SpaceLogic KNX

KNX universal dimming actuators LL REG-K

Universal Dimming LL 3245/1.0

Application description

This document describes the application 3245/1.0. The application is designed to program the KNX universal dimming actuators LL REG-K

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www.schneider-electric.com

Legal information

Trademarks

Warnings

Read through the following instructions carefully and familiarise yourself with the device prior to installation, operation and maintenance. The warnings listed below can be found throughout the documentation and indicate potential risks and dangers, or specific information that clarifies or simplifies a procedure.

The addition of a symbol to "Danger" or "Warning" safety instructions indicates an electrical danger that could result in serious injuries if the instructions are not followed.

This symbol represents a safety warning. It indicates the potential danger of personal injury. Follow all safety instructions with this symbol to avoid serious injuries or death.

DANGER

DANGER indicates an imminently hazardous situation that will inevitably result in serious or fatal injury if the instructions are not observed.

WARNING

WARNING indicates a possible danger that could result in death or serious injuries if it is not avoided.

CAUTION

CAUTION indicates a possible danger that could result in minor injuries if it is not avoided.

NOTE

NOTE provides information about procedures that do not present any risk of physical injury.

Further information

The information provided must be complied with, otherwise program or data errors may occur.

You will find additional information here to make your work easier.

Depictions in this document

Style and text features used

Text features used

Text feature	Meaning
[F6]	Keys on the keyboard
[Ctrl] + [N]	Press both buttons at the same time
Programming Select the *Programming service button* *Relay operation* – *Make contact* – *Flashing*	Body text contains: Service buttons, tab name, parameter name and values.
File/Save	Menu and menu sequences
Save changes?	System notifications
Choice: **10%**/90% **...**	Preselected values in the ETS are highlighted in bold in the tables.
.. influences the *switch object*.	Communication objects
Operation section	Cross-references

Setting tabs, parameters and values

Overview - setting functions

The following overview allows you to **understand** the steps needed to get to the functions and settings. This overview also provides you with the right sequence needed to get to the functions.

Push-button	Select push-button function	Scene
	Select scene function	Extended
	Number of objects	Two
Scene extended	...	...

Example

Meaning: First go to the *Push-button* tab and set the *Select push-button function* parameter to value *Scene*. Further parameters will then appear in the tab. These can be used to change settings. A new tab will also open.

ETS operation

Requirements for safe operation

Knowledge of the basic rules for operating programs using Windows® is a prerequisite for operation.

The ETS is the software for the KNX system, and is not manufacturer-specific. Knowledge of ETS operation is required. This also includes selection of the correct sensor or actuator, transferring it to the line and commissioning it.

Special features of the ETS software

Restoring defaults

You can set the factory-specified default using the *Default* service button in the ETS3 or the *Default parameter* service button in the ETS4 and ETS5.

You can use the *Default* and *Default parameter* service buttons to switch all parameters back to the settings on delivery (following consultation). The ETS will then permanently delete all manual settings.

Dependent functions and parameters

Many functions are affected by how other functions are set. This means that dependent functions can only be seen and selected in the ETS when the upstream function is enabled.

- If you de-select functions or change parameters, previously connected group addresses may be removed in the process.
- The values of some parameters only become active once the functions influenced by these parameters are activated.

Appropriate ETS version

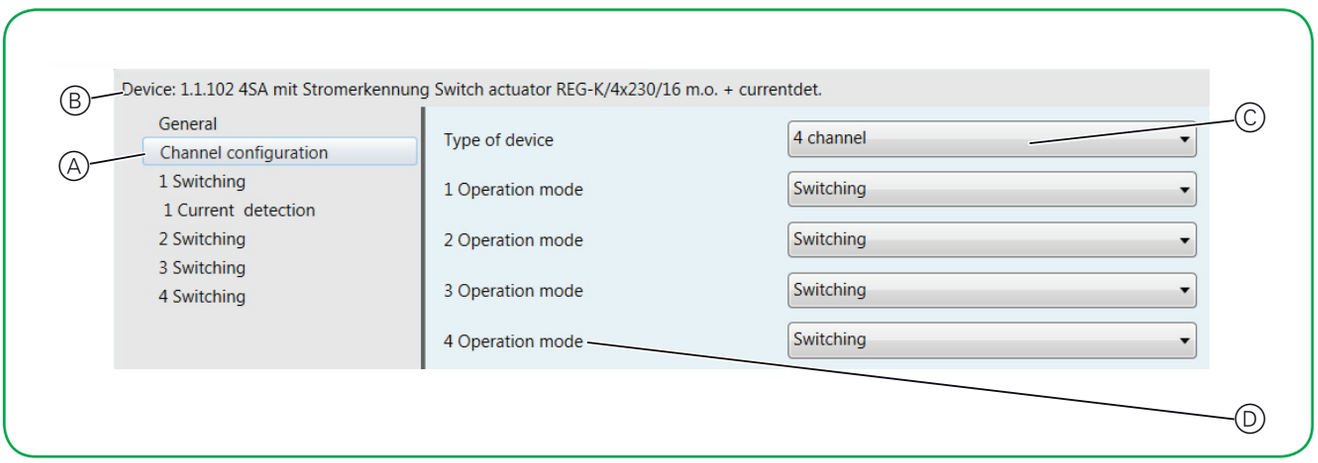
Application files are optimised for the corresponding ETS version:

- ETS3: vd3, vd4 and vd5
- ETS4: knxprod
- ETS5: knxprod

If you load an ETS3 application in the ETS4, time will be wasted on conversion. The same is true if you load the ETS4 in the ETS5.

User interface

In the ETS, the device parameters are opened using the *Edit parameters* service button: The user interface is divided into 2 sections: The tabs are on the left and the parameters on the right, together with their values.



Ⓐ Tab
Ⓑ Name of device
Ⓒ Input fields for parameter values
Ⓓ Parameter

Setting communication objects in the ETS

No.	Name	Object function	Length	Properties	DPT
6	Priority control	Channel 1, high priority function	2 bit	receiving	2.001 switch control
7	Locking object	Channel 2, high priority function	1 bit	receiving	1.* 1-bit, 1.001 switch

DPT

The data point types (DPT) in this application are not preset. The data point types shown in the communication object lists can be assigned in the ETS4 and ETS5. These are recommended options. For some 1 bit objects general data point types are recommended. During telegram recording with the ETS4 and ETS5 you will see that the *DPT 1.** has the values *$00* and *$01*, while the *DPT 1.001 switch* has the values *On* and *Off*.

Table of contents

1 For your safety

WARNING

Risk of serious damage to property and personal injury due to incorrect electrical installation.

Safe electrical installation can only be ensured if the person in question can prove basic knowledge in the following areas:

- Connecting to installation networks
- Connecting several electrical devices
- Laying electric cables
- Connecting and establishing KNX networks
- Commissioning KNX installations

These skills and experience are normally only possessed by certified specialists who are trained in the field of electrical installation technology. If these minimum requirements are not met or are disregarded in any way, you will be personally liable for any damage to property or personal injury.

1.1 Qualified personnel

This document is aimed at personnel who are responsible for setting up, installing, commissioning and operating the device and the system in which it is installed.

Detailed expertise gained by means of training in the KNX system is a prerequisite.

2 General information on the application 3245/1.0

This application enables you to program the KNX universal dimming actuators LL REG-K (referred to below as the actuators). The actuators can switch and dim ohmic, inductive or capacitive loads. They are also designed for dimmable LED and energy-saving lamps. You can find information on the connectable loads under (Dimming operation mode and loads --> 13) and in the **User manual** for the actuators.

The actuator controls the brightness of the connected lamp. You can configure the controlling function separately for each of the actuator's output channels.

You can also operate the actuator using the channel buttons on the front side of the device. (Manual operation --> 65 | Status displays --> 63).

- The group addresses are managed dynamically. The maximum number of group addresses and assignments is 172.
- The limit for the telegram rate of the device is set to 127 telegrams every 17 seconds.

2.1 Components and programming environment

The actuator is commissioned using KNX-certified software. The application and the technical descriptions are updated regularly and can be found on the Internet.

This application can be run in conjunction with the ETS software on versions 3, 4 and 5.

2.2 Overview of application functions

The application for the actuator provides you with numerous functions. The description of these functions includes an explanation of the parameters and communication objects. You can find an overview of all the parameters and communication objects for this ETS application at the end of this document:

Overview of parameters and values --> 82

Overview of communication objects --> 87.

You can set the following functions for the actuator.

