light Precise Dimming (at once)	1 byte dimmer ctrl	1 Byte
⬛4	Light Precise Dimming (smooth)	1 byte dimmer ctrl	1 Byte
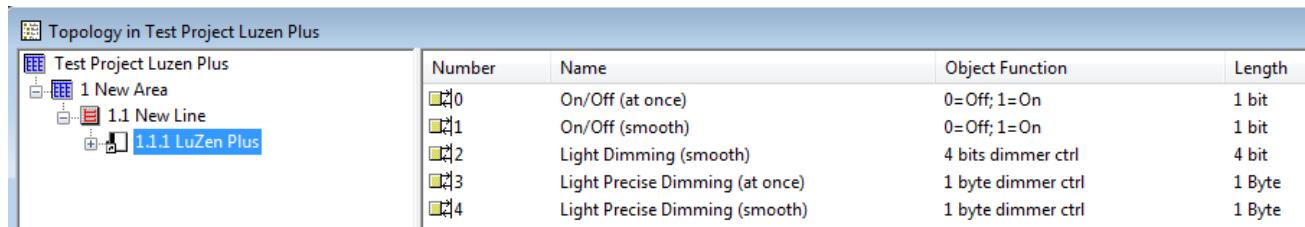
Figure 3.1. LUZEN PLUS. Default topology

When entering for the first time to the parameters edition of QUAD, the following window will be shown:
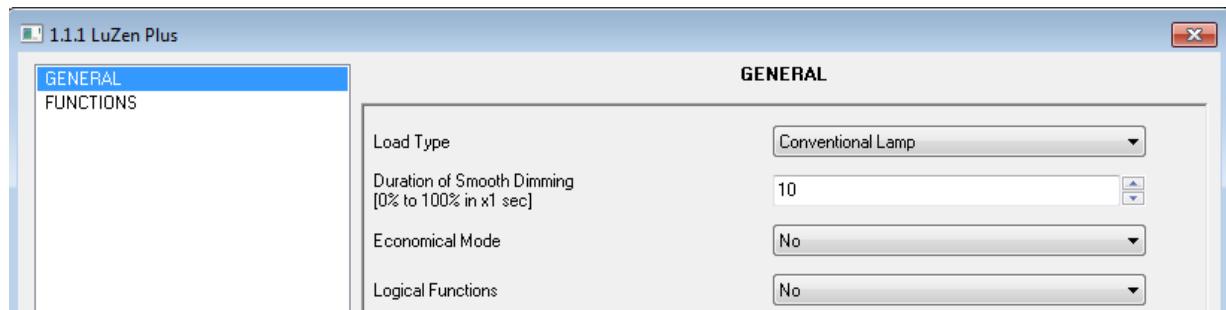
Figure 3.2. Parameterization screen by default

As seen in the figure 3.2, the parameterization screen has two main sections, which will be explained in detail in the next sections:

🔵 **General**: parameterization of the global characteristics of the Dimmer.

🔵 **Functions:** allows enabling and configuring specific functionalities of the Dimmer.

3.2. GENERAL WINDOW

This section of the settings allows determining several global characteristics of the Dimmer:

🔵 **Load type:** to select by parameter the type of load connected to the output channel of the Dimmer, in order to properly carry out the dimming. The available options are:

➢ **Conventional Lamp:** this option includes the conventional loads, i.e., those whose luminosity response is linear regarding the provided energy. These loads can be Resistive, Capacitive or Inductive. It is not necessary to specify the concrete load type, since LUZEN PLUS carries out an automatic detection of the conventional load type connected to its output. See section 1.3 for further information.

➢ **CFL/LED lamp:** this option includes those loads whose luminosity response is not necessarily linear regarding the provided energy. When selecting this type of load, a set of configuration parameters are enabled, whose options must be chosen in such way one gets the most linear luminosity response in the load.

Load Type	CFL / LED Lamp
Dimming Pattern (Characteristic Curve)	CFL Lamp (Curve 1)
Low Dimming Limit (%)	0
Dimmig Mode	Leading Edge

The available parameters are:

• **Dimming pattern (Characteristic curve):** where to select the energy transfer curve type that best fits to the luminosity response of the connected load. There are 5 different options:

Linear / LED Lamp (Curve 1) / LED Lamp (Curve 2) / CFL Lamp (Curve 1) / CFL Lamp (Curve 2)

The dimming pattern can be modified in execution time through the communication object "**Dimming Pattern (Only for Test Purposes)**". When sending the value "0", a linear pattern is established. With the values "1" and "2", the Curves 1 and 2 of the LED lamp, respectively, are established and with the values "3" and "4", the Curves 1 and 2 of the CFL lamps, respectively.

- **Low dimming limit (%):** this parameters sets the minimum dimming level (between 0 and 20%) under which the Dimmer will quit from dimming the connected load, with the aim of avoiding undesired effects at low dimming levels.

Note: *If a low dimming limit is configured, together with the Economical mode (i.e., maximum light level different from 100%), the dimming limit may be raised regarding its normal range (0-20%).*

- **Dimming mode:** this parameter allows choosing the way LUZEN PLUS carries out the wave cutting in the load. The available options are: Leading edge (default option) and Trailing edge.

The dimming mode can be modified in execution time through the communication object "**Edge Select (Only for Test Purposes)**". When sending the value "0", a trailing edge is established, when sending the value "1", a leading edge and when sending the value "2", the dimming mode will be disabled.

Duration of smooth dimming: this parameter sets the time (in seconds) the Dimmer takes to softly pass from 0% (OFF) to 100% (ON) of brightness percentage in the Dimmer channel output. The same can be said for the "OFF to ON" status change. This duration can range from 3 to 200 seconds.

The smooth dimming between brightness levels different from the 0%-100% one (on-off) are performed at the same velocity, so the time needed to carry them out will be lower than the parameterized in "Duration of Smooth dimming".

Economical mode: when enabling this parameter (selecting "Yes" in the drop-down box), it will be possible to customize the maximum brightness level applied to the Dimmer channel output. This percentage is defined in the box "Max light Level", whose valid range is [20%...99%]. When LUZEN PLUS receives an ON order through the ON/OFF object or a 100% percentage), it performs a serial of internal calculations to apply the load an intensity

with a reduction over the maximum allowed intensity (depending on the parameterized in this field).

Whatever the customized value for the maximum brightness level, in the valid range, LUZEN PLUS will send a luminosity percentage of 100% to the bus, for the purposes of connection and communication with other KNX devices, for example, with the touch panel InZennio Z38i, which interprets the maximum luminosity level as 100%.

💧 **Logical functions:** when this parameter is enabled, a new window appears in the left menu, where it will be possible to enable and configure up to 5 multi-operation logical functions. See section 3.4 for further information.

