



LUMENTO X4 RGBW

RGBW LED Controller

ZN1DI-RGBX4

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1. INTRODUCTION

1.1. LUMENTO X4

LUMENTO X4 is a **Zennio** controller that allows handling the operation of monocolor LED modules as well as LED modules of up to 4 colors (RGBW-type LEDs. See section 1.3).

It has 4 independent output channels, with 12-24 VDC and 2.5 A each.

This controller allows being programmed with three different application programs, depending on the type of the LED modules to control:

- 🌐 **LUMENTO X4 LED:** independent control over up to 4 monocolor LED modules
- 🌐 **LUMENTO X4 RGBW:** joint control over one LED module of up to 4 colors (RGBW).
- 🌐 **LUMENTO X4 WHITE:** control over white LED modules of the type Cool White/Warm White (CW).



Figure 1.1. Lumento X4 LED controller

1.2. INSTALLATION

In the figure 1.2, the connection scheme of LUMENTO X4 is shown:

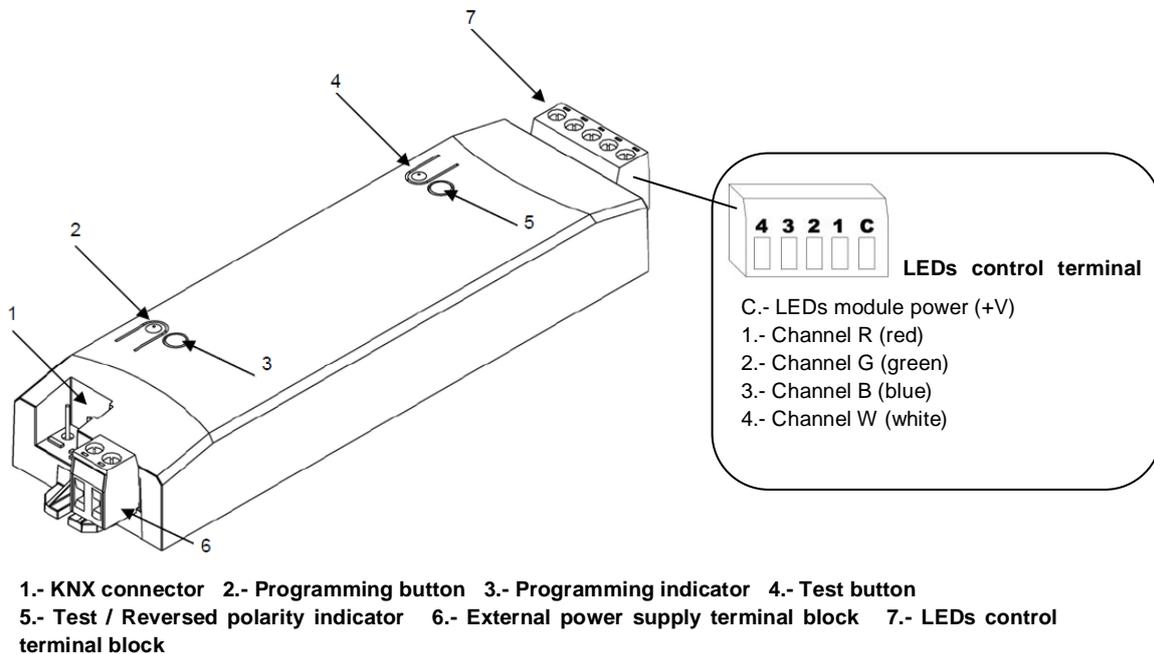


Figure 1.2. QUAD. Connection scheme

The LED controller LUMENTO X4 connects to the KNX bus via the bus connecting terminal (1) included with the device, from when it receives all the power to work. For its part, the LED module needs to be fed with an external power supply, of 12 or 24 VDC. This power supply is connected to the controller (in order to properly regulate the voltage applied to the LEDs) through the connection terminal block with screws included in the original packaging (6). Every cable must be properly connected: from the positive of the external power supply to the positive (+) of the terminal block and from the negative of the power supply to the negative (-) of the terminal block. If, whatever the reason, the connection of the power supply is carried out in the inverse way, LUMENTO X4 will report this event by switching on (in orange) the Test/Reversed polarity indicator (5).

It is also provided with the controller a second terminal block with screws for controlling the LEDs (7), where to connect every channel and the power of the LEDs module (+V). In the figure 1.2 appears a scheme of the terminal block, with each of its connection points. **(Note:** *These cables can be screwed onto the terminal block before installing the device and then inserted at a later date*).

Note: It is important to keep always in mind that the **only loads** that can be connected to LUMENTO X4 output are the **LED** ones.

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

After the first connection to the KNX bus during the installation process or after a download of the application program on LUMENTO X4, the programming indicator (3) starts blinking in blue and the Test/Reversed polarity indicator (5) lights blue in a fixed way, for about 25 seconds. Before carrying out any action over the controller, one must wait until both indicators are OFF again (not blue any more), since LUMENTO X4 is carrying out an internal test.

It is described below the functionality of the main elements of the controller:

 **Programming button (2):** a short press on this button set the controller in programming mode, and the associated indicator lights red. If this button is held while plugging the device into de KNX bus, LUMENTO X4 goes into secure mode. The indicator blinks red.

 **Test button (4):** a long press on this button, at least 3 seconds (until the associated indicator lights white) enables the Test Mode of the device, which allows checking the correct connection of the LED module. This test is carried out as follows: once enabled, every time the button is short-pressed, the associated indicator color will change, as well as the color of the LED module, depending on the enabled channel in every press. The color sequence will be: "Red-Green-Blue-White-Red..." and in the indicator: "Red-Green-Blue-White-Red..." If the LED module is properly connected to the controller (through the corresponding terminal block), the color that will light with every press (red, green or blue) will be the same as the Test indicator, thus checking that all the channels are correctly enabled. To leave the Test Mode, just push the Test button at least 3 seconds (until the associated indicator and the LED module switch off).

Note: Meanwhile the Test Mode is enabled, any order received from the KNX bus will be ignored until the deactivation of the mode.

To obtain more detailed information about the technical features of LUMENTO X4, as well as security and installation information, please read the controller **Datasheet**, included in the original package of the device and also available at: <http://www.zennio.com>.

1.3. RGBW LED DIODES

The LUMENTO X4 RGBW application is able to dimmer both the **color** and the **luminosity** of RGBW LED modules.

This kind of diodes is conformed usually by 4 subgroups of monicolor LEDs: Red, Green, Blue and White. When the Red, Green and Blue LEDs light at the same time and with the same intensity, the result is the color White, as it can be seen in figure 1.3. The other intermediate colors are got by mixing the main colors (R, G, B, W) in different proportions.