- Setting loads
- Dimming parameters
- Basic functions
  - Switching (1 bit), relative dimming (4 bit), absolute dimming/value dimming (1 byte)
- Advanced functions
  - Time functions (ON/OFF delay, staircase timer), scenes, central function
- Higher priority functions
  - Logic operation or priority control, locking function
- Status reports
  - Switching (1 bit, values (8 bit), errors (1 bit))
- Manual operation
  - Manual operation via channel key (locking and enabling)
- Normal mode, exception mode and stopping operation

3 Setting loads

The actuators are types of universal dimming actuator, and detect connected loads automatically. Load detection determines whether an inductive, capacitive or ohmic load is connected. However, there is also the option of selecting an alternative operating mode for special LED or energy-saving lamps (*ESL/CFL*) using the ETSD parameters.

LED	**Light emitting diode**
ESL	**Energy-saving lamp**
CFL	**Compact fluorescent lamp**

In order to ensure that different loads are adjusted optimally, further settings can be altered for each channel. You can adjust the starting properties for switch-on in the ignition process of ESL/CFL.

The *dimming range* can normally be adjusted individually for each channel for all loads. More information on this can be found in section 4.1 Dimming range --> 18.

Information on special dimming curves for LED, halogen and incandescent lamps can be found in section 4.2 Base dimming curve --> 19.

3.1 Dimming operation mode and loads

In this section you will learn about automatic load detection and the alternative dimming operation mode *Leading edge phase LED, ESL/CFL (RL-LED)*, and find out which combinations of different loads are permitted.

The following dimming operating modes can be selected:

- **RC** operating mode = **Trailing edge phase** (automatic)
- **RL** operating mode = **Leading edge phase** (automatic)
- **RL-LED** operating mode = **Leading edge phase LED, ESL/CFL** (can be set via ETS)

Load detection is only possible if the voltage and frequency are within the permissible range and there is no short circuit or overload.

Automatic load detection

In general, the connected loads are detected automatically for each channel. The load detection for each channel can be conducted as soon as the loads are connected and the mains voltage has been switched on. Load detection takes place when starting or dimming for the first time (values > 0). For load detection to take place, the light is dimmed to minimum brightness and then the value selected by the user is set.

The load is also checked with respect to inductive properties during continuous operation, and switched to RL operating mode if necessary. Please note that loads may only be exchanged when the mains voltage is switched off.

When the mains voltage is back on, load detection can be performed by means of various events, depending on the parameters:

Event	Application
Channel key actuation	Once the line has been enabled, a lamp is tested directly from the distribution box.
Actuation of a KNX push-button with switching or dimming function	The lighting is only switched on manually. This may be useful for bedrooms, for example.

Event	Application
Automatic power-on	The lighting is automatically reset to its former state. The user does not need to press a push-button.

The various settings available when the mains voltage is restored are described in section Normal mode, exception mode and stopping operation --> 67.

Dimming operation mode leading edge phase LED, ESL/CFL (RL-LED)

Normally, LED or ESL/CFL lamps are automatically preset to the operating mode **Trailing edge phase** (**RC**).

Alternatively, you can also dim lamps in the **Leading edge phase** (**RL-LED**) operating mode. To do this set the *Dimming operation mode leading edge phase LED, ESL/CFL (RL-LED)* in the ETS. You should select this mode in the following cases:

- If the manufacturer of the light expressly recommends the leading edge phase or RL operating mode.
- If the lowest dimming value in the automatically selected operating mode is still too bright, and this operating mode is not prohibited by the manufacturer of the light. Switching to dimming operation mode RL-LED is particularly useful if the dimming range was previously deemed too small (Dimming range --> 18).

In this case, activate the corresponding channel so that the parameter *Dimming operation mode* is visible.

General	Channel X	activated
X: General	...	...
	Dimming operation mode	**automatic** Leading edge phase LED, ESL/CFL (RL-LED)

You can then set the *Dimming operation mode leading edge phase LED, ESL/CFL (RL-LED)*. This operating mode is only suitable for LEDs or ESL/CFL lamps.

The setting is activated once the application has been loaded. The inductive properties of the load are also checked in this operating mode, and the system will switch to the RL operating mode if necessary.

Load detection is normally performed when switching on or dimming (value > 0) for the first time after the mains voltage has been restored. Please note that loads may only be exchanged when the mains voltage is switched off.

If the bus voltage fails, exception mode can be set using the channel keys. The selected dimming operation mode is also maintained in this mode, and the load is still checked with regard to inductive properties.

Using LED and ESL/CFL lamps

- Do not use LED lamps in conjunction with energy-saving lamps (ESL/CFL). If possible, use lamps from the same manufacturer and of the same type in order to achieve satisfactory dimming properties.
- The max. power of each channel is generally lower for LED or energy-saving lamps than for other loads.
- The values are also significantly lower in the operating mode *Leading edge phase LED, ESL/CFL (RL-LED)*.
- The max. power depends heavily on the LEDs and energy-saving lamps used. If the load is too high, the actuator dims to minimum brightness or switches off directly. If this happens, reduce the number of lights. More detailed information

can be found in the Dimmer tool and the "Technical data" Section of the user manual.

Dimmer tool

Schneider Electric has tested numerous dimmable LED and energy-saving lamps. The dimmer tool provides information on the minimum and maximum permissible numbers of individual lamp models. The maximum permissible load depends heavily on the lamp model. You can find the dimmer tool on the following Internet site or by using the corresponding QR code.

http://schneider-electric.dimmer-test.com

QR code	(QR = quick response) is a 2D code in the form of a square that smart phones or tablet computers can read once an appropriate app has been installed.

Loads per channel

- 230 V incandescent and halogen lamps (ohmic load).
- Low-voltage halogen lamps with dimmable, wound transformers (inductive load).
- Low-voltage halogen lamps with dimmable, electronic transformers (capacitive load).
- A combination of ohmic and inductive loads:
  230 V halogen and incandescent lamps, halogen lamps with wound transformers.
- A combination of ohmic and capacitive loads:
  230 V halogen and incandescent lamps, halogen lamps with electronic transformers, LED or ESL/CFL.
- Dimmable ESL/CFL.
- Dimmable LED lamps.

More detailed information on the minimum and maximum permissible loads can be found in the "Technical data" section of the user manual. More information on dimmable LED and energy-saving lamps can be found in the Dimmer tool.

Read the user manual carefully. This section contains safety information that refers exclusively to the selection of the load.

CAUTION

The device can be damaged.

- Only operate the device according to the specifications listed in the technical data.
- Only connect dimmable transformers to the dimmer when you use transformers.
- Only use wound transformers with a load of at least 30% of the nominal load.
- Do not connect a combination of capacitive and inductive loads to one channel.
- Do not connect a combination of LED or ESL/CFL lamps and inductive loads such as wound transformers to one channel.
- Do not use dimmers on socket outlets. The risk of overload and connecting unsuitable devices is too high.

3.2 Starting behaviour

Compact fluorescent lamps often need a minimum voltage for the ignition process. In order to guarantee safe starting, a minimum brightness can be set for after they have been switched on.

X: General	Always start at 50% brightness (ESL/CFL)	**disabled** enabled

This setting ensures that 50% brightness is switched on for approx. two seconds in order to ignite the lamp. The brightness is then altered to the required dimming value.

Example

The memory function is selected. This function ensures that, where possible, the previous brightness value is restored when the lamp is switched on again. The minimum dimming value is 20%.

Action	Result
Switch off at 30% brightness (1 bit)	Lighting is switched off
Switch on (1 bit)	Switch on at 50% brightness
Automatic brightness correction	Dim back down to 30% after approx. 2 seconds
Send 10% dimming value (1 byte)	Dim down to 20% (min. dimming value)

Information on *Minimum dimming value in %* can be found in the following section (Dimming range --> 18).