3.3. FUNCTIONS

The Dimmer LUZEN PLUS has a set of different functions, disabled by default (see figure 3.3). These functions may be selectively enabled, depending on the needs and requirements of the installation.
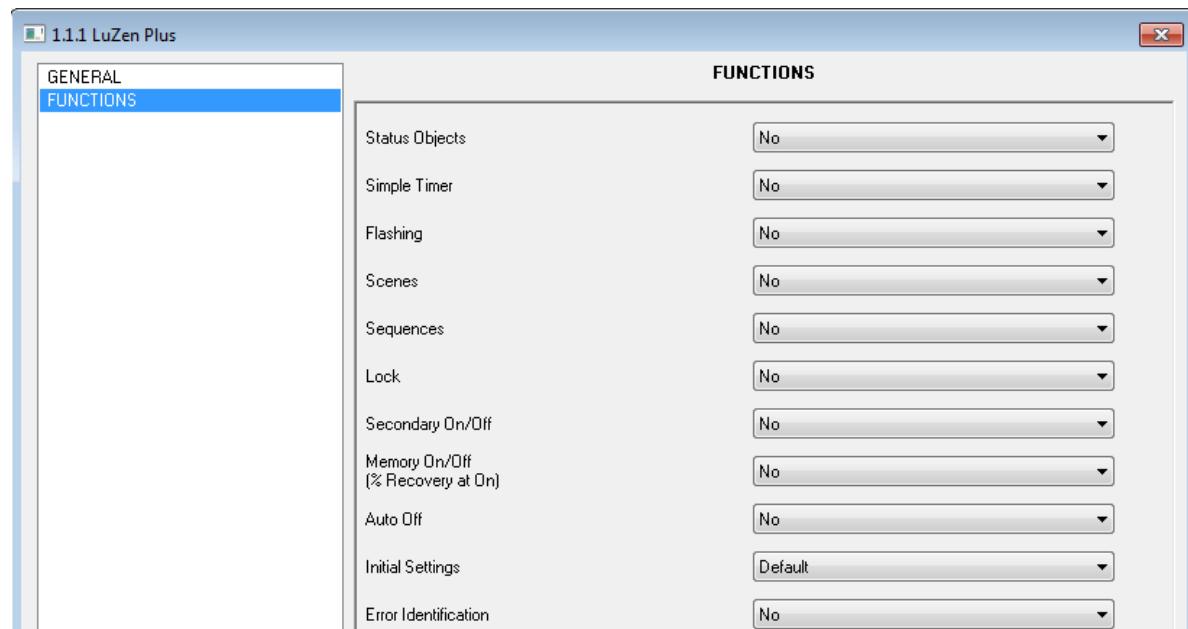

Figure 3.3. Functions section, by default

Every available function is detailed next.

3.3.1. STATUS OBJECTS

This function allows to independently enable (when selecting "Yes" in the corresponding box/boxes) the 1 bit status object ("On/Off Status") and/or the 1 byte one ("Lighting Level Status"), responsible for updating the status of the devices in the KNX installation.
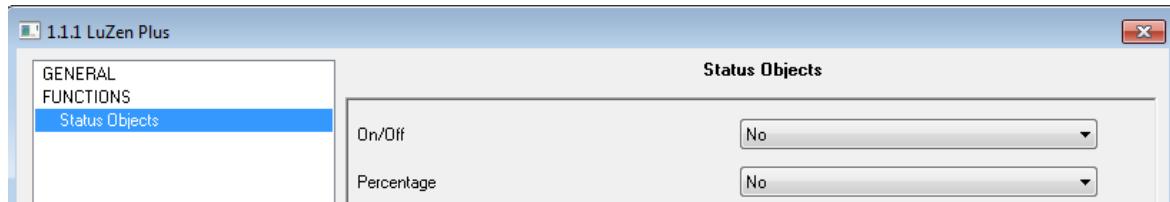

Figure 3.4. Status objects

🔵 **On/Off:** enable the 1 bit communication object "On/Off (Status)", in charge of updating the (ON/OFF) status of the Dimmer channel when required. In the drop-down box "Send ON when" it can be set when the channel status output signal will be sent to the bus, choosing between:

> **Totally ON:** the ON status ("ON/OFF status = 1") of the Dimmer channel output will only be sent to the KNX bus when the luminosity level is 100%.

> **Partially ON:** the status of the Dimmer channel output is sent to the KNX bus any time its luminosity level is in the range [1%...100%]; i.e., any value different from 0% will be considered as ON and the status will be sent to the KNX bus.

🔵 **Percentage:** enable the 1 byte communication object "Lighting Level (Status)", in charge of the real-time updating of the status (in percentage) of the lighting level applied to the Dimmer channel output, with precision of ±1%, when required.

3.3.2. SIMPLE TIMER

It allows controlling the Dimmer channel output in a temporized way, by applying delays for the ON as well as for the OFF.

In addition to this, it is also possible to set the ON duration, by parameter.
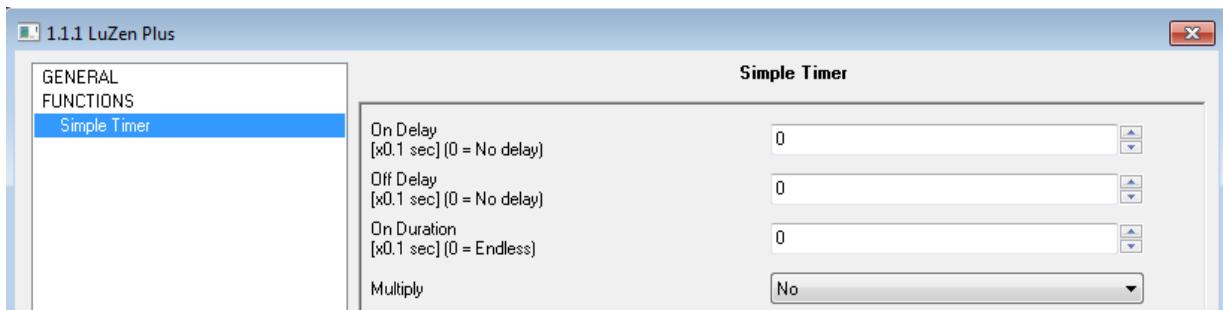
Figure 3.5. Simple timer

The parameters that can be customized in this function are the following:

🔹 **On Delay:** this parameter sets the elapsed time between the Timer ON order reception and the switch-on of the channel output. This value must be set with precision of tenths of a second (e.g. to get 2.5 seconds, set 25). If no delay is needed, please set 0 in this field.

🔹 **Off Delay:** this parameter sets the elapsed time between the Timer OFF order reception and the switch-off of the channel output. Similar to the On delay working.

🔹 **On Duration:** this parameter sets the time the channel output remains ON before switching off again. Setting 0 in this field means unlimited duration; thus, no temporize is applied to the On Duration. The output behaves as if it had received an ON/OFF order.

These parameters are used in the timer as follows:

- When LUZEN PLUS receives a "1" through the communication object "Simple Timer", an ON order is sent to the output, applying the On Delay and the On Duration (if a value different from 0 has been parameterized in these fields).

- When LUZEN PLUS receives a "0" through the communication object "Simple Timer", an OFF order is sent to the output, applying the Off Delay (if a value different from 0 has been parameterized in this field).

🔹 **Multiply:** it allows progressively increasing (multiply), in execution time, the On Duration or the On/Off delays. I.e., when enabling this function, LUZEN PLUS multiplies the defined times as many times as the value "1" or "0" is received through the "Simple Timer" object.