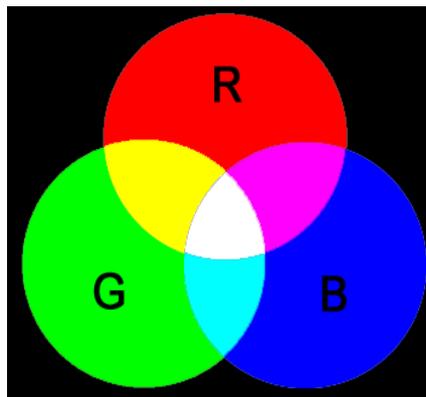


Figure 1.3. Red, Green and Blue mixture

The brightness refers to the amount of light that the LED strip is emitting at a given time. The value of the overall brightness of the set of diodes has been defined as the brightness of the channel that emits with the highest intensity. The overall brightness regulation is carried out so that the chosen color is kept at any time, by increasing or decreasing the brightness component of each channel, until reaching the required brightness level.

Note: *Take into account that the real color (the one seen through the eye) may vary from the theoretical color, depending on the LED module and the color diffuser used.*

2. CONFIGURATION

The LUMENTO X4 RGBW application allows, as shown in the previous section, controlling both the color and luminosity of a RGBW LEDs module. Moreover, it will be possible to configure a set of additional functionalities, which make the controller a very versatile device:

- 🌐 **General dimmer features** parameterization, such as:
 - Smooth dimming times
 - Global dimming type (at once, smooth 1 or smooth 2)
 - Maximum light level
- 🌐 Possibility of carrying out an **independent channel control** (RGBW)
- 🌐 **Error identification:** LUMENTO X4 RGBW is able to detect some anomalous behaviours that may affect the correct working of the device: external voltage and overheating errors.
- 🌐 **ON/OFF:** possibility of enabling up to 4 different ON/OFF types, configuring the color and their associated dimming type.
- 🌐 **Simple timer and Flashing:** timed ON/OFF of the LED module.
- 🌐 **Scenes/Sequences:** possibility of enabling up to 10 different scenes/sequences, which can be of three types: **fixed color**, **predefined sequence** or **custom sequence** (5 customizable steps).
- 🌐 **Block:** option to enable/disable the control over the LED module.
- 🌐 **Start-Up:** allows customizing the configuration of the initial status of the LED module when recovering the KNX bus power and sending (immediately or with delay) the status to the KNX bus.

3. ETS PARAMETERIZATION

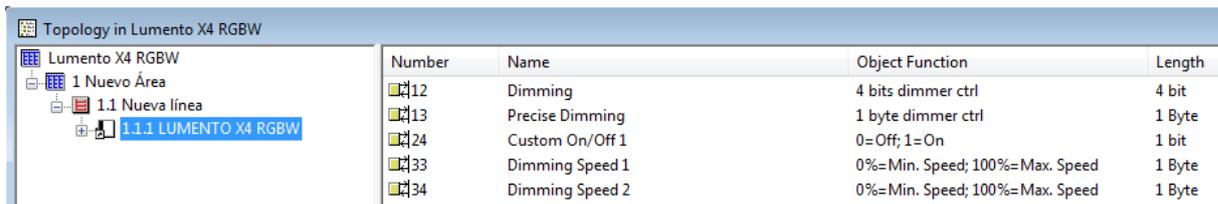
For starting to parameterize the LED controller LUMENTO X4 it is necessary, once the ETS program has been opened, importing the data base of the product (version 1.0 of the LUMENTO X4 RGBW application program).

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 LUMENTO X4 RGBW in ETS.

3.1. DEFAULT CONFIGURATION

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



Number	Name	Object Function	Length
12	Dimming	4 bits dimmer ctrl	4 bit
13	Precise Dimming	1 byte dimmer ctrl	1 Byte
24	Custom On/Off 1	0= Off; 1= On	1 bit
33	Dimming Speed 1	0%=Min. Speed; 100%=Max. Speed	1 Byte
34	Dimming Speed 2	0%=Min. Speed; 100%=Max. Speed	1 Byte

Figure 3.1. LUMENTO X4 RGBW Default topology

The following communication objects appear:

- Dimming:** 4-bits object to carry out the general brightness level dimming, step by step.
- Precise Dimming:** 1-byte object to carry out a precise dimming of the general brightness level, by applying a concrete luminosity percentage.
- Custom On/Off 1:** The option Custom On/Off 1 is enabled by default. For this reason, its associated object appears in the topology window by default. This object allows sending the ON/OFF orders, parameterized in the corresponding window (see section 3.3.3).

🌐 **Dimming Speed 1:** 1-byte object that allows modifying, in execution time, the dimming speed associated with the Smooth Dimming time 1. (See section 3.2. General Window. Smooth Dimming Time).

🌐 **Dimming Speed 2:** The same as Dimming Speed 1, but this case for the Smooth Dimming time 2.

When entering for the first time to the parameters edition of LUMENTO X4 RGBW, the following window will be shown:

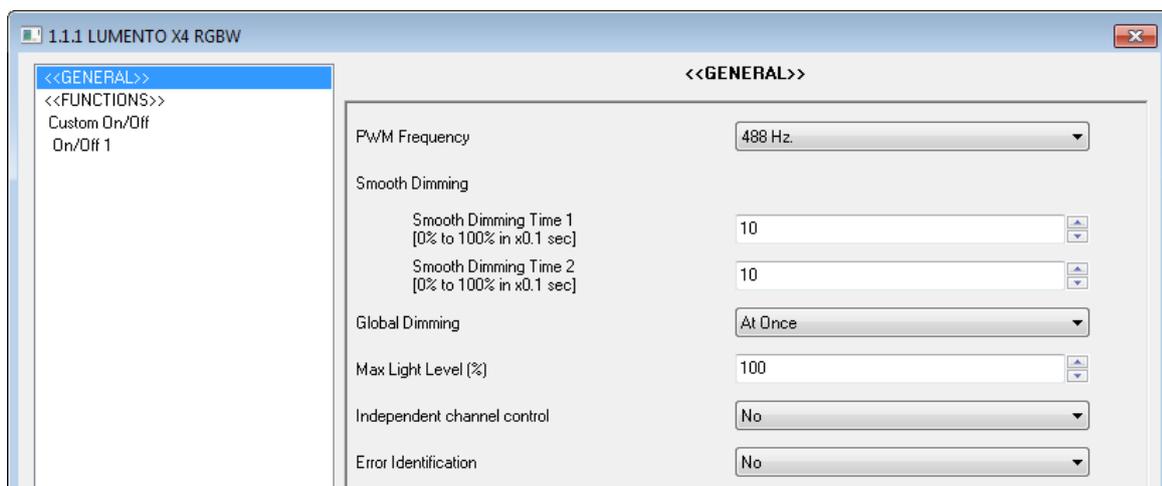


Figure 3.2. Parameterization screen by default

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 controller.