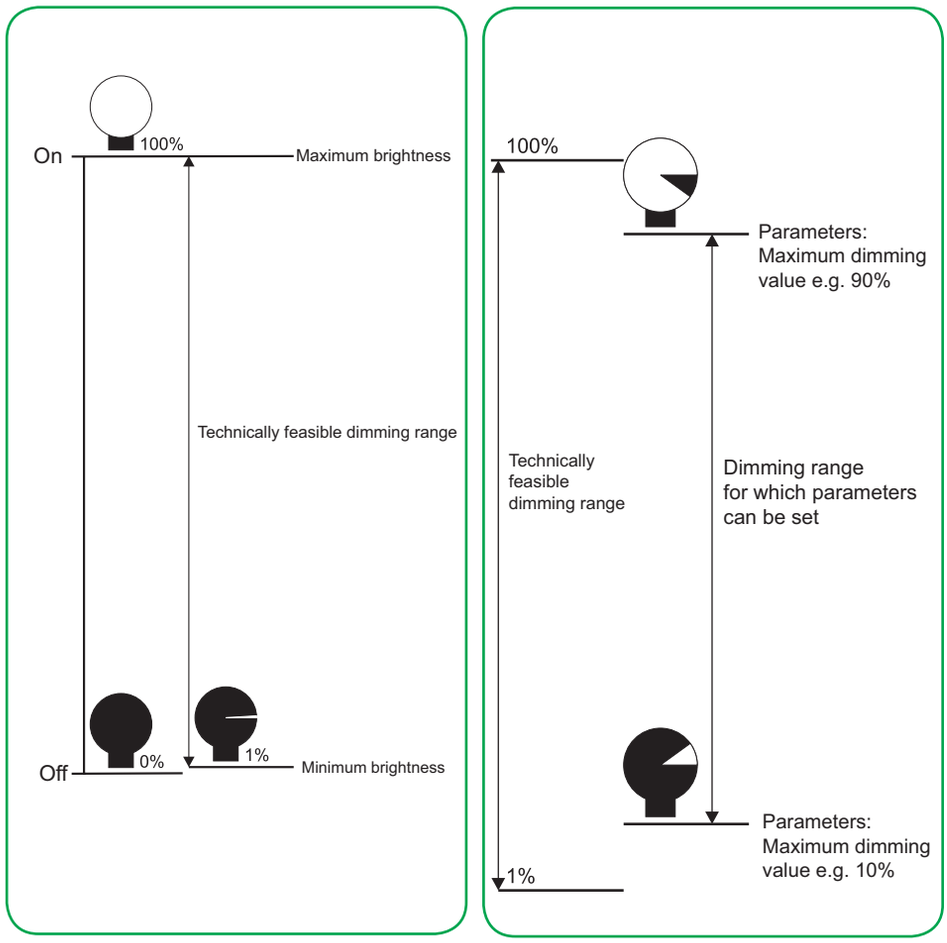
4 Setting the dimming parameters

In this section, you will learn how to set the dimming process individually for each channel. The **dimming range** and the **base dimming curve** can be adjusted to the lamp (e.g. special LED). The **dimming speed** is already adjusted to different functions in the default settings (e.g. slow transition in lighting scenes). However, you can also configure special solutions, such as a light alarm with various dimming speeds. The function **Same dimming time** can be used to send different brightness values for each lamp group and finish the overall dimming process simultaneously.

Activate a channel so that the dimming parameters are displayed.

General	Channel X	activated
X: General	...	...
X: Base dimming curve	...	...
X: Dimming time reductions	...	...

4.1 Dimming range



The technical dimming range is defined by the range between the minimum and maximum brightness of a lamp, and can be set with the aid of a dimmer.

The minimum brightness value that can be set corresponds to a dimming value of 1%, and the maximum brightness value that can be set corresponds to a dimming value of 100%.

The dimming range can be limited further using the application. This limit can be set individually for each output channel.

Activate a channel so that the dimming parameters are displayed.

X: General	Minimum dimming value in %	**15** (1-100)
	Maximum dimming value in %	**100** (1-100)

The limits of the parameterisable dimming range cannot be crossed. If, regardless of the function, a telegram that demands a lower or a higher value is received, the respective minimum or maximum value will be set.

Example

Minimum dimming value = 10%, maximum dimming value = 90%

Telegram value = 5% => output = 10%

Telegram value = 70% => output = 70%

Telegram value = 95% => output = 90%

Maximum dimming value

In some situations, it may not be possible to discern changes to the brightness at maximum brightness values. In such cases, you can reduce the maximum dimming value.

If lamps can only be dimmed slightly, check whether the maximum dimming value has been set too low.

Minimum dimming value

Faults such as flickering may occur at minimum brightness values. The brightness of the lamps may have fallen below the minimum value. In this case, increase the minimum dimming value.

If lamps can only be dimmed slightly, check whether the minimum dimming value has been set too high.

LED and energy-saving lamps

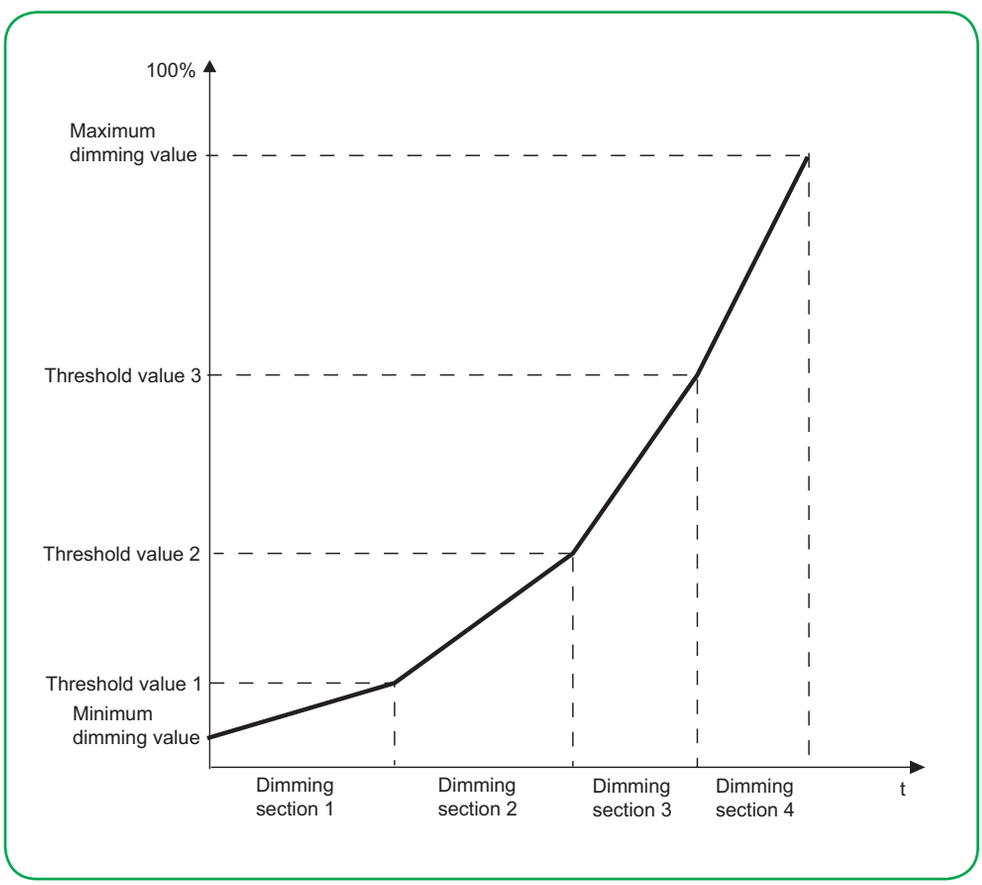
The default settings of some LED and energy-saving lamps need to be adjusted.

You can find some recommended minimum and maximum dimming values in the Dimmer tool from Schneider.

4.2 Base dimming curve

Description

You can use the base dimming curve to adjust the control properties of a channel to the physical characteristics of different lamps.



The base dimming curve is divided into **four dimming sections**. You can set individual times for each dimming section. The sum of these times is the total time for a dimming process.

Dimming section 1 starts at the **minimum** dimming value and dimming section 4 ends at the **maximum dimming value.**

The maximum dimming range that can be set goes from 1% to 100% (Dimming range --> 18). The sections are divided up by 3 threshold values.

If the lighting was previously turned off, the dimming process starts with the minimum dimming value.

Example of dimming section 1

Dimming process: from 0% to 25% (**without dimming time reduction**)

Minimum dimming value	15%
1st Threshold value	25%
Time for dimming section 1	15 s

Result: Within a period of 15 s, the lamp is switched on and dimmed from 15% to 25%.

Actual dimming curve

The base dimming curve is the basis for the dimming speeds for each channel. The actual dimming curve is also influenced by the *Dimming time reductions* and the *Dimming time reduction object* (Dimming speed --> 21).

Selection in the ETS

Three different base dimming curves are installed at the factory.

X: General	Base dimming curve	LED or any other lamp; can be altered
		Halogen lamps
		Incandescent lamps

For LED, halogen and incandescent lamps, specific base dimming curves are installed in the application.

Base dimming curve	**LED lamps**		**Halogen lamps**		**Incandescent lamps**	
	Time	**Range**	**Time**	**Range**	**Time**	**Range**
Dimming section 1	15 s	0 - 25%*	33 s	0 - 25%*	23 s	0 - 25%*
Dimming section 2	15 s	25 - 50%	15 s	25 - 50%	18 s	25 - 50%
Dimming section 3	15 s	50 - 75%	8 s	50 - 75%	12 s	50 - 75%
Dimming section 4	15 s	75 - 100%	4 s	75 - 100%	7 s	75 - 100%
Total	60 s	0 - 100%	60 s	0 - 100%	60 s	0 - 100%

* Starts with the *minimum dimming value* of 15%, if this preset is selected.