➢ **No multiply:** if during a temporized ON, LUZEN PLUS receives a "1" through the object "Simple Timer", it starts counting again the time set in the On Duration field.

➢ **Multiply:** the timing applied to the controller output is multiplied by "n" when receiving "n" times the timer order through the corresponding object, before the parameterized time for the temporization ends.

3.3.3. FLASHING

This function allows conducting a sequence of type ON-OFF-ON-OFF, as well as setting the ON/OFF duration of the flashing applied to the output. Moreover, the number of repetitions can be set by parameter (up to a maximum of 255), as well as the status the Dimmer output will remain after the last repetition.

The flashing starts when LUZEN PLUS receives a "1" through the object "Flashing" and stops when it has executed all the configured repetitions (unless they are endless, because a 0 has been written in the corresponding box, as shown later). It is possible to end the flashing execution at any time, by sending the value "0" through the "Flashing" object, or by sending any control order over the output (like an ON/OFF, a sequence, etc.).
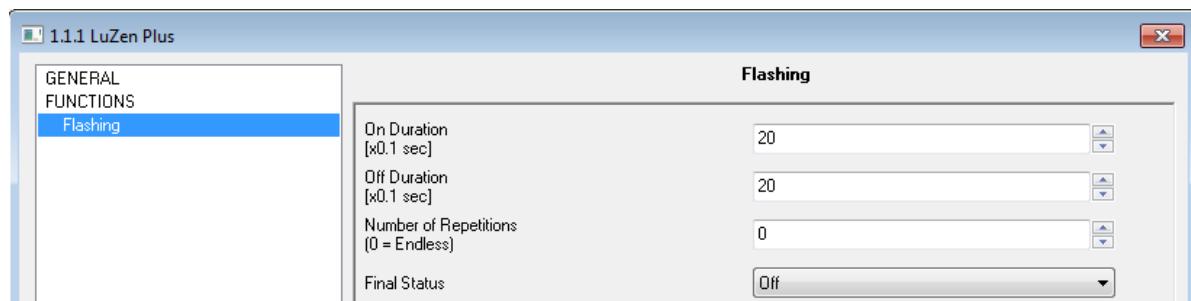
Figure 3.6. Flashing

These are the parameters that can be configured in the flashing function:

🔵 **On Duration:** set the time the output will remain ON when the flashing function is active.

🔵 **Off Duration:** set the time the output will remain OFF when the flashing function is active.

🔵 **Number of repetitions:** select by parameter the number of times the ON/OFF sequence will be repeated when the flashing function is active. For an unlimited number of repetitions, please set the value 0 in this field. (The sequence will be repeated until receiving an order to deactivate the flashing).

🔵 **Final status:** allow setting the Dimmer channel output status after the last flashing repetition. This status can be configured as OFF or ON.

Note: *Both functions Simple Timer and Flashing are independent from each other, and also independent from the normal ON/OFF control and the secondary ON/OFF, as all of them are managed from four different communication objects.*

✓ *Example:*

If a "1" value is received through the object "Simple Timer" a temporized ON starts in the Dimmer channel output. If before this comes to the end, an OFF is sent to the object "ON/OFF", the output will switch off and the temporization will finish.

3.3.4. SCENES

This function allows controlling the Dimmer channel output through the 1 byte object "Scenes", in order to create a predefined ambient.
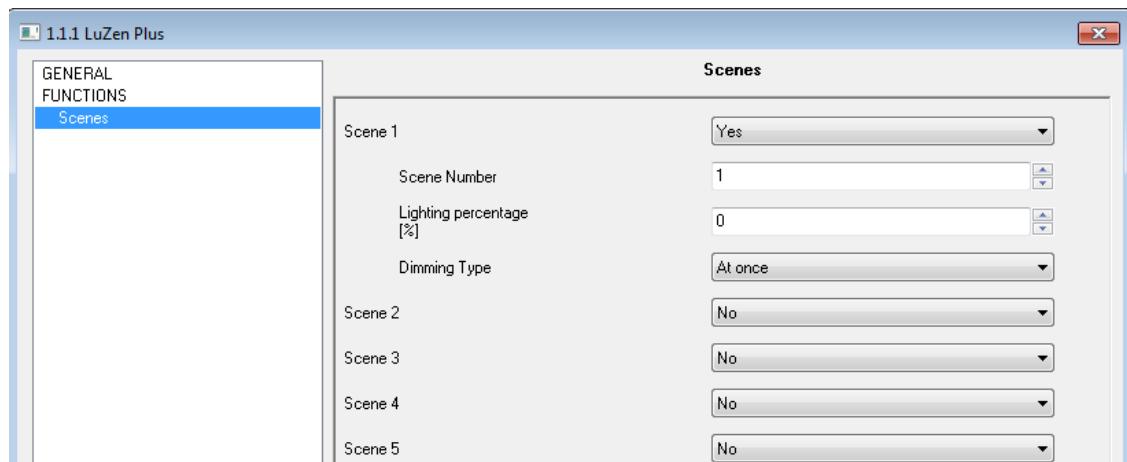
Figure 3.7. Scenes

The LUZEN PLUS Dimmer allows configuring up to 5 scenes and for each of them there are the following configurable fields:

🔵 **Scene number:** this is a number defined by parameter to which the Dimmer output will react.

🔵 **Lighting percentage (%):** set the brightness percentage the channel output will remain, when LUZEN PLUS receives the corresponding scene through the object "Scenes".

🔵 **Dimming type:** the way LUZEN PLUS will dimmer the output to place it in the lighting percentage defined before can be a <u>smooth</u> or <u>at once</u> way.

Note: *In case of parameterizing several scenes with the same scene number (wrong configuration), LUZEN PLUS will run the one that has been parameterized first, obviating the others (the Dimmer does not carry out the actions associated to the other scenes with the same number).*

3.3.5. SEQUENCES

A **sequence** consists of a Dimmer channel output programming in steps, phases or actions, up to a maximum of 4. Every action allows parameterizing the channel output response, as well as its duration, in minutes (up to 255).