🌐 **Functions:** allows enabling and configuring specific functionalities of the controller.

Moreover, as it was mentioned before, the Custom On/Off 1 is enabled by default, so the parameterization **On/Off 1** window is also shown.

3.2. GENERAL WINDOW

This section of the setting allows determining several global characteristics of LUMENTO X4 RGBW:

 **PWM frequency:** allows selecting by parameter the working frequency of the LED controller, choosing one of these values: 150, 300, 488 and 600 Hz. The default working frequency is **488 Hz**.

 **Smooth Dimming:** sets the time LUMENTO X4 takes to softly pass from 0% to 100% of brightness percentage. It is possible to configure two smooth dimming times: **Smooth Dimming Time 1 and 2**, with values between 3 and 65535 tenths of second. Both values are 10, by default.



Smooth Dimming Time 1 and 2 may be modified in execution time, via the communication objects "Dimming Speed 1" and "Dimming Speed 2", respectively. Please see the Table 3.1 to know the relation between several dimming speed values (the most common ones) and its associated dimming times.

Dimming Speed (1 or 2)	Parameterized Smooth Dimming Time 1 or 2 (T)
0%	T
25%	$\frac{3}{4} T$
33%	$\frac{2}{3} T$
50%	$\frac{1}{2} T$
75%	$\frac{1}{4} T$
100%	0*

* The dimming is carried out in the minimum time allowed for this Dimming type: 3 tenths of second.

Table 3.1. Dimming speeds and times

Consider the following application example.

✓ Example:

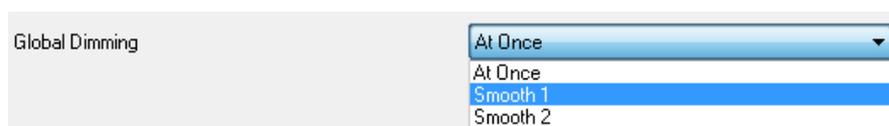
Suppose that a Smooth Dimming Time 1 is 20 seconds (parameterized value). At a given time during the execution, this time must be modified in order to carry out the smooth dimming (no matter the brightness percentage to reach) in half the time, i.e., 10 seconds. To achieve this, the value 50% must be written in the object "Dimming Speed 1". If the original time must be reduced to the fourth part (from 20 to 5 seconds) the value 75% must be sent to the mentioned object. To come back to the original smooth dimming time 1, just write the value 0% through "Dimming Speed 1".

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 "Smooth dimming".

✓ Example:

Suppose that 10 seconds are parameterized in the field "Smooth dimming time 1". A total ON order is sent to a channel that was OFF. If the global dimming is configured as "Smooth 1", the channel will take 10 seconds to reach its maximum brightness level. If the channel was already in a brightness percentage of 50%, for instance, the time taken to reach 100% brightness level will be 5 seconds (the half part of the 10 seconds parameterized).

 **Global dimming:** in this field it is possible to define the way the transition between different brightness levels will be carried out, after sending the corresponding orders through the communication objects in charge of the general dimming of the 3 channels (jointly: objects "Dimming" and "Precise Dimming" or independently: objects "[Ch] Dimming" and "[Ch] Precise Dimming"). This dimming can be at once (direct transition between levels) or smooth (the transition will have associated a dimming time equal to the one defined for Smooth Dimming time 1 or 2, as configured).



 **Max Light level (%):** to define the maximum brightness percentage (from 5 to 100%) to be applied to the channels when receiving the dimming order. LUMENTO X4 will apply the channels an intensity with a reduction over the maximum allowed intensity (depending on the parameterized in this field).

Note: Whatever the customized value for the maximum light level is, LUMENTO X4 will send a luminosity percentage of 100% to the bus, through the object(s) "Luminosity (Status)", for the purpose of connection and communication with other KNX devices of the installation.

 **Independent channel control (RGBW):** when enabling this option ("Yes"), it will appear new 12 communication objects to activate/deactivate each of the channels independently ("[Ch] On/Off") and to dimmer the brightness levels of each of them ("[Ch] Dimming" and "[Ch] Precise dimming").

If after sending a control order over an individual channel (precise dimming, step by step dimming, stop dimming, etc.) a global dimming order is sent (precise or step by step, see section 3.1), the last established proportions will be taken as new base color over which carry out the global dimming.

✓ Example:

Suppose starting with the base RGBW color: (20, 0, 60, 0). The precise dimming order over the blue channel is sent "[B] Precise Dimming"=50%, so the new base color will be (20, 0, 128, 0). If now a global dimming over the 4 channels is carried out, these new color components will be taken as starting point.

 **Error identification:** this option enables two 1-bit communication objects to inform about anomalous behaviours that may appear when working with LUMENTO X4:

- "Error: External voltage". Object through which LUMENTO X4 notifies that the received external power is incorrect, due to any of these events: too low voltage, total absence of power (source disconnected) or inversion in the connection of the power supply (this is also visually notified by switching on (in orange) the Test/Reversed Polarity indicator). When LUMENTO X4 detects any of those anomalous situations, it will send the value "1" through this object. When the event finishes, it will send a "0".
- "Error: Overheating". Object through which LUMENTO X4 notifies it is exposed to an excessive temperature (**higher than 90°C**), by sending the value "1". In that moment, LUMENTO X4 will reduce the brightness level of the channels to 50% (only if they were in a higher percentage) and the working frequency will be set to its minimum value (150 Hz). When the temperature is lower than 80°C, LUMENTO X4 will send the value "0" through this object, thus marking the end of this event and it will

retake the brightness levels and frequency value it had before the error. If 15 minutes after the beginning of the Overheating error, the temperature does not lower, LUMENTO X4 will switch off its output load, for safety reasons.

Note: Take into account that, although the error identification is not enabled by parameter, the overheating protection is **always enabled**, although this status is not notified by object.

3.3. FUNCTIONS

LUMENTO X4 RGBW has a set of different functions (see figure 3.3), which may be selectively enabled, depending on the needs and requirements of the installation.