If you want to set your own dimming curve, select *LED or any other lamp; can be altered.* Then you can change the settings of the threshold values and times of the dimming sections in the *Base dimming curve* tab:

X: Base dimming curve	1st threshold value in %	**25** (0 ... 100)
	1st threshold value in %	**50** (0 ... 100)
	1st threshold value in %	**75** (0 ... 100)
	Time base of 1st dimming section	**100 ms**
	Time factor of 1st dimming section (1-255)	**150**
	Time base of 2nd dimming section	**100 ms**
	Time factor of 2nd dimming section (1-255)	**150**

	Time base of 3rd dimming section	**100 ms**
	Time factor of 3rd dimming section (1-255)	**150**
	Time base of 4th dimming section	**100 ms**
	Time factor of 4th dimming section (1-255)	**150**

Please observe the following conditions when setting your own dimming curves:

- The 1st threshold value must be greater than or equal to the set minimum dimming value. Otherwise, the 1st threshold value will be set equal to the minimum value.
- The 2nd threshold value must be greater than or equal to the 1st threshold value; otherwise it will be set equal to this.
- The 3rd threshold value must be greater than or equal to the 2nd threshold value; otherwise it will be set equal to this.
- If the 3rd threshold value is larger than the maximum dimming value, this maximum value will define the upper brightness limit.
- The dimming hardware requires at least 500 ms to run through the entire dimming range from 1% to 100%. Observe this limit value when setting the dimming times for the individual dimming sections.
- The period for running through an entire dimming curve is limited to 24 hours. Should longer running times result from the settings you have made, the application will automatically determine a corrective factor to cut your settings back down to 24 hours.

4.3 Dimming speed

In the base dimming curve, you define a base dimming time. The actual dimming curve is also influenced by the *Dimming time reductions* and the *Dimming time reduction object*.

Dimming time reductions

The dimming time reduction (> 100%) increases the dimming speed. The actual dimming time therefore results from the time factors of the base dimming curve and the values of the *Dimming time reductions*.

The following calculation for the overall dimming time applies for all telegram types.

Calculation

Base dimming time x dimming time reduction = overall dimming time

60 s x 10% = 6 s (example calculation for value telegrams)

Dimming time reduction for each telegram type

Dimming time reductions for different **telegram types** are already in the default settings. The overall dimming time of all three base dimming curves is **60 s**.

In total, the following values are entered in the default settings:

Dimming time reduction for	Percentage	Total dimming time
Switching telegrams and switching on staircase lighting	1%	0.6 s
Dimming telegrams	9%	5.4 s
Switching off staircase lighting	50%	30 s
Value telegrams	10%	6 s
Scene telegrams	16%	9.6 s
Higher priority functions	2%	1.2 s

Sets

The values displayed here can be found in **Set 0** of the dimming time reductions.

The reductions in dimming time always uniformly influence all dimming sections in the base dimming curve. The shape of the dimming curve is therefore retained.

Since the dimming time can only be reduced using these dimming time reductions, it makes sense to parameterise the base dimming curve to the maximum times

required. You can then use the dimming time reduction sets to adjust the speeds to the specific functions.

You can define a total of four dimming time reduction sets, which you can then activate using a *set object*.

Adjusting for each dimming function

The preset dimming time reductions from Set 0 can be found under:

X: Dimming time reductions	Set 0: dimming time reduction	
	for switching telegrams and staircase lighting, switch on at	**1%** (1% ... 100%)
	for dimming telegrams to	**9%** (1% ... 100%)
	for staircase lighting switch off at	**50%** (1% ... 100%)
	for value telegrams at	**10%** (1% ... 100%)
	for scene telegrams at	**16%** (1% ... 100%)
	for priority functions at	**2%** (1% ... 100%)

Different dimming functions are performed at the channel output depending on the incoming telegram type (see following section). The telegram types correspond to different communication objects.

- Switching telegrams *Switch object* and *Central switch object*
- Dimming telegrams *Dimming object* and *Central dimming object*
- Staircase lighting telegrams *Staircase timer object*
- Value telegrams *Value object* and *Central value object*
- Scene telegrams *Scene object*
- Higher priority functions and *Locking function* *Logic object* or *Priority control object*

Example

The resulting dimming time for *switching off staircase lighting* is much longer than for *switching on staircase lighting*. The brightness is dimmed down slowly as a warning that the lighting is going to be switched off completely.

You can select the input format for this parameter using the *Format of dimming time reduction* tab.

X: Dimming time reductions	Format of dimming time reductions	**1-100%**
		1 - 255 (corresponds to 1-100 %)

In total you can enable up to four sets.

X: Dimming time reductions	Sets 1 to 3	**disabled**
		enabled

In the *Set object* tab, you can select which set will be used. After initialising, Set "0" is always active. The preset values for all sets can be found under (Overview of parameters and values --> 82).

Selection of a set

If the *Set object* receives a value between *0* and *3*, the corresponding set is activated. Values outside of this range (invalid values) will cause Set "0" to be activated.

Examples

You can use the set parameters to modify the dimming speed (based on the base dimming curve) for a large number of solutions.

- Slower dimming up and down when switching on and off: *Dimming time reduction for switching telegrams and staircase lighting switch on* at *10%*. (6 s)

- Fast dimming up and very slow dimming down of the staircase lighting: *Dimming time reduction for switching telegrams and staircase lighting switch on* at *2%* and *Dimming time reduction for staircase lighting switch off* at *100%.* (60 s)
- Fast dimming up and down, even for value dimming: *Dimming time reduction for value telegrams* at *2%.* (1.2 s)
- Faster setting of the scene values: *Dimming time reduction for scene telegrams* at *4%.* (2.4 s)

With a set value of *100%* or *255*, the actual dimming curve corresponds precisely to the base dimming curve. This corresponds to a dimming time of 60 s in the default settings.

Making adjustments using the dimming time reduction object

If you activate the parameter *Dimming time reduction object for dimming curve* , the *Dimming time reduction object* will appear.

X: Dimming time reductions	Dimming time reduction object for dimming curve	**deactivated** activated

If the object receives a valid value between *1* and *255*, the resulting dimming time is calculated as follows:

Calculation **Dimming time x object value / 255 = new dimming time**

Example

Parameterised dimming time	10 s	
Value of dimming time reduction object	64	
New dimming time (absolute value)	2.5 s	(10 x 64 / 255)
New dimming time (with percentage values)	2.5 s	(10 x 25 / 100)

If the value 255 (corresponds to 100%) is given in a description, the original dimming curve is also used with the value from the valid set for dimming time reduction. In Set 0, this is a time of 0.6 s in the default settings for switching telegrams.

After initialising, the object has a value of 255.

Practical example

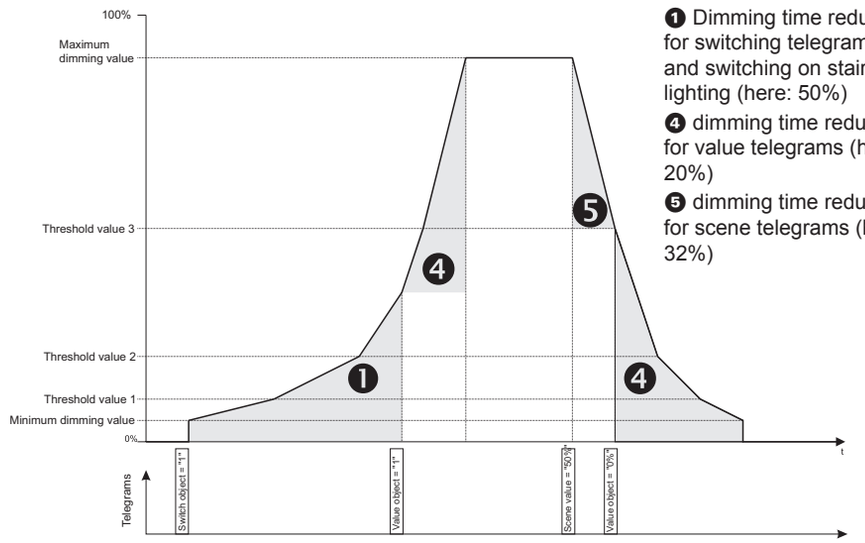
Requirements The speed of all dimming processes needs to be increased by 50% when required and then be set back to normal speed again.

Solution Push-button for high speed: sends value of 128 (50%).

Push-button for normal speed: sends value of 255 (100%).

Functional change during a dimming function

If the application receives a telegram for another dimming function while a dimming function is running, the values for the new dimming function will be used immediately. The values used for the dimming time reduction are taken from the settings in the set that is currently valid. The following figure illustrates this principle.



❶ Dimming time reduction for switching telegrams and switching on staircase lighting (here: 50%)
❹ dimming time reduction for value telegrams (here 20%)
❺ dimming time reduction for scene telegrams (here: 32%)

Communication objects

You can select the following communication objects.