This function allows handling the Dimmer output through the 1-byte object "Sequences".
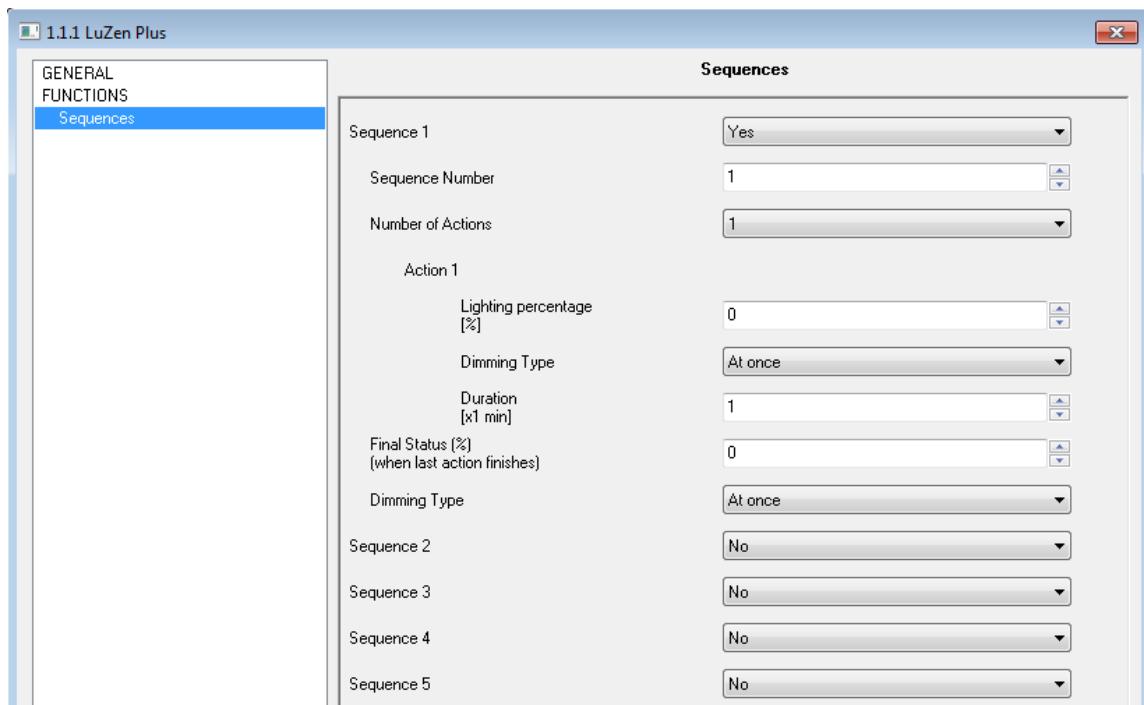
Figure 3.8. Sequences

Up to a maximum of 5 different sequences can be programmes through the following parameterizable fields:

🔵 **Sequence number:** indicates the sequence number (values between 1 and 64) to which the Dimmer channel output will react.

🔵 **Number of actions:** set the number if stages in which the sequence will be divided [1 ... 4].

🔵 **Final Status (%):** set the lighting status the channel output will remain when the last action of a sequence finishes.

🔵 **Dimming type:** the way LUZEN PLUS will dimmer the output to place it in the lighting percentage defined before can be a smooth or at once way.

For every enabled stage (1 to 4), three new parameterizable fields appear:

➢ **Lighting percentage (%):** set the brightness percentage the channel output will have in every stage.

➢ **Dimming type:** the way LUZEN PLUS will dimmer the output to place it in the lighting percentage defined before can be a smooth or at once way.

> ➢ **Duration:** set the time the corresponding action will last, in minutes (up to 255).

✓ *Example:*

Suppose the following sequence configuration:

Enable the Sequence 1, which will be executed when receiving the value "13" through the object "Sequences". This sequence has 4 different actions:

Action 1: Sets the Dimmer channel output in a lighting percentage of 60%, smoothly. It will keep this status during 3 minutes.

Action 2: Sets the Dimmer channel output in a lighting percentage of 0%, at once. It will keep this status during 5 minutes.

Action 3: Sets the Dimmer channel output in a lighting percentage of 100%, at once. It will keep this status during 2 minutes.

Action 4: Sets the Dimmer channel output in a lighting percentage of 0%, smoothly. It will keep this status during 7 minutes. When this time ends, the output will be set in a lighting level of 60%, at once, and it will keep this status until LUZEN PLUS receives a new order.

Below, the ETS configuration of the sequence described:

The behaviour of the load connected to the Dimmer channel output will be as follows:
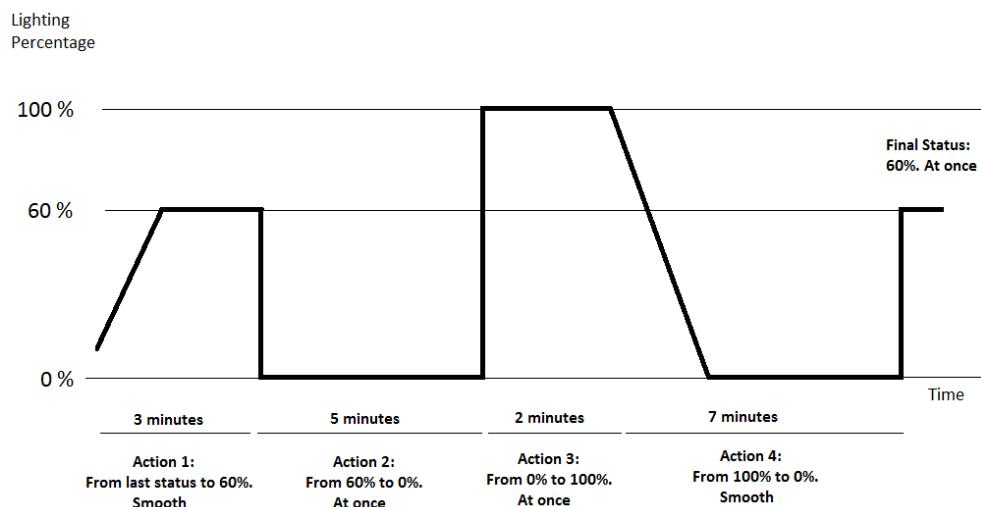
3.3.6. LOCK

This function makes possible to lock the Dimmer channel output; i.e., to disable its control.

LUZEN PLUS will lock the output when receiving a "1" through the 1-bit communication object "Lock". In this lock status, any order received from the KNX bus will be ignored. The channel output keeps the last status it had before receiving the lock order.

LUZEN PLUS will unlock the output when receiving a "0" through the object "Lock". The output will keep the status it had before receiving the lock order. Any other order received during the lock status will not be taken into account until the output will be unlocked.

3.3.7. SECONDARY ON/OFF

This function brings the possibility to enable a secondary ON/OFF control of the Dimmer channel output, through the 1 bit communication object "Secondary ON/OFF". This control allows customizing the ON/OFF brightness level of the channel output and, at the same time, defining if the switching will be at once or smooth.

Secondary ON/OFF is really useful when, besides the "normal" ON/OFF, it is necessary a specific brightness level and Dimmer response, for instance, in children bedrooms, hospitals, with patients, etc., where the maximum brightness level may be harmful in the presence of these people. In this case, both options (Normal and Secondary ON/OFF) can be chosen, depending on the situation.
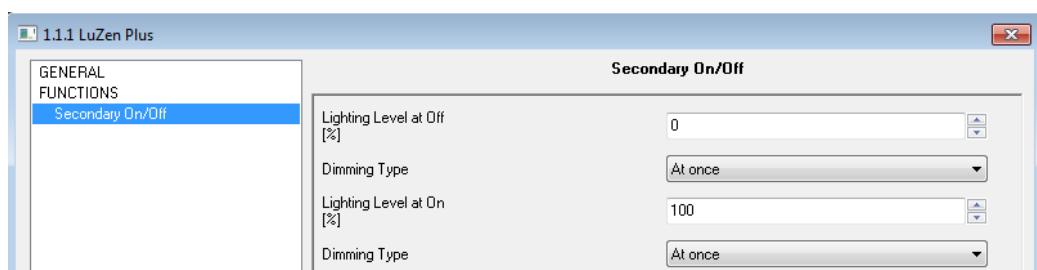

Figure 3.9. Secondary On/Off

As it can be seen in figure 3.9, the following parameters for the Secondary ON/OFF can be configured:

🔵 **Lighting level at OFF (%):** this filed allows defining the brightness percentage (0% to 100%) for the secondary OFF order.