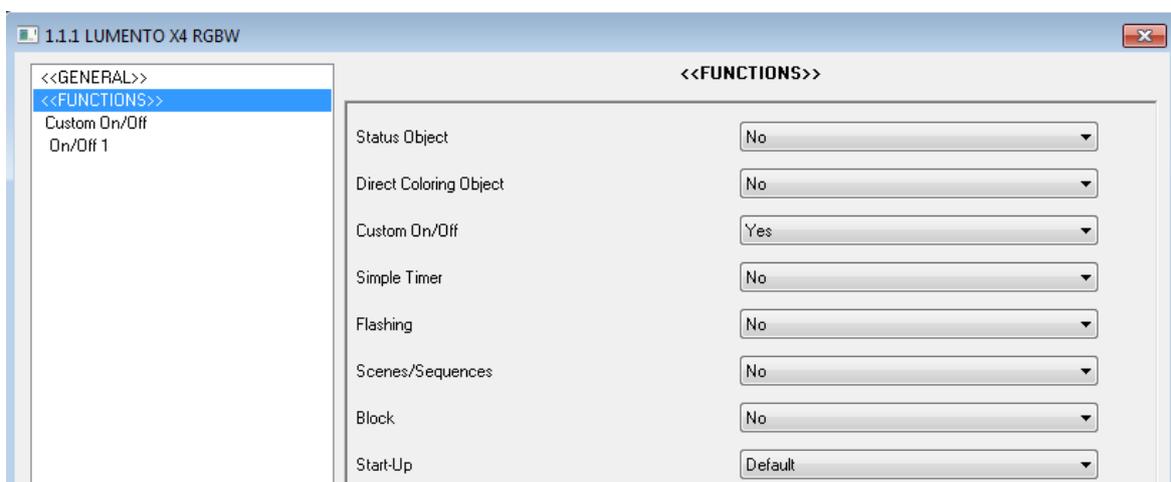


Figure 3.3. Functions section, by default

Every available function is detailed next.

3.3.1. STATUS OBJECTS

This function allows enabling the 1-bit status object ("On/Off Status") and the 1-byte status object ("Luminosity Status"), responsible for reporting on the overall brightness status of the output at any moment, updating the status of the devices in the KNX installation, if required.

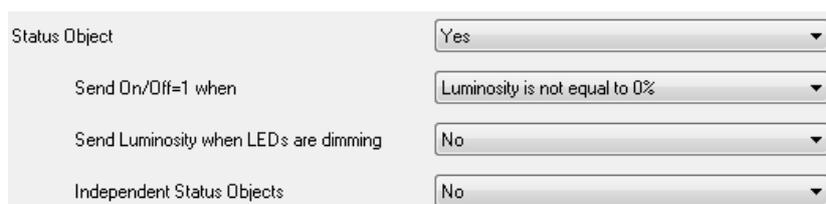


Figure 3.4. Status objects

 **Sends On/Off=1 when:** to select when the value "1" (ON) is sent through the object "On/Off (Status)" to the KNX bus, choosing between:

- Luminosity is not equal to 0%: when the brightness level is different from 0%, the object "On/Off (status) = 1" will be sent to the bus. The value "0" will be only sent when the luminosity level is 0%.
- Luminosity is equal to 100%: the object "On/Off (Status)" will only send the value "1" when the brightness level is equal to 100%. The value "0" will be only sent when the luminosity level is 0%.

 **Send Luminosity when LEDs are dimming:** this option allows selecting whether to send the brightness status of the output (through the object "Luminosity (Status)") or not (default option). If the status sending during dimming is enabled, the following option will appear:

- **Minimum time between status sending:** to set the minimum time (in seconds) between consecutive sendings of the brightness status through the object "Luminosity (Status)". This limitation is applied in smooth dimming.

 **Independent status objects:** this option enables 8 additional communication objects to know at any moment the status of each channel, independently. These objects are "[Ch] On/Off (Status)" and "[Ch] Luminosity (Status)", which functioning is analogue to the general status objects.

3.3.2. DIRECT COLORING OBJECT

It is a 1-byte communication object to check from ETS the 22 predefined colors.

Each color has associated a scene number (from 1 to 22), as it can be seen in the table 3.2. When writing any value between 0 and 21 (value of the corresponding scene minus 1) in the object "Direct Coloring", the LEDs module will light up with the corresponding color **immediately**, no matter the configured global dimming type (at once, smooth 1 or smooth 2).

Scene (Value)	Color	R	G	B	W
1 (0)	OFF	0	0	0	0
2 (1)	White	255	255	255	255
3 (2)	White light	128	128	128	128
4 (3)	Blue	0	0	255	0
5 (4)	Blue Light	102	204	255	51
6 (5)	Blue Navy	0	0	102	0
7 (6)	Blue Cyan	0	255	255	0
8 (7)	Blue Turquoise	0	255	77	51
9 (8)	Blue Lavender	128	128	255	51
10 (9)	Green	0	255	0	0
11 (10)	Green Light	128	255	51	51
12 (11)	Green Dark	0	102	0	0
13 (12)	Green Lime	128	255	0	13
14 (13)	Red	255	0	0	0
15 (14)	Red Pink	255	0	77	0
16 (15)	Red Dark	102	0	0	0
17 (16)	Red Magenta	255	0	255	0
18 (17)	Red Fuchsia	255	26	51	0
19 (18)	Yellow	255	255	0	0
20 (19)	Orange	255	51	0	0
21 (20)	Lilac	255	128	128	0
22 (21)	Purple	170	0	255	0

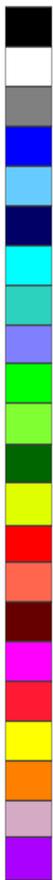


Table 3.2. Predefined colors in LUMENTO X4 RGBW

3.3.3. CUSTOM ON/OFF

This option appears enabled by default, while the first of the custom On/Off also enabled, thus allowing a more direct configuration.