Communication objects per channel

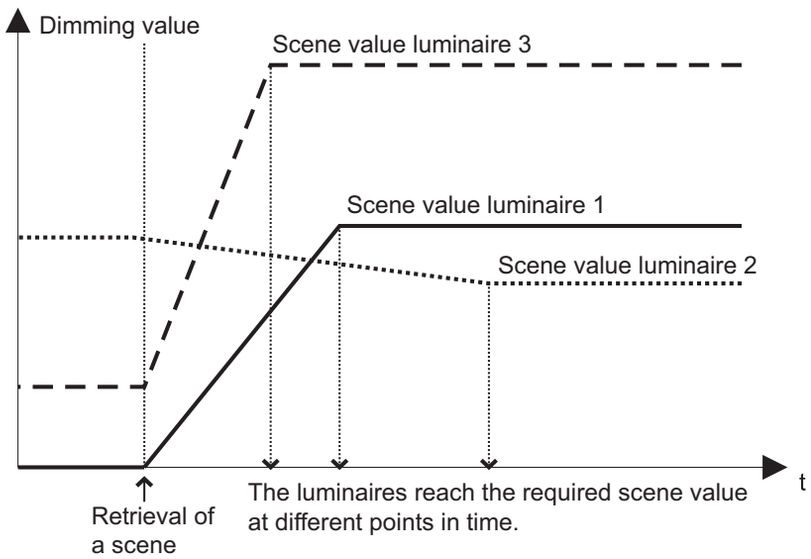
No.	Name	Object function	Length	Properties	DPT in ETS
3	Set object	Channel X, dimming speed	1 byte	receiving	5.010 counter pulses (0-255)
4	Dimming time reduction object	Channel X, dimming speed	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)

4.4 Same dimming time

Setting for several dimming channels

The function **Same dimming time** causes a dimming process with several dimming channels to **start simultaneously** and to **end at the same time**. You can use this function for scenes and central functions. You can also optionally extend or shorten a same dimming time that has already been parameterised via telegram.

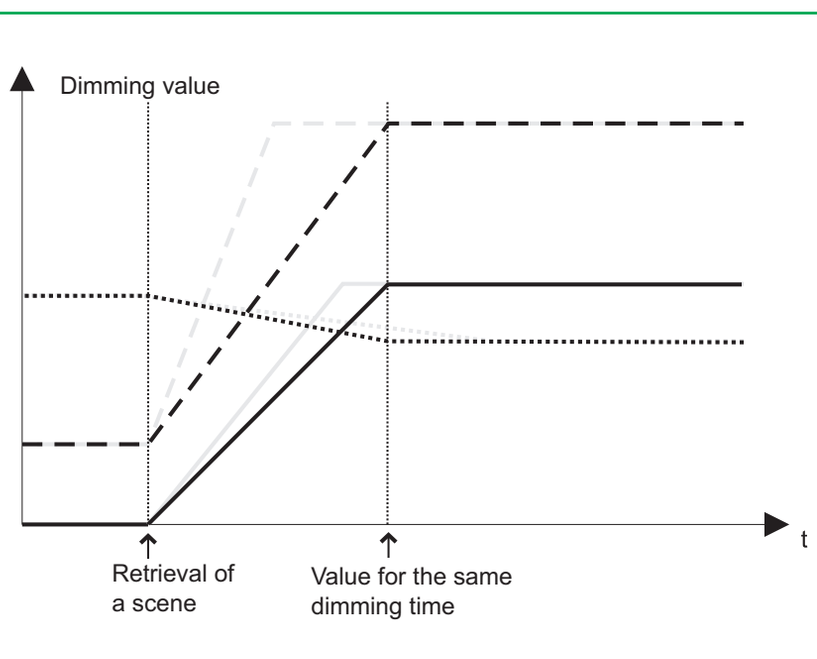
As previously described, **lamps at each dimming channel** can have different **dimming curves**. The dimming speed – i.e. the time taken to go through the dimming range until the required dimming value is reached – is thus also different for each of the connected lamps. Often, several dimming channels are used together in one scene or central function. If a function of this type is activated, all the lamps will begin to dim to the required value. The lamps will reach the loaded value at different speeds depending on the dimming curve and scene value. If Same dimming time is set, the dimming process starts and ends at the same time for all dimming channels.



Same dimming time can be used to synchronise the different dimming times of the channels so that all the channels reach their setpoint values at the same time.

Same dimming time is only used in conjunction with scenes and the central function. If no scene or central function has been activated, the parameters for Same dimming time will have no effect.

For the base dimming curve, an offset factor is calculated when a scene or central function is loaded, depending on the current output value and the required end value. This offset factor extends or compresses the base dimming curve so that all the assigned lamps reach the required final value at the same time.



You enable the function globally for the device via a parameter, set an appropriate dimming time after enabling and then activate the *Same dimming time* function for each dimming channel.

General	Same dimming time at central function and scenes	enabled
Same dimming time	Time base for same dimming time	**1 s**, 1 min, 1 hr
	Time factor for same dimming time 1-255	**5** (1-255)
	Must be >1s and greater than delay times!	
	Time factor for same dimming time selectable via bus	**deactivated**
		activated

Extend or shorten same dimming time

You can also extend or shorten the *Same dimming time* via telegram. If you have activated the parameter *Time factor for same dimming time selectable via bus*, a new communication object will appear *Factor for identical dimming time*. This object is used to set the required time. In this case, the parameter *Factor for identical dimming time* is only used for setting the time after a bus reset or download. As soon as the object *Factor for identical dimming time* has been described with a value for the first time, this value will be used to set the time.

Activation

Assignment of the individual channels for Same dimming time is performed individually **for each channel** for the scene functions and central function.

Same dimming time is activated for the scene function of a channel via the parameters for the scene in question.

X: General	Scenes	enabled
X: Scenes	Same dimming time	**deactivated**
		activated

The Dimming time reduction object and the sets for dimming time reduction are not taken into account for scenes and central function for the duration of Same dimming time.

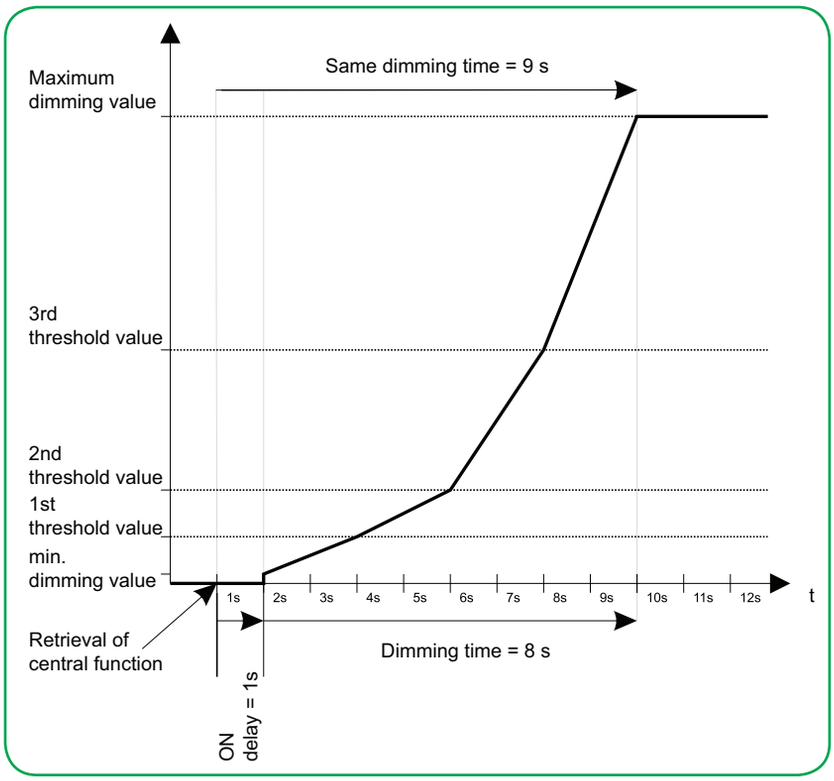
Delay times and minimum duration

If you have parameterised ON or OFF delays, these delay times will be taken into account. If there is an ON delay, the dimming process will start once the delay time has expired. The same dimming time is divided up between the delay time and the dimming process and recalculated.

Example

- Current output status: OFF
- ON delay = 1 s
- Same dimming time = 9 s
- Loading of central function with output value 100% (= max. dimming value)

The total time after loading is 9 s. Once the delay time of 1 s has expired, the dimming process will run for 8 s.



The dimming curve is compressed so that the total time corresponds to the value of the set Same dimming time: New dimming time = Same dimming time minus delay time.

In the example illustrated above, a lamp group is switched on with a delay. For the central function with Same dimming time, further lamp groups without delay times can be added. Although one group has a delay time, the dimming process ends at the same time for all groups.

Minimum dimming time

The set dimming time must be greater than 1 second and no smaller than any set ON or OFF delays for the individual output channels. If this is not the case, the Same dimming time will be ignored and the dimming curves will be executed normally using time factors and dimming time reductions.