🔹 **Dimming type:** define whether the OFF will be immediate (at once) or soft (smooth). The duration of the smooth OFF will depend on the configured time in the "Duration of smooth dimming" box.

🔹 **Lighting level at ON (%):** this filed allows defining the brightness percentage (0% to 100%) for the secondary ON order.

🔹 **Dimming type:** define whether the ON will be immediate (at once) or soft (smooth). The duration of the smooth ON will depend on the configured time in the "Duration of smooth dimming" box.

3.3.8. MEMORY ON/OFF

This functionality allows restoring Dimmer on the light percentage it had before it was turned off by any of these OFF commands: "ON/OFF smooth", "ON/OFF at once", "Memory ON/OFF".

Selecting the feature in ETS will enable the 1 bit communication object "Memory ON/OFF", and this new tab to customize the following parameters:

Figure 3.10. Memory ON/OFF

Where to customize the following options:

🔹 **Dimming type at OFF:** set the type of shut down of the Dimmer channel output when LUZEN PLUS receives a "0" through the object "Memory ON/OFF. It can be at once or smooth.

🔹 **Dimming type at ON:** set the type of shut down of the Dimmer channel output when LUZEN PLUS receives a "1" through the object "Memory ON/OFF. It can be at once or smooth.

The "Memory ON/OFF" will only keep the light percentage in memory if it is different of 0% and the Dimmer is turned off by communication objects "ON/OFF smooth", "ON/OFF at once" or "Memory ON/OFF". If the Dimmer is regulated to 0% through the object "Light precise dimming (at once or

smooth)", the previous percentage will not be stored, thus, when sending an ON command through the "Memory ON/OFF" object, the light percentage will be the one stored before the last OFF command and different of 0%.

Note: *If an ON command is sent through the "Memory ON/OFF" and the channel output was already dimmered at a higher percentage than 0%, LUZEN PLUS will respond with a total ON (100%) in the output.*

3.3.9. AUTO-OFF

If the Auto OFF is enabled, the load managed by the Dimmer channel, may be automatically turned off by LUZEN PLUS, within two limits set by parameter.

The Auto OFF function considers the time the channel output falls below certain threshold brightness level and, after this time, LUZEN PLUS proceeds to send the Auto OFF order.

This function has not any communication object associated to its control (enabling/disabling). It is an internal operation executed by the Dimmer, where only the two parameters defined next are considered.

Figure 3.11. Auto-OFF

This function allows configuring the following fields:

🔹 **Level (%):** set the brightness percentage (value between 1% and 50%) the Dimmer will consider when proceeding to an Auto OFF order.

🔹 **Time:** set the time (1...255 minutes) after which, taken into account the parameter above Level, the Dimmer will execute the Auto OFF order.

Note: *When LUZEN PLUS detects a brightness level lower than the parameterized level, it starts counting the configured time to turn the output off. If before this time finishes another brightness level below the threshold is detected, the time to the Auto OFF is reset.*

3.3.10. INITIAL SETTINGS

A default or custom configuration can be selected.

If the default configuration is chosen, the status of the Dimmer channel output on bus voltage and load voltage recovery will be the last it had before the bus power failure. After the first ETS download or a reset, the output remains OFF.

If a custom configuration is chosen, it is possible to select by parameter the channel output status on bus voltage and load voltage recovery.
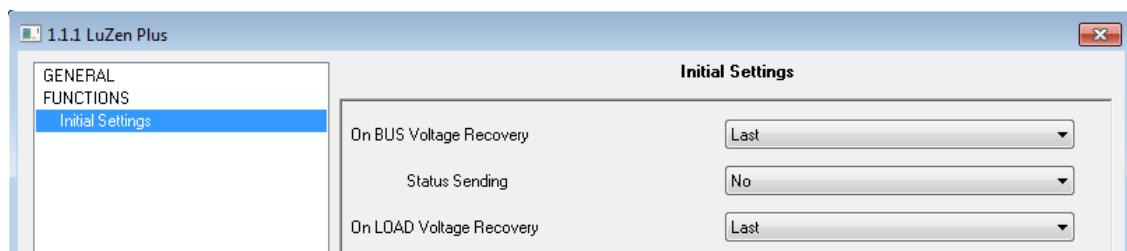

Figure 3.12. Initial Configuration

The following parameters can be configured:

🔹 **On bus voltage recovery:** choose the initial status of the Dimmer channel output when the bus power failure ends or after a download from ETS. It is possible to select one of these statuses: Last (the output remains just as it was before the bus power failure) and Positioning. When the Positioning option is selected, the drop-down box "Lighting percentage (at once)" appears, to set the specific brightness level (%) the Dimmer channel output will remain.

🔹 **Status sending:** this parameter offers the option to update the rest of devices in the installation by sending the Dimmer the initial status of its output to the KNX bus when recovering the bus voltage, thus allowing the up-to-date of the status of the rest of devices in the installation that may need it. When enabling the status sending, a new drop-down box is shown: "Delay", to set the time (in seconds) LUZEN PLUS waits until sending the output status. To get an immediate sending (no delay), set the value 0 in this field. The start-up status sending is performed trough the communication objects "On/Off (Status)".

🔹 **On load voltage recovery:** to set the channel output initial status when LUZEN PLUS detects it again after open circuit event. It is possible to select the statuses Last or Positioning. When the Positioning option is selected, the drop-down box "Lighting percentage (at once)" appears, to set the specific brightness level (%) the Dimmer channel output will remain.

3.3.11. ERRORS IDENTIFICATION

Protection against short-circuits, open circuits, overload, overtemperature, voltage surge and anomalous frequency is integrated within LUZEN PLUS.

For LUZEN PLUS to inform the KNX bus the appearance of any of these events, it will be necessary to enable by parameter each of the possible protection functions.
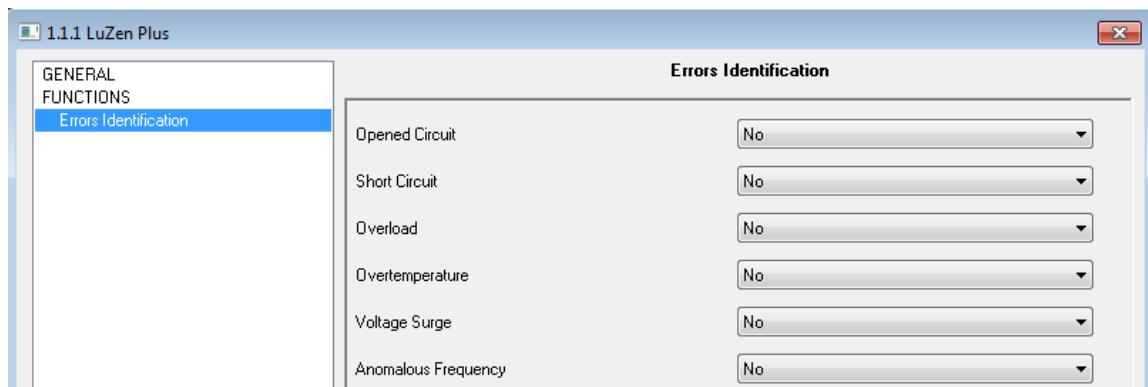
Figure 3.13. Errors identification

The working of every protection function is detailed next:

🔵 **Opened circuit.** When enabling the parameter "Opened Circuit", it appears a new 1 bit communication object with the same name, in charge to show the appearance of an open circuit event (when the value of the object is "1"). A "0" means that the circuit is connected to a load.