Figure 3.5. Custom On/Off

LUMENTO X4 allows customizing up to 4 different on/off types, being able to configure the following parameters for each of them:

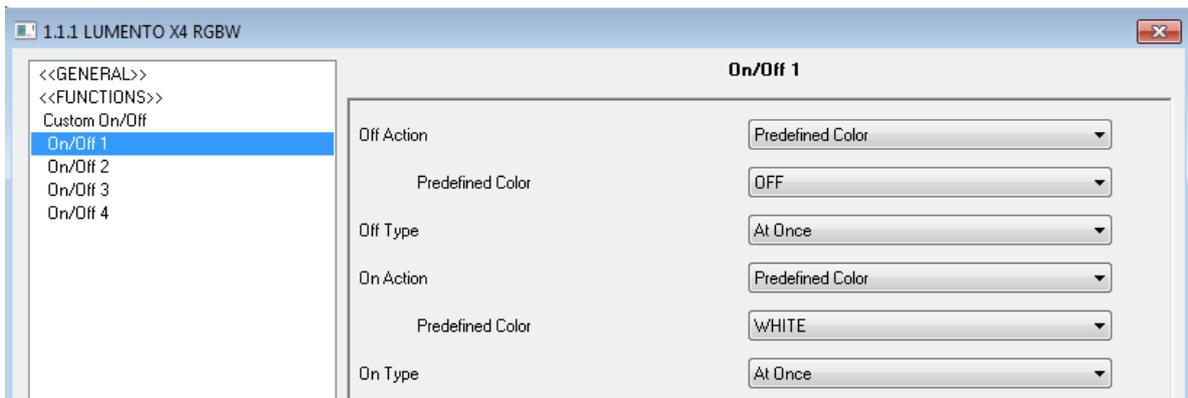


Figure 3.6. Custom On/Off configuration

 **Off action:** to set the color of the LEDs module when LUMENTO X4 receives the value "0" through the 1-bit object "Custom On/Off X". If the "Predefined Color" option is chosen, it will be possible to select one of the 22 predefined colors (see Table 3.2) in the drop-down box "Predefined Color"; if the "RGBW Color" option is chosen, it will be possible to set manually the desired color, typing a value (between 0 and 255) for each color component (R, G, B, W).

 **Off type:** to set the dimming type to be applied in the switch-off of the LEDs module, to choose among: at once, smooth 1 and smooth 2.

 **On action:** to set the color of the LEDs module when LUMENTO X4 receives the value "1" through the 1-bit object "Custom On/Off X". A predefined color can be chosen (see Table 3.2) or a customized one, by configuring manually each of the RGB color components. Besides, it is possible to define a **memory On**, if the option "**Last Color**" is chosen. This way, whenever LUMENTO X4 receives a "0" through the corresponding "Custom On/Off" object, it will keep in memory the color that the LEDs module has at that moment, and then LUMENTO X4 will light the LEDs module with the color defined in the Off Action field. When LUMENTO X4 receives an ON order ("Custom On/Off = 1"), it will light the LEDs module with the color it had before the switch-off.

✓ *Example:*

Suppose the second Custom On/Off is configured this way: Off Action = blue and On Action = last. The LEDs module is lighting in yellow when LUMENTO X4 receives the switch-off order (value "0") through the object "Custom On/Off 2". The module lights in blue (Off Action). LUMENTO X4 keeps in memory the color of the LEDs module before they switched off and when it receives the on order ("Custom On/Off 2=1"), the LEDs will light with the last color stored before the switch-off (yellow).

 **On type:** to set the dimming type to be applied in the switch on of the LED strip, choosing one of these: at once, smooth 1 or smooth 2.

3.3.4. SIMPLE TIMER

It allows switching-on/off the LEDs module connected to the LUMENTO X4 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, the ON color and the ON type, by parameter.

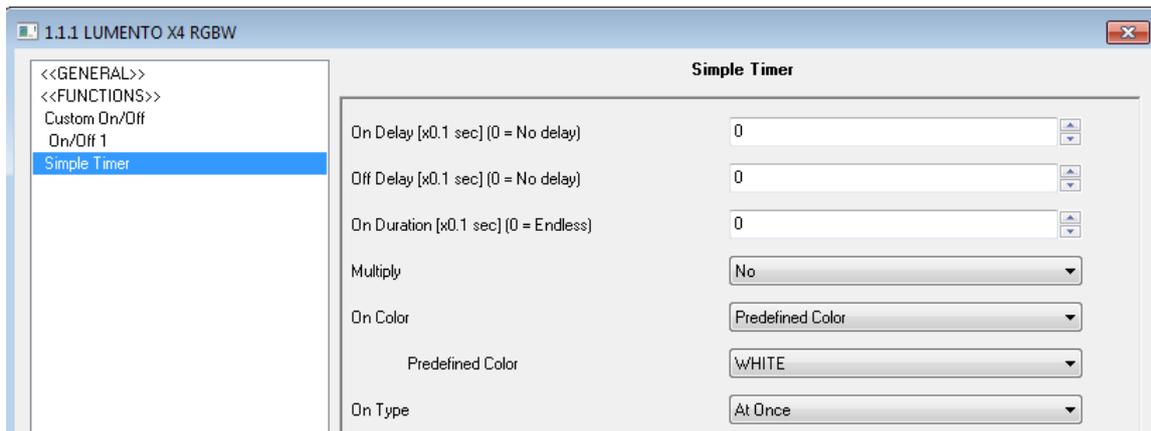


Figure 3.7. Simple timer

- **On Delay:** this parameter sets the elapsed time between the Timer ON order reception and the switch-on of the LEDs module. 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 LEDs module. Similar to the On delay working.
- **On Duration:** this parameter sets the time the LEDs module remains ON before switching off again. A 0 in this field indicates an endless duration, i.e., no timing is applied to the On duration (the LEDs module behaves as it had received an On order).

These parameters are used in the timer as follows:

- When LUMENTO X4 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 LUMENTO X4 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 of the output. I.e., when enabling this function, LUMENTO X4 multiplies the defined times as many times as the value "1" or "0" is received through the "Simple Timer" object. Two situations are distinguished:

- **No multiply:** if during a temporized ON, LUMENTO X4 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.
- 🌈 **On Color:** to set the color of the LEDs module during the duration of the timed On. A predefined color can be chosen (see Table 3.2) or a customized one, by configuring manually each of the RGBW color components.
 - 🌈 **On type:** to set the dimming type to be applied in the timed switch-on of the LEDs module, to choose among: at once, smooth 1 and smooth 2.

3.3.5. 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 LEDs module. Moreover, the number of repetitions can be set by parameter, as well as the On color and the final color of the LEDs after the last repetition.

The flashing starts when LUMENTO X4 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 after). It is possible to end the flashing execution at any time, by sending the value "0" through the "Flashing" object, or by sending any other control order over the output (like an ON/OFF, a sequence, etc.). If, during the flashing execution, LUMENTO X4 receives a new order to start a flashing ("Flashing" = 1), this will be reset, no matter the execution point it is.