Communication objects

You can also extend or shorten a parameterised Same dimming time via telegram. The Same dimming time is calculated using a parameterised basic value and the factor sent by telegram. To do this, select the following communication object.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT
51	Factor for identical dimming time*	Same dimming time	1 byte	receiving	5.005 ratio (0-255)

*You can set the appropriate basic value using the parameters.

5 Priorities

The functions of the application have different priorities in relation to their processing:

Priorities

High priority	
3	Locking function
2	Logic operation or priority control
1	Switching, dimming, value dimming, time functions, scenes, central functions
Low priority	

5.1 Priority group 1

In priority group 1, all functions have an equal status, i.e. they can be overwritten by other functions. A function which is currently active is ended when a new control telegram with the same priority is received.

5.2 Priority group 2

When a function from priority group 2 is activated, the dimmer output is controlled according to the output value that is now active. The function values for priority group 1 are overwritten and are no longer forwarded to the output while the higher priority function is active. However, all the control functions in priority group 1 continue to be calculated and updated in the background.

You can determine the response of an output after priority control has been deactivated via a parameter (Priority control --> 53).

After a logic operation has been deactivated (Logic operation --> 50), the output is always set to the output value that the device has just calculated in the background.

5.3 Priority group 3

The locking function with the highest priority level – 3 – overrides all other functions. However, the functions in priority levels 1 and 2 are also still evaluated in the background here, so that after the locking function has been deactivated, the dimmer output can be set to the current required value or adopt a parameterised status. You can also determine this output behaviour via a parameter in the same way as for priority control (Locking function --> 56).

Please note that function changes can also cause changes to the dimming curve, and thus the dimming speed (Dimming speed --> 21).

6 Basic functions

The application provides three basic functions for controlling the brightness of the connected lamps: **Switching**, **Relative dimming** and **Value dimming**.

If you set the parameter *Channel X* to the value *activated*, you will find further parameters on the parameter tab that can be used to determine the functionality of the dimming output.

General	Channel X	activated
X: General	...	...

For each output channel that you activate via the parameter *Channel X*, three communication objects will appear for controlling these basic functions.

- The *Switch object* (1 bit) for the switching function
- The *Dimming object* (4 bit) for the relative dimming function
- The *Value object* (1 byte) for the value dimming function

The dimming time for the respective function can be adjusted in accordance with the base dimming curve and the dimming time reduction. In addition to this, you can change the dimming times that are valid at a specific moment during operation using the *Set object* and the *Dimming time reduction object* (Dimming speed --> 21).

Moreover, two communication objects are displayed for each output channel, reporting the current switching state and brightness value.

- The *Status feedback switch* (1 bit) object for the switching state feedback function
- The *Status feedback value object / brightness value* (1 byte) object for the brightness value feedback function

6.1 Switch(1 bit)

If the *Switch object* receives a telegram with the value "1", the output will be switched on. In the default settings, the dimming time for switching on is 0.6 s at 100%. The output is switched off with an object value of "0".

The maximum value that is approached when switching on via the *Switch object*, can be determined via parameters.

X: General	Switch-ON behaviour (switch object)	**max. brightness**
		selectable brightness
		last brightness value (Memory)

Value: *max. brightness*
The output channel is set to the value which you have set in the parameter *Maximum dimming value in %*.

Value: *selectable brightness*
With this value, an additional parameter appears.

X: General	Switch-ON behaviour	selectable brightness
	Initial brightness in %	**100** (5-100)

The output is switched to the set switch-ON brightness with a "1" telegram. The value of the switch-ON brightness should not exceed the maximum dimming value. The maximum output brightness is always limited by the maximum dimming value. Higher values for the switch-ON brightness are not taken into account. If the selected switch-ON brightness is under the minimum dimming value, this value is not taken into account either. In this case, the minimum dimming value is used as the starting value.

Value: *last brightness value (Memory)*
After a "1" telegram, the output is reset to the last brightness value it had before switching off. Behaviour following download/recovery of bus or mains voltage can also be affected by this parameter (Normal mode, exception mode and stopping operation --> 67).

Execute switch-ON behaviour

You can determine when the aforementioned starting properties are executed.

X: General	Execute selected Switch-ON behaviour	**always** only if status OFF

The setting *always* executes the respective starting properties for every "1" telegram. This corresponds to the default settings.

The setting *only if status OFF* ensures the respective starting properties are only activated when the current brightness value is "0". If the *Switch object* receives a "1" telegram when its status is ON, this has no effect. The current brightness is maintained.

Please note that the setting *Always start at 50% brightness (ESL)* for compact fluorescent lamps influences the starting properties (Starting behaviour --> 16).

Status feedback switch

The value of the signal object of a channel always corresponds to the current output status (ON or OFF). Dimmed corresponds to the ON setting. The status of the signal object corresponds to the yellow channel status LED (Status displays --> 63). Every time you change the state from OFF to ON or vice versa, the current object value is sent to the bus (Status of switch object (channel-specific) --> 61).

6.2 Relative dimming (4 bit)

You can use the relative dimming function to dim the output up or down relative to its current value. The step width of the brightness change and the dimming direction are determined by the telegram value.

Telegrams for the relative dimming function are received via the dimming object. After a relative dimming telegram has been received, a new nominal value is calculated using the current value, the received dimming direction and the received step width.

Example

Minimum dimming value = 10%, current output value = 15%

Dimming brighter telegram with a step width of 12.5%	=>	New nominal value: 15% + 12.5% = 27.5%
Dimming darker telegram with a step width of 25%	=>	New calculated nominal value: 27.5% - 25% = 2.5% Actual value: 10% (minimum dimming value)

The limit values *Minimum dimming value in%* and *Maximum dimming value in %* cannot be crossed during relative dimming.

You can use the parameter *Dimming object switches channel* to determine the other functions of an output channel when a relative dimming telegram is received.

X: General	Dimming object switches channel	not **only ON, not OFF** only OFF, not ON ON and OFF

Value: *not*
This parameter setting prevents switching on and off, i.e. the channel remains off or at the minimum dimming value.

Value: *only ON, not OFF*
The output channel can only be switched on by relative dimming telegrams. If it is switched on and the set value fails to reach the minimum dimming value using relative dimming telegrams, the output remains switched on at the minimum dimming value.

Value: *only OFF, not ON*
The output channel cannot be switched on by relative dimming telegrams. If it is switched on and the nominal value falls short of the minimum dimming value via relative dimming telegrams, the output is switched off.

Value: *ON and OFF*
The output channel can only be switched on by relative dimming telegrams. If it is switched on and the nominal value falls short of the minimum dimming value via relative dimming telegrams, the output is switched off.

Please note that the setting *Always start at 50% brightness (ESL)* for compact fluorescent lamps influences the starting properties (Starting behaviour --> 16).

6.3 Value dimming (1 byte)

The value dimming function is used to directly set the required brightness. To do this, the *Value object* of the output channel sends the required brightness value as a percentage between 0% and 100%. The value range is divided up into 255 brightness levels. A level has a step width of approximately 0.4%. The telegrams for dimming with absolute values have a 1-byte data format (0 to 255).

The required brightness values must lie within the limits which are specified by the minimum and maximum dimming values. If the brightness value exceeds the maximum dimming value, the maximum dimming value will be set as the output value. If the brightness value is lower than the minimum dimming value, this will be set as the output value.

You can establish the settings for switching the dimming output on and off via the value dimming function using a parameter.

X: General	Value object switches channel	not only ON not OFF only OFF not ON **ON and OFF**

Value: *not*
This parameter setting prevents switching, i.e. the channel remains at the current value.

Value: *only ON not OFF*

The output channel can be switched on by value telegrams. If it is switched on and the *Value object* receives the value 0%, the output remains switched on at the minimum dimming value.

Value: *only OFF not ON*

The output channel cannot be switched on by value telegrams. If it is switched on and the *Value object* receives the value 0%, the output is switched off.

Value: *ON and OFF*

The output channel can be switched on by value telegrams. If it is switched on and the *Value object* receives the value 0%, the output is switched off.

Please note that the setting *Always start at 50% (ESL)* for compact fluorescent lamps influences the starting properties (Starting behaviour --> 16).

Status feedback brightness value

The value of the signal object of a channel always corresponds to the current output value (Status of value object/brightness value (channel-specific) --> 62). The object value is sent after the following events.

- A dimming procedure is completed.
- The minimum or maximum dimming value has been reached.
- A dimming process has been stopped by manual operation.

6.4 Relay switch off

There is a voltage at the dimming output even when the brightness value is at 0%. This can lead to a visible residual brightness in LED lamps. Flickering may also be visible. If the relay switches off, these effects are ruled out. In addition, switching off the relay reduces the **energy consumption** in the switched-off state.