Note: *An Opened circuit is that situation on which there is no load connected to the Dimmer channel output.*
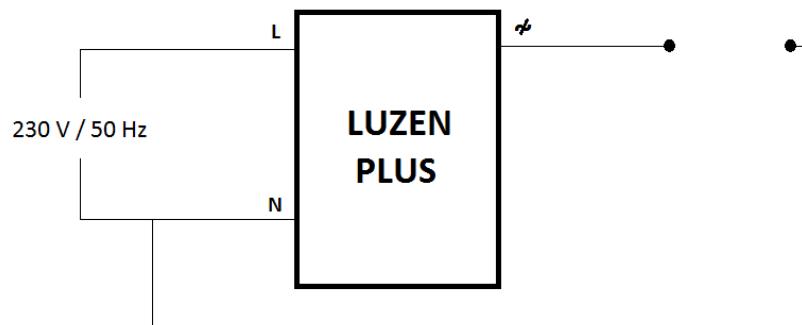
Figure 3.14. Opened circuit

The response of LUZEN PLUS to open circuit detection will be as follows:

➢ LUZEN PLUS sends a "1" through the object "Opened Circuit". Any order sent to the Dimmer during this event will be ignored until the open circuit finishes.

➢ The status objects of the load will change to "OFF" and will send their value to the KNX bus (only if its last status was different from the actual one and if the status sending was parameterized in ETS).

➢ The Dimmer will periodically check whether the open circuit situation is corrected.

➢ Once the open circuit situation is corrected, LUZEN PLUS will send a "0" through the object "Opened Circuit", and the action configured in the field "On Load voltage recovery" will be executed (if any. See section 3.3.10). The Dimmer will be ready again to receive new orders from the KNX bus.

Note: *After the open circuit situation is corrected, LUZEN PLUS tests the load connected to its channel output, to check the kind of load, since it may have been changed during the open circuit.*

🔹 **Short-circuit.** When enabling the parameter "Short circuit", it appears a new 1 bit communication object with the same name, in charge to show the appearance of a short circuit event (when the value of the object is "1"). A "0" means the end of this situation.
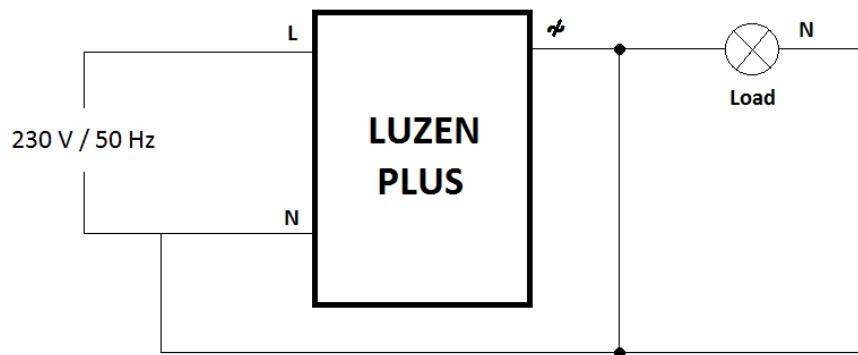

Figure 3.15. Short circuit

The response of LUZEN PLUS to short circuit will be as follows:

➢ When a Short circuit happens, LUZEN PLUS sends a "1" through the object "Short Circuit". Besides, the status objects of the load will change to "OFF" and will send their

value to the KNX bus (only if its last status was different from the actual one and if the status sending was parameterized in ETS).

➢ If during the short circuit event, LUZEN PLUS receives a dimming order from the KNX bus (ON, timer, scene, etc.), it will try to dimmer the load, considering the following situations:

• If the load is still in short circuit, LUZEN PLUS will not dimmer the load and will send the value "1" again, through the object "Short circuit".

• If the load is no longer in short circuit, LUZEN PLUS will carry out the dimmer action and will send the value "1" through the object "Short circuit".

🔵 **Overload.** When enabling the parameter "Overload", it appears a new 1 bit communication object with the same name in charge to show the appearance of an overload event (when the value of the object is "1"). A "0" means the end of this situation.

This type of error happens when the total amount of the load connected to the Dimmer channel output is over **400 W**, for conventional loads and over **125 W** for CFL and LED loads.
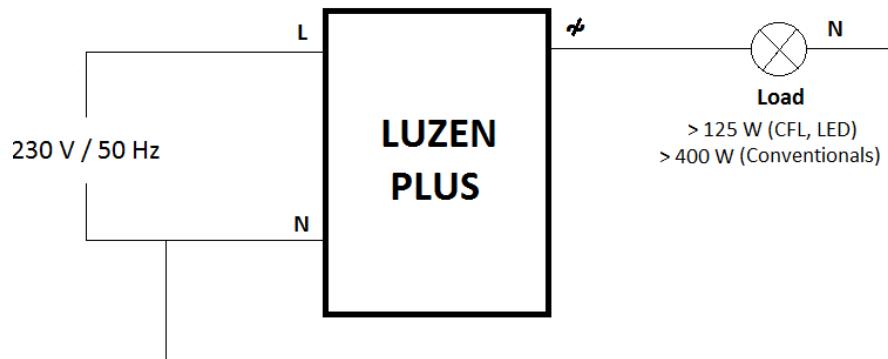
Figure 3.16. Overload

The response of LUZEN PLUS to an overload situation will be as follows:

➢ When an overload occurs, LUZEN PLUS sends a "1" through the communication object "Overload" and the load connected to its channel will be switched off.

➢ If during the overload event, LUZEN PLUS receives a dimming order from the KNX bus (ON, timer, scene, etc.), it will try to dimmer the load, considering the following situations:

- If the load is still in overload, LUZEN PLUS will not dimmer the load and will send a "1" through the object "Overload".

- If the load is no longer in overload, LUZEN PLUS will carry out the dimmer action and will send the value "0" through the object "Overload".

🔵 **Overtemperature.** When enabling the parameter "Overtemperature", it appears a new 1 bit communication object with the same name to show the appearance of an overtemperature event (when the value of the object is "1"). A "0" means the end of this situation.