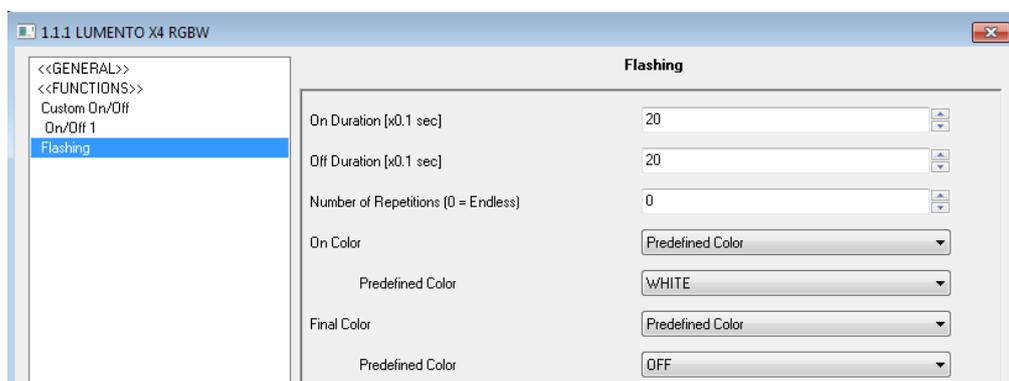


Figure 3.8. Flashing

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).
- 🌈 **On Color:** set the color of the LEDs module during the duration of the On. A predefined color can be chosen (see Table 3.2) or a customized one, by configuring manually each of the RGBW color components.
- 🌈 **Final color:** set the color of the LEDs module when the last flashing repetition finishes, or when receiving the order "Flashing=0". A predefined color can be chosen (see Table 3.2) or a customized one, by configuring manually each of the RGB color components.

3.3.6. SCENES/SEQUENCES

This function allows sending different dimming and lighting orders to the controller output, through the 1-byte object "Scenes/Sequences", in order to create a specific ambient.

The 1-bit object "Start/Stop Sequence" also appears. It allows execute the last played sequence (by writing the value "1") or stopping the sequence in execution (with the value "0").

Note: *After a download from ETS, if the value "1" is sent through this object, the first scene/sequence parameterized in ETS will be executed (unless it is a scene/sequence of the type "Fixed Color", in which case the next configured sequence different from this type will be executed).*

LUMENTO X4 allows configuring up to 10 scenes/sequences, which can be individually enabled in the section Scenes/Sequences of ETS.

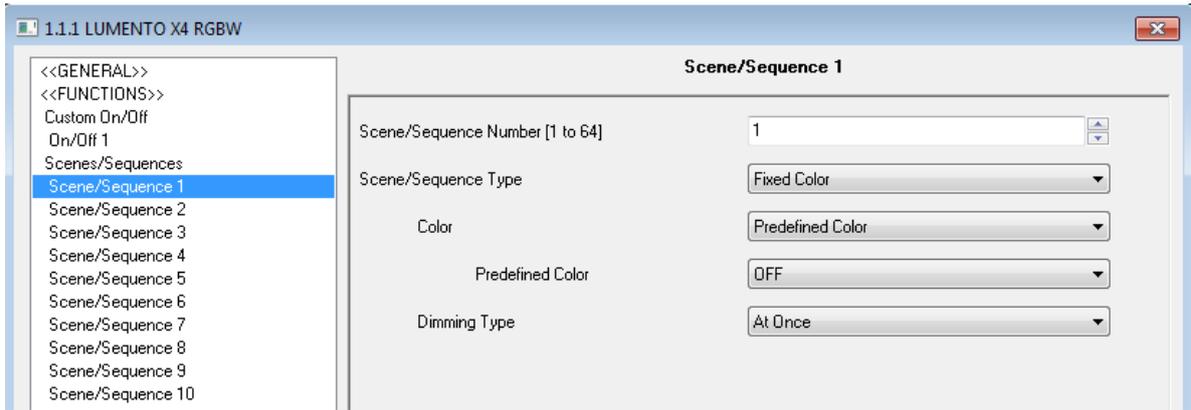


Figure 3.9. Scenes

For each of them there are the following configurable fields:

- 🌈 **Scene/Sequence number:** it indicates the scene/sequence number (from 1 to 64) to which the controller output will react.
- 🌈 **Scene/Sequence type:** to choose the desired configuration for each enabled scene/sequence:

- **Fixed color.** To light the LEDs module with a specific color when LUMENTO X4 receives through the object "Scenes/Sequences" the configured scene number. A predefined color can be chosen (see Table 3.2) or a customized one, by configuring manually each of the RGBW color components. Also the dimming type can be selected (at once, smooth 1 or smooth 2).

If "Fixed color" is selected, besides running the scene it will be also possible to **save** it. I.e., if LUMENTO X4 receives an order to save a scene, the current color of the LEDs will be saved, so when the corresponding scene will be executed again, the color showed will be the saved one (and not the parameterized in ETS for the corresponding scene).

- **Predefined sequence.** LUMENTO X4 has 3 different preconfigured sequences: colorful, cool colors and warm colors.



These sequences have 5 steps (or smooth transitions between different colors) of determined duration. They are **cyclical**, so when the last step of the sequence finishes, it will start again from the beginning (first step) automatically. The default duration of every cycle is 1 minute, but it can be modified in the box **Time** (t), writing a value in the range [1...255], in minutes.

Note: *LUMENTO X4 will proportionally modify the action time of every step of the sequence in order to adjust it to the new parameterized cycle time (t).*

In the field **Luminosity sending** one can select when LUMENTO X4 will send the brightness status of its output, choosing between:

- Send continuously: the brightness level will be continuously sent, through the object "Luminosity (Status)" (**only if** in Functions section the status sending when dimming was enabled) and respecting the minimum time between sendings.
- Don't send: Whenever the Status sending when dimming option was enabled or not, the brightness status during the sequence execution will not be sent to the KNX bus.

Next, three tables with the predefined color schemes (and their action times) are shown:

Sequence 1: "Colorful"

Step	Color (RGBW)	Action T.
1	Red (255/0/0/0)	t/5
2	Green (0/255/0/0)	t/5
3	Blue (0/0/255/0)	t/5
4	Magenta (255/0/255/0)	t/5
5	Yellow (255/255/0/0)	t/5



Sequence 2: "Cool colors"

Step	Color (RGBW)	Action T.
1	Blue1 (100/128/255/0)	t/5
2	Green1 (20/255/100/0)	t/5
3	Green (0/255/0/0)	t/5
4	Green2 (0/255/77/0)	t/5
5	Blue (0/0/255/0)	t/5



Sequence 3: "Warm colors"

Step	Color (RGBW)	Action T.
1	Red (255/0/0/0)	t/5
2	Magenta (255/0/255/0)	t/5
3	Pink (255/80/128/0)	t/5
4	Orange (255/51/0/0)	t/5
5	Yellow (255/255/0/0)	t/5



➤ **Custom sequence.** By selecting this option, it will be possible to customize sequences of up to 5 steps/actions and configuring the following general aspects:

- **Cyclic.** Yes option (Cyclic Sequence: once finished the last parameterized step, the sequence will start executing again, from the first of its parameterized steps). No option (Non-Cyclic Sequence: it is possible to choose whether another parameterized sequence is executed after the last step of the current one or not).
- **Luminosity sending:** to choose between Send continuously (same working as for Predefined sequences) or Send when sequence ends, in which case the brightness level of LUMENTO X4 output will be sent to the bus once the last step of the sequence finishes (no matter if the status sending when dimming was enabled or not).