Reduce energy consumption

X: General	Relay opens at status OFF	**enabled**
		disabled

The default setting **enabled** opens the relay at a brightness value of 0%. Please note that the output will not be enabled even when the relay is open. If you do not want to switch off, e.g. due to the noise made by the relay, select *disabled*.

6.5 Communication objects

Once a channel has been activated, the following communication objects are available.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT in ETS
0	Switch object	Channel 1, general	1 bit	receiving	1.001 switching
1	Dimming object	Channel 1, general	4 bit	receiving	3.007 dimming
2	Value object	Channel 1, general	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
8	Status feedback switch	Channel 1, status feedback	1 bit	sending, readable	1.011 state
9	Status feedback value object / brightness value	Channel 1, status feedback	1 byte	sending, readable	5.001 percentage (0-100%), 5.010 counter impulses (0-255)

7 Advanced functions

The advanced functions are the functions of the application which share the same priority as the basic functions switch, relative dimming and value dimming (Priorities --> 28). The advanced functions include the following functions.

- Time functions (on/off delay, staircase timer)
- Scenes
- Central function

Any update to one of the basic or advanced functions overwrites the current status, and sets the dimming output according to the last function value received.

7.1 Time functions

Delay functions

The delay functions affect the switching on or off of an output channel. They are switched upstream or downstream in relation to the actual output functions, i.e. they delay the execution of the requested output command.

The delay functions affect the basic and advanced functions. The higher priority functions are always effective immediately and without a delay.

For the delay functions, the dimming curve follows the base dimming curve and the respective dimming time reduction (Dimming speed --> 21). You can activate the delay functions for each channel via a parameter.

General	Channel X	activated
X: General	Delay times	enabled
X: Delay times	ON delay	...
	OFF delay	...

ON delay

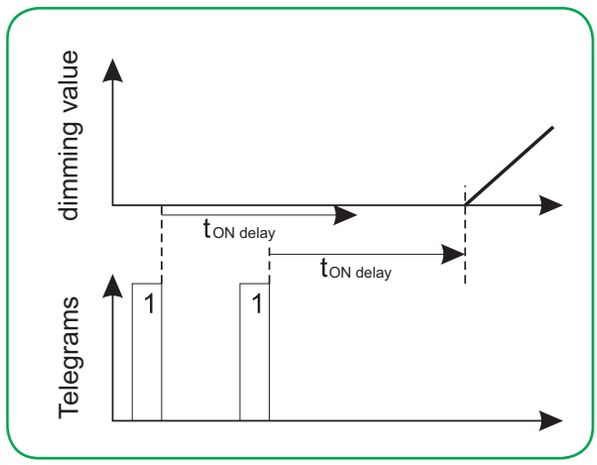
The ON delay becomes active when the output is currently switched off, and is now set to be switched on via a new telegram for a basic or advanced function. If you wish to use the ON delay, you must activate the function.

X: Delay times	ON delay	**deactivated**
		retriggerable
		not retriggerable

Value: *deactivated*
The ON delay is not active.

Value: *retriggerable*

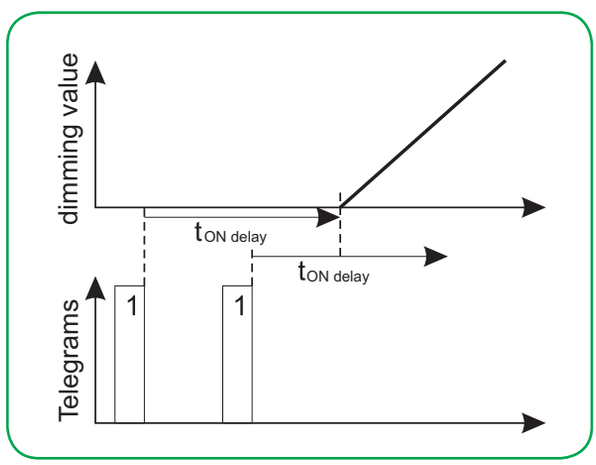
If the channel receives an ON telegram, the ON delay will be started. If a new ON telegram then follows while the delay time is running, the delay time will be restarted. The value of the new telegram is saved as the new setpoint, which is only activated after the delay period has expired.



If the new value is the *STOP dimming* value for relative dimming, then the output value is set to the minimum dimming value after the delay period has expired.

Value: *not retriggerable*

If the channel receives an ON telegram, the ON delay will be started. If a new ON telegram then follows while the delay time is running, this will be ignored and the ON procedure will be executed after the delay time that was initially started has expired. However, the value of the new telegram is saved as the new setpoint, which will be activated after the delay period has expired.



If the new value is the *STOP dimming* value for relative dimming, then the output value is set to the minimum dimming value after the delay period has expired.

Further parameters for ON delay

Parameter for ON delay

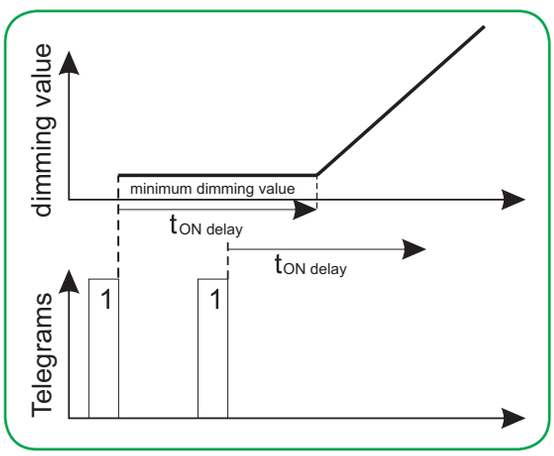
Parameter	Values	Meaning
Output during ON delay	**switched off**	Here you can set which dimming value is selected when switching on.
	at minimum brightness/lower dimming limit	

Parameter for ON delay

Parameter	Values	Meaning
Time base for ON delay	100 ms	The specific delay time for the ON delay is calculated as the product of the time base and the factor. The default values produce an ON delay of 3 minutes.
	1 s	
	1 min	
	1 hr	
Time factor for ON delay (1-255)	**3** (1-255)	

Parameter *Output during ON delay*

You can use this parameter to set whether the output channel remains switched off during the ON delay, or whether it is already set to the minimum dimming value.



In the default settings, the lighting remains **switched off** during the delay time (see above: value *retriggerable* and value *not retriggerable*).

OFF delay

The OFF delay becomes active when the output is switched on, then is set to be switched off via a new telegram for a basic or advanced function. If you want to use the OFF delay, you must activate this function.

The OFF delay is not effective with relative dimming commands, since these are not specific OFF commands.

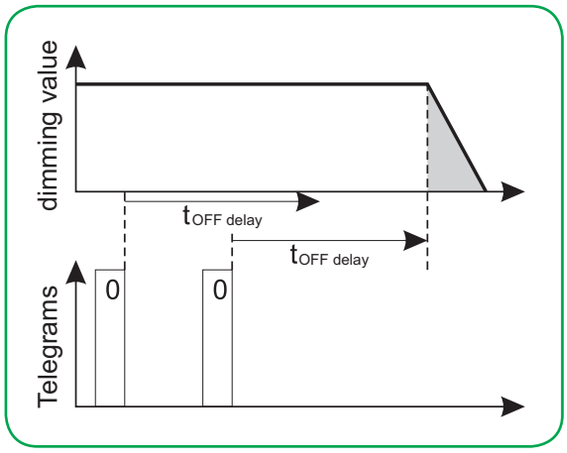
X: Delay times	OFF delay	**deactivated**
		retriggerable
		not retriggerable

Value: *deactivated*

The OFF delay is not active.

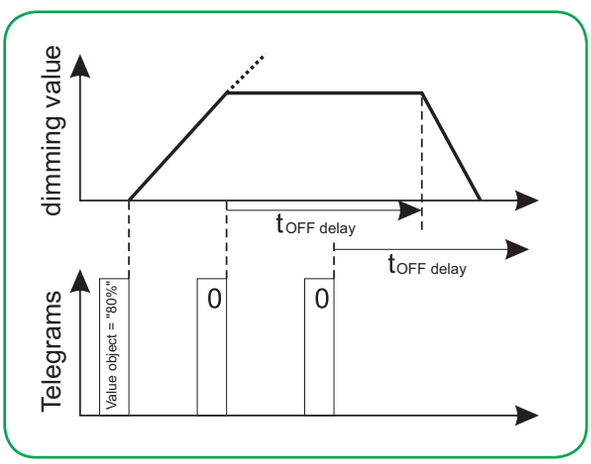
Value: *retriggerable*

If the channel receives an OFF telegram, the OFF delay will be started. If a new OFF telegram then follows while the delay time is running, the delay time will be restarted.



Value: *not retriggerable*

If the channel receives an OFF telegram, the OFF delay will be started. If a new OFF telegram then follows while the delay time is running, it will be ignored and the OFF procedure will be executed once the delay time that was initially started has expired.