LUZEN PLUS has an internal protection system to automatically reduce the regulation of the channel load when the internal temperature of the Dimmer is excessive.
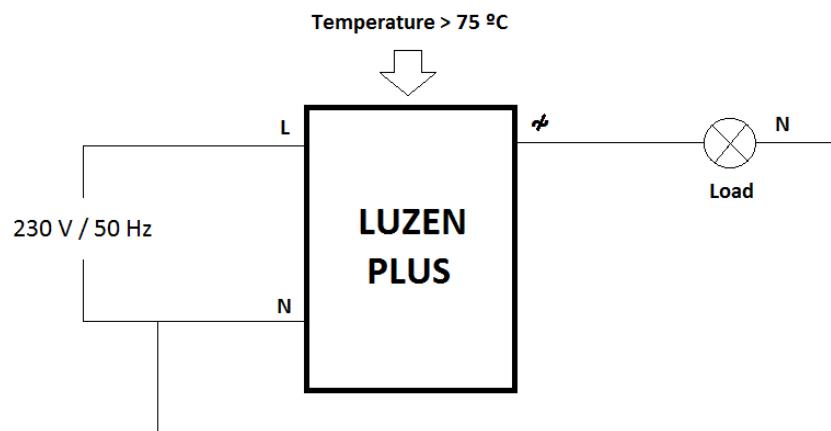
Figure 3.17. Overtemperature

There are two different types of response depending on the internal temperature of the Dimmer:

➢ Temperature in the range [75ºC … 85ºC]:

LUZEN PLUS sends a "1" through the object "Overtemperature" and reduces the brightness level of the output to 20%. From that moment, any order sent to dimmer the brightness level over 20% will be ignored (if the order implies a regulation lower than 20%, it will be executed).

LUZEN PLUS will not send a "0" to the object "Overtemperature" until this situation finishes (when the temperature is below 65ºC). The regulation will be 20% until receiving any other order changing this percentage (to increase or decrease).

➢ Temperature over 85ºC:

The only difference with the case explained above is that, if the temperature is over 85ºC, the channel output status object is also sent to the bus as LUZEN PLUS has decreased the brightness level of the load to 0%, i.e., the power supply stops. Any received order will be ignored until the temperature is below 65ºC.

🔵 **Voltage surge.** When enabling the parameter "Voltage surge", it appears a new 1 bit communication object with the same name to show the appearance of a voltage surge event (when the value of the object is "1"). A "0" means the end of this situation.

This error occurs when the voltage in the Dimmer is greater than **265 V$_{AC}$.**
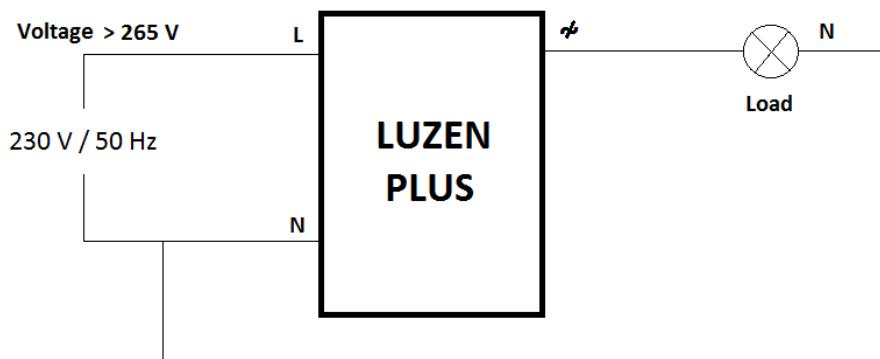
Figure 3.18. Voltage surge

The LUZEN PLUS response to a voltage surge event consists of sending the value "1" through the communication object "Voltage surge". When the voltage received by the Dimmer is the correct one again, a "0" will be sent through the same object. During the voltage surge status, any dimmer order received through the KNX bus will be executed.

🔵 **Anomalous frequency.** When enabling the parameter "Anomalous frequency", it appears a new 1 bit communication object with the same name to show the appearance of an anomalous frequency event (when the value of the object is "1"). A "0" means the end of this situation.

This option allows the detection of an anomalous frequency in the power supply. The supplier company usually provides power supply at 50 Hz. Nevertheless, that frequency could be affected by different reasons. Because of this, the Dimmer needs to detect anomalous frequency, in order to protect the system.
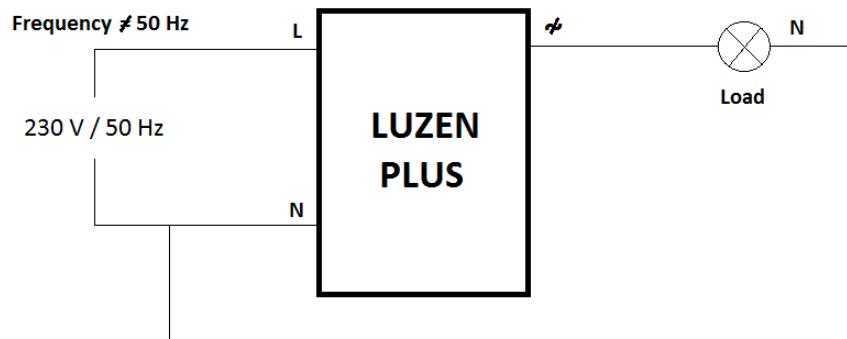
Figure 3.19. Anomalous frequency

The response of LUZEN PLUS to a detection of an anomalous frequency will be as follows:

➢ The frequency is continuously monitored and compared with the range 50 Hz ± 2Hz.

➢ If LUZEN PLUS detects that the frequency is lower than 48 Hz or higher than 52 Hz, it will activate (sets to "1") the communication object "Anomalous Frequency", interpreting this situation as an open circuit, so the load connected to its channel output will be switched off (it it was ON) and the Dimmer will send a "1" through the object "Opened Circuit".

➢ LUZEN PLUS continues monitoring the frequency to know if the correct frequency is re-established or not. In case the right frequency of power supply is re-established, the "Anomalous Frequency" and "Opened Circuit" objects will be disabled (set to "0"). The Dimmer will also test the load, since it behaves as it had recovered from an open circuit and will set the load on the status configured in the parameter "On load voltage recovery" (if this option has been enabled in ETS; if not, the load will recover the brightness level it had before detecting the anomalous frequency error).

3.4. LOGICAL FUNCTIONS

This section in LUZEN PLUS is meant to perform binary logic operations with incoming data from the KNX bus, to send the result through other communication objects specifically enabled in the Dimmer for this purpose.