For every step, the following parameters can be configured:

- **Color.** To set the color of the LEDs module (RGBW or predefined).
- **Dimming type:** at once, smooth 1, smooth 2 or Equal to action time. If this last option is chosen, the dimming will be carried out gradually, changing from the last color to the defined in the corresponding step in a time equal to the defined in the box "Time", in seconds.
- **Time.** To set the duration of the step (action time), in seconds.

The steps (or actions) will be executed orderly, i.e., when LUMENTO X4 receives the Scene number that enables the sequence, the first configured step will be executed, and so on. Moreover, if the sequence is cyclical, once the last step finishes, the sequence will be automatically executed, again from the beginning.

See an example of custom sequence configuration in the figure 3.10, where the three first steps of Sequence 1 have been parameterized.

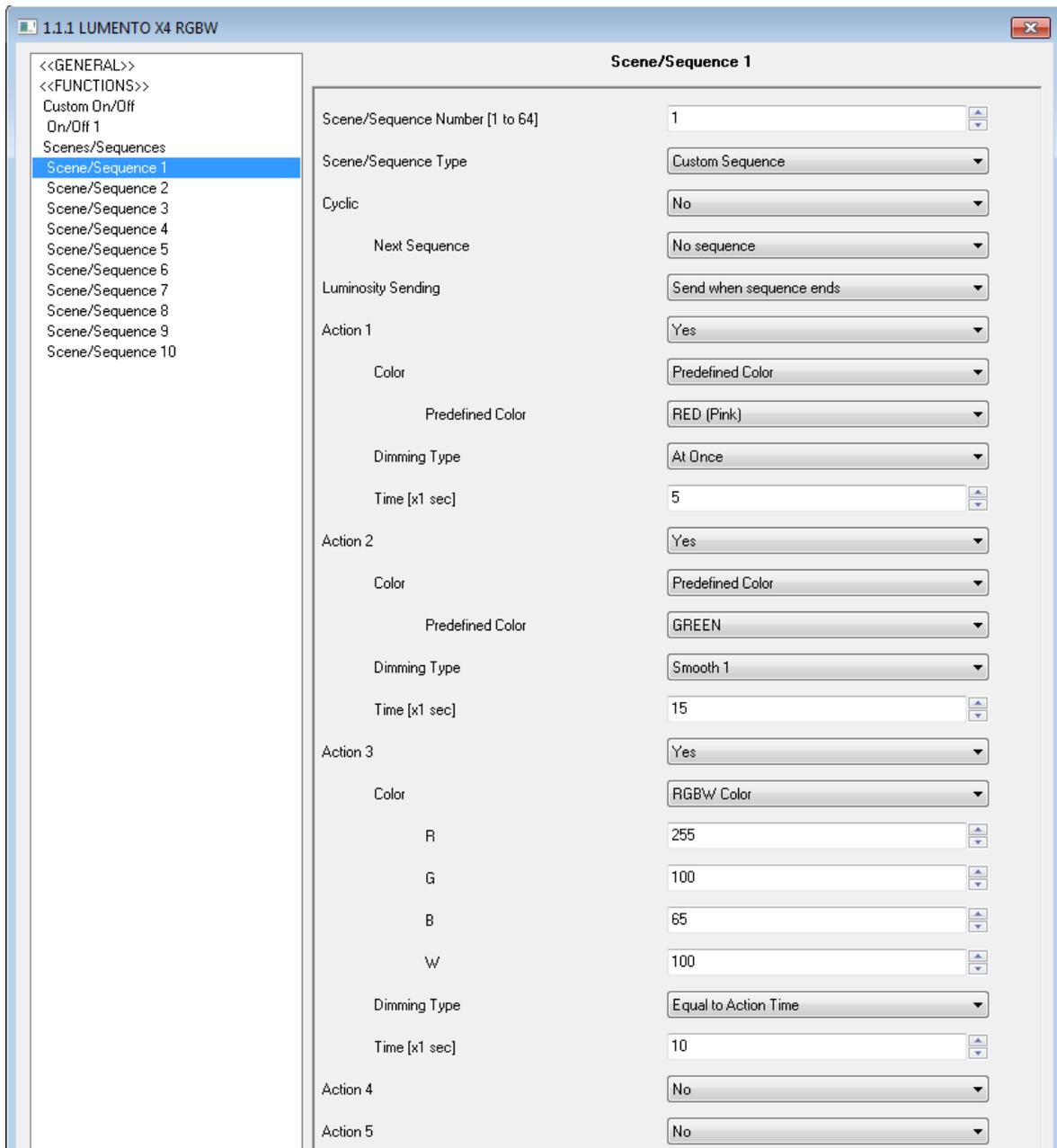


Figure 3.10. Custom sequence example

3.3.7. BLOCK

This function makes possible to block the LED controller; i.e., to disable its control.

LUMENTO X4 will block the output when receiving a "1" through the 1-bit communication object "Block", which appears when enabling this function. In this moment, any action in execution will be stopped and the LEDs module will keep the brightness value it had before receiving the blocking order.

In this block status, any order received from the KNX bus will be ignored.

LUMENTO X4 will unblock the output when receiving a "0" through the object "Block". The output will keep the color it had before receiving the block order. Any other order received during the block status will not be taken into account until the output will be unblocked.

3.3.8. START-UP

A default or custom configuration can be selected.

If the default configuration is chosen, the LEDs will remain OFF after a download from ETS. On bus voltage recovery, the color of the LEDs will be the last one they had before the bus power failure.

If a custom configuration is chosen, it is possible to select by parameter the status of the LEDs module on bus voltage recovery and after a download from ETS.

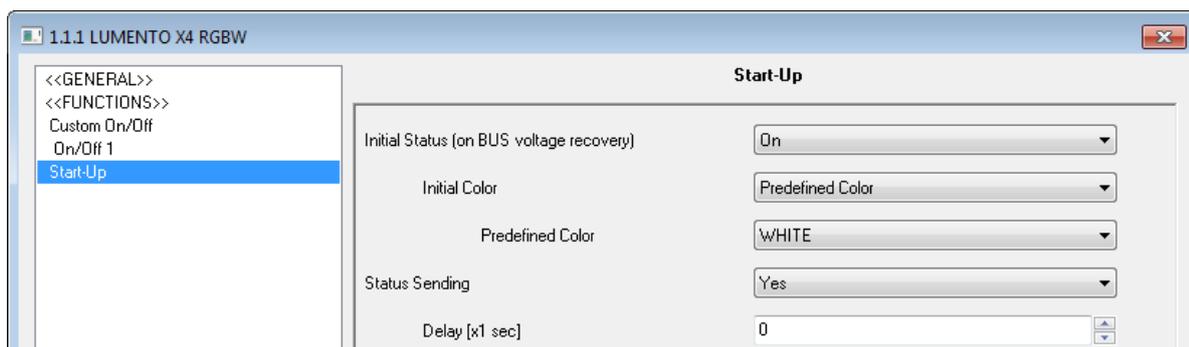


Figure 3.11. Start-up

The following parameters can be configured:

 **Initial Status (on bus voltage recovery):** choose the initial status of the LEDs module when the bus power failure ends or after a download from ETS. It is possible to select one of these statuses:

- **Last:** the LEDs module will keep the same color and brightness level it had before the bus power failure.
- **Off:** the LEDs will be OFF after the bus power failure (if they were ON).
- **On:** after the bus power failure, the LEDs will light with the color parameterized in the box that appears below: "Initial Color". This color can be RGBW or a predefined one.

 **Status sending:** by enabling this parameter ("Yes"), the status of the LEDs module will be sent to the KNX bus after the bus power failure, 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) LUMENTO X4 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 through the communication objects "On/Off (Status)" and "Luminosity (Status)" and through the status objects of the independent channels, if they were enabled: "[Ch] On/Off (Status)" and "[Ch] Luminosity (Status)".

ANNEX I. COMMUNICATION OBJECTS

SECTION	NUMBER	SIZE	IN/OUT	FLAGS	VALUES			NAME	DESCRIPTION
					RANGE	1st TIME	RESET		
RGB CHANNELS	0	1 bit	I	W	0/1	Indifferent	Indifferent	[R] ON/OFF	0=Off; 1=On
	1	1 bit	I	W	0/1	Indifferent	Indifferent	[G] ON/OFF	0=Off; 1=On
	2	1 bit	I	W	0/1	Indifferent	Indifferent	[B] ON/OFF	0=Off; 1=On
	3	1 bit	I	W	0/1	Indifferent	Indifferent	[W] ON/OFF	0=Off; 1=On
	4	4 bits	I	W	0-15	Indifferent	Indifferent	[R] Dimming	4-bits dimmer control
	5	4 bits	I	W	0-15	Indifferent	Indifferent	[G] Dimming	4-bits dimmer control
	6	4 bits	I	W	0-15	Indifferent	Indifferent	[B] Dimming	4-bits dimmer control
	7	4 bits	I	W	0-15	Indifferent	Indifferent	[W] Dimming	4-bits dimmer control
	8	1 byte	I	W	0-100%	Indifferent	Indifferent	[R] Precise Dimming	1 byte dimmer control
	9	1 byte	I	W	0-100%	Indifferent	Indifferent	[G] Precise Dimming	1 byte dimmer control
	10	1 byte	I	W	0-100%	Indifferent	Indifferent	[B] Precise Dimming	1 byte dimmer control
	11	1 byte	I	W	0-100%	Indifferent	Indifferent	[W] Precise Dimming	1 byte dimmer control
GENERAL	12	4 bits	I	W	0-15	Indifferent	Indifferent	Dimming	4-bits dimmer control
	13	1 byte	I	W	0-100%	Indifferent	Indifferent	Precise Dimming	1 byte dimmer control
STATUS OBJECTS	14	1 bit	O	RT	0/1	0	Last	[R] ON/OFF (Status)	0=Off; 1=On
	15	1 bit	O	RT	0/1	0	Last	[G] ON/OFF (Status)	0=Off; 1=On
	16	1 bit	O	RT	0/1	0	Last	[B] ON/OFF (Status)	0=Off; 1=On
	17	1 bit	O	RT	0/1	0	Last	[W] ON/OFF (Status)	0=Off; 1=On

SECTION	NUMBER	SIZE	IN/OUT	FLAGS	VALUES			NAME	DESCRIPTION
					RANGE	1st TIME	RESET		
STATUS OBJECTS	18	1 byte	O	RT	0-100%	0	Last	[R] Luminosity (Status)	0-100%
	19	1 byte	O	RT	0-100%	0	Last	[G] Luminosity (Status)	0-100%
	20	1 byte	O	RT	0-100%	0	Last	[B] Luminosity (Status)	0-100%
	21	1 byte	O	RT	0-100%	0	Last	[W] Luminosity (Status)	0-100%
	22	1 bit	O	RT	0/1	0	Last	ON/OFF (Status)	0=Off; 1=On
	23	1 byte	O	RT	0-100%	0	Last	Luminosity (Status)	0-100%
CUSTOM ON/OFF	24-27	1 bit	I	W	0/1	Indifferent	Indifferent	Custom On/Off x [x=1...4]	0=Off; 1=On
SIMPLE TIMER	28	1 bit	I	W	0/1	Indifferent	Indifferent	Simple timer	0=Deactivate; 1=Activate
FLASHING	29	1 bit	I	W	0/1	Indifferent	Indifferent	Flashing	0=Deactivate; 1=Activate
SCENES/SEQUENCES	30	1 byte	I	W	0-64	Indifferent	Indifferent	Scenes/Sequences	Scene/Sequence value
	32	1 bit	I	W	0/1	Indifferent	Indifferent	Start/Stop Sequence	0=Stop; 1=Start
BLOCK	31	1 bit	I	W	0/1	0	Last	Block	0=Unblock; 1=Block
DIMMING SPEED	33-34	1 byte	I/O	RW	0-100%	0%	Last	Dimming Speed (1 or 2)	0%=Min.Speed; 100%=Max.Speed
DIRECT COLORING	35	1 byte	I/O	RW	1-22	Indifferent	Indifferent	Direct Coloring	Color number (Scene 1-22)
ERROR OBJECTS	36	1 bit	O	RT	0/1	0	0	Error: External voltage	0=Normal; 1=Low Ext. Voltage
	37	1 bit	O	RT	0/1	0	0	Error: Overheating	0=Normal; 1=Overheating



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