Up to 5 different logical functions can be enabled, independent of each other, which can carry out up to 4 operations each. To use any pf them, it is necessary to enable them in the screen shown in figure 3.20, which appears when the option "Yes" has been selected in the Logical functions parameter, in the General window of LUZEN PLUS.
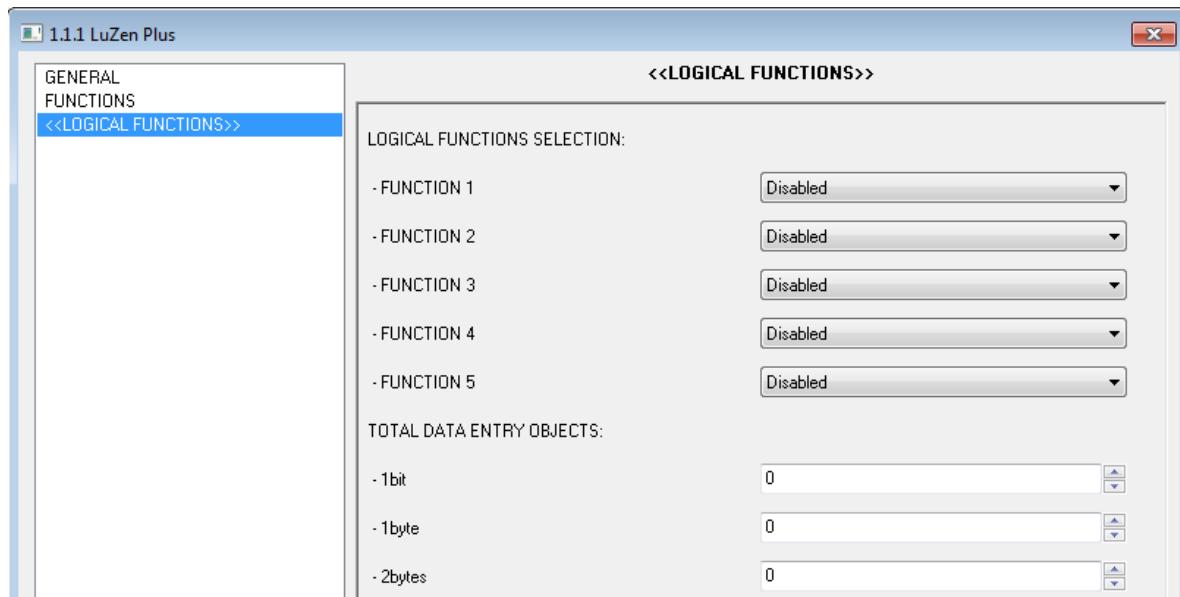
Figure 3.20. Logical functions

The specific communication objects for logical functions can be 1-bit, 1-byte or 2-bytes. It is necessary to indicate how many of them are needed to implement the enabled functions.

To get detailed information about the use and ETS parameterization of the logical functions, please consult the specific documentation "**Logical Functions X5**", available at: http://www.zennio.com.

ANNEX I. COMMUNICATION OBJECTS

SECTION	NUMBER	SIZE	IN/OUT	FLAGS	VALUES			NAME	DESCRIPTION
					RANGE	1st TIME	RESET		
COMMON	0	1 bit	I	W	0/1	Indifferent	Indifferent	ON/OFF (at once)	0=Off; 1=On
	1	1 bit	I	W	0/1	Indifferent	Indifferent	ON/OFF (status)	0=Off; 1=On
	2	4 bits	I	W	0-15	Indifferent	Indifferent	Light dimming (smooth)	4-bits dimmer control
	3	1 byte	I	W	0-100%	Indifferent	Indifferent	Light precise dimming (at once)	1 byte dimmer control
	4	1 byte	I	W	0-100%	Indifferent	Indifferent	Light precise dimming (smooth)	1 byte dimmer control
SECONDARY ON/OFF	5	1 bit	I	W	0/1	Indifferent	Indifferent	Secondary On/Off	0=Secondary off 1=Secondary On
MEMORY ON/OFF	6	1 bit	I	W	0/1	Indifferent	Indifferent	Memory ON/OFF	0=Off; 1=On (Memory)
STATUS OBJECTS	7	1 bit	O	RT	0/1	0	Last	ON/OFF (Status)	0=Off; 1=On
	8	1 byte	O	RT	0-100%	0	Last	Lighting level (Status)	0%: Off; 1-100%: On
SIMPLE TIMER	9	1 bit	I	W	0/1	Indifferent	Indifferent	Simple timer	0=Deactivate; 1=Activate
FLASHING	10	1 bit	I	W	0/1	Indifferent	Indifferent	Flashing	0=Deactivate; 1=Activate
LOCK	11	1 bit	I	W	0/1	0	Last	Lock	0=Unlock; 1=Lock
SEQUENCES	12	1 byte	I	W	0-63; 128-192	Indifferent	Indifferent	Sequences	Sequence value
SCENES	13	1 byte	I	W	0-63; 128-192	Indifferent	Indifferent	Scenes	Scene value

SECTION	NUMBER	SIZE	IN/OUT	FLAGS	VALUES			NAME	DESCRIPTION
					RANGE	1st TIME	RESET		
ERRORS IDENTIFICATION	14	1 bit	O	RT	0/1	0	0	Opened circuit	0=Closed Circ 1=Opened Circ
	15	1 bit	O	RT	0/1	0	0	Short circuit	0= No Shortcircuit; 1= Short circuit
	16	1 bit	O	RT	0/1	0	0	Overload	0= No Overload; 1=Overload
	17	1 bit	O	RT	0/1	0	0	Overtemperature	0= No Overtemp; 1=Overtemp.
	18	1 bit	O	RT	0/1	0	0	Voltage surge	0= No Vol. Surge; 1=Vol. Surge
	19	1 bit	O	RT	0/1	0	0	Anomalous frequency	0=Normal; 1=Wrong
LOGICAL FUNCTIONS	20-35	1 bit	I	W	0/1	0	Last	[LF] Data (1 bit) 1 … [LF] Data (1 bit) 16	Binary Data Entry (0/1) … Binary Data Entry (0/1)
	36-43	1 byte	I	W	0-255	0	Last	[LF] Data (1 byte) 1 … [LF] Data (1 byte) 8	1 byte data entry (0-255) … 1 byte data entry (0-255)
	44-51	2 bytes	I	W	0-FFFF	0	Last	[LF] Data (2 bytes) 1 … [LF] Data (2 bytes) 8	2 byte data entry (0-FFFF) … 2 byte data entry (0-FFFF)
	52-56	1 bit	O	RT	0/1	0	Last	[LF] Function 1 RESULT (1 bit) … [LF] Function 5 RESULT (1 bit)	Function 1 Result (1 bit) … Function 5 Result
	57-61	1 byte	O	RT	0-255	0	Last	[LF] Function 1 RESULT (1 byte) … [LF] Function 5 RESULT (1 byte)	Function 1 Result … Function 5 Result (1 byte)
	62-66	2 bytes	O	RT	0-FFFF	0	Last	[LF] Function 1 RESULT (2 byte) … [LF] Function 5 RESULT (2 byte)	Function 1 Result … Function 5 Result
					0-120.0	0	Last	[LF] Function 1 RESULT (2 byte) … [LF] Function 5 RESULT (2 byte)	Function 1 Result … Function 5 Result
OBJECTS FOR CFL/LED LOADS	67	1 byte	I	W	0-2	Indifferent	Last	Edge Select (Only for Test Purposes)	Trailing=0; Leading=1; Off=2
	68	1 byte	I	W	0-4	Indifferent	Last	Dimming Pattern (Only for Test Purposes)	Linear=0; LED1/2=1/2; CFL1/2=3/4

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