Switch-OFF telegram during dimming process

If the output receives a new telegram while an OFF delay is active, thus triggering an ON status, the OFF procedure will be halted and the new setpoint value set.

If the output is conducting a dimming process when an OFF telegram is received, this dimming procedure will be stopped. The output remains at the current dimming value for the duration of the OFF delay, then switches off after the delay has expired. (see above: *OFF delay* value *not retriggerable*).

Further parameters for OFF delay

Parameter for OFF delay

Parameter	Values	Meaning
Time base for OFF delay	100 ms	The specific delay time for the OFF delay is calculated using your settings, as a product of the time base and factor. The default values produce an OFF delay of 3 minutes.
	1 s	
	1 min	
	1 hr	
Time factor for OFF delay (1-255)	**3** (1-255)	

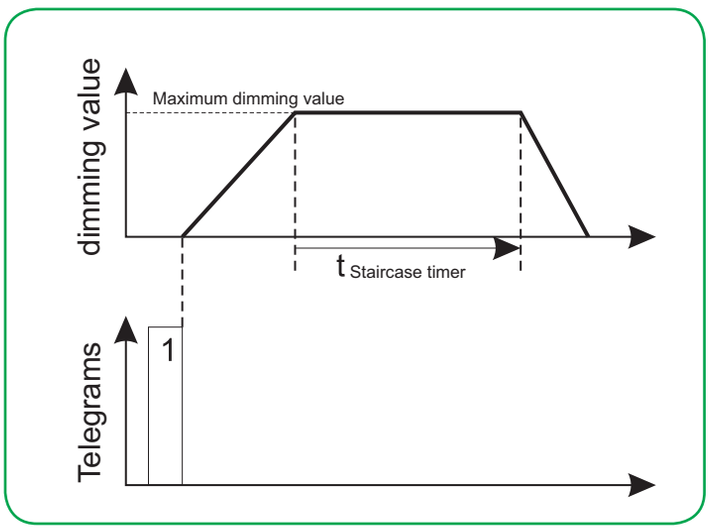
Staircase lighting function

The staircase lighting function offers you the option of switching on a dimmer output with a telegram in such a way that said output switches itself back off automatically after a specified time has expired, without the need for a new telegram. Since this function is often used to control the lighting in staircases, it is named accordingly.

The dimming curve of the staircase lighting function follows the respective dimming time reduction (Dimming speed --> 21).

Note that the dimming speeds for the ON and OFF procedures may differ.

The staircase lighting time does not start until the output channel has reached the final dimming value after dimming up. As such, the dimming time is not included in the staircase lighting time. The dimming value during the staircase lighting time is the (parameterised) maximum dimming value.



How to activate the staircase lighting function:

General	Channel X	activated
X: General	Staircase lighting function	activated
X: Staircase timer	Staircase lighting function	...
	Time base for staircase timer	...
	Time factor for staircase timer (1-255)	...
	Staircase lighting object effective	...
	Switch-OFF warning for staircase timer	...

Staircase timer object

When you have activated the staircase lighting function for an output channel, a new parameter tab and a new communication object labelled *Staircase timer object* **will appear for this channel. The** *Staircase timer object* **has a 1-bit format. The staircase lighting function is controlled via the received telegram values of the** *Staircase timer object***.**

Duration of staircase lighting time

The duration of the staircase lighting time is the product of your setting for the time base and factor.

X: Staircase timer	Time base for staircase timer	1 s **1 min** 1 hr
	Time factor for staircase timer (1-255)	**3** (1-255)

The default values therefore result in a staircase lighting time of 3 minutes.

If the *Staircase timer object* receives a telegram with the value "1", the dimmer output will be switched on and be dimmed to the max. dimming value, remaining at this value for the set staircase lighting time, after which the output channel is then dimmed automatically to the value 0%.

During the staircase lighting time you can modify the output brightness using dimming telegrams via the *Dimming object* or the *Value object*. If the output fails to reach its minimum dimming value due to these dimming telegrams, or if the *Value object* is described with the value "0", the parameter settings for the OFF properties of these functions will apply.

Manually interrupting the staircase timer

You can use the *Staircase lighting function* parameters to specify whether an active staircase lighting function can be interrupted manually or not.

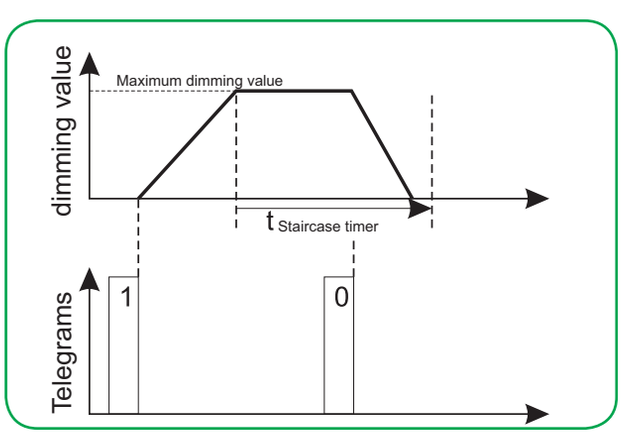
X: Staircase timer	Staircase lighting function	not retriggerable with manual OFF retriggerable with manual OFF sum up time with manual OFF not retriggerable without manual OFF retriggerable without manual OFF sum up time without manual OFF

Value: *with manual OFF/without manual OFF*

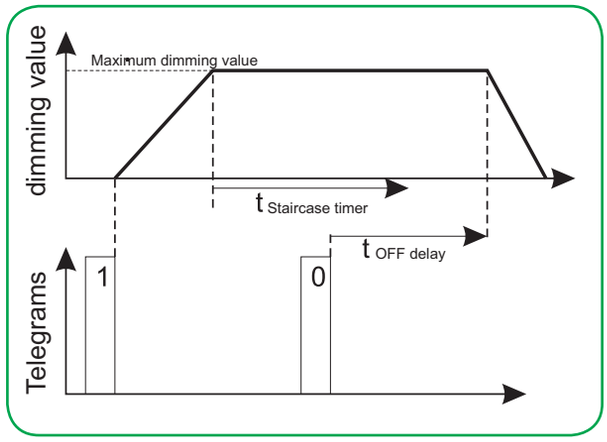
Firstly, you can specify whether an active staircase lighting function can be interrupted manually (*with manual OFF*) or not (*without manual OFF*).

Manual OFF does not refer to a manual switch-off using the manual keys on the device. *Manual OFF* means switching off via a KNX telegram.

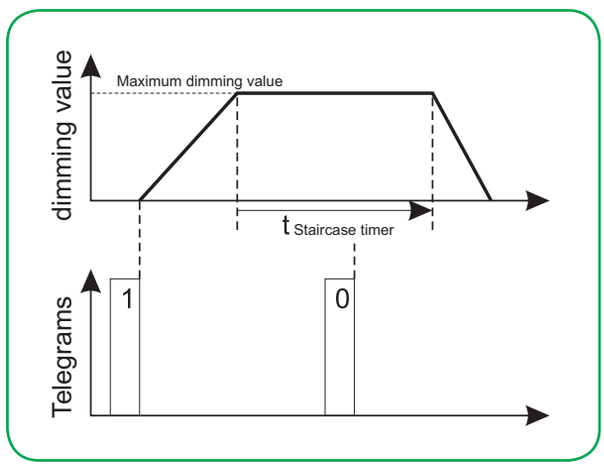
If you have set the parameter to the value *with manual OFF*, the output will be switched off when the *Staircase timer object* receives a telegram with the value "0".



If an OFF delay has also been parameterised, this delay will now be active, and the output will only switch off after the delay time has expired.

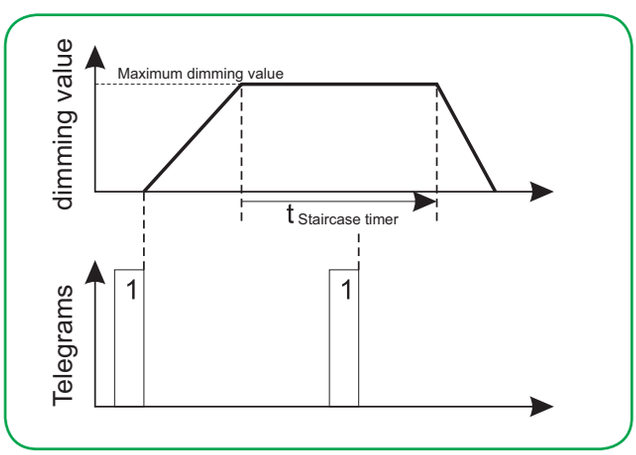


If you have selected the parameter value *without manual OFF*, the staircase lighting function will not be interrupted when a telegram with the value "0" is received, but will continue to run normally until the staircase lighting time has expired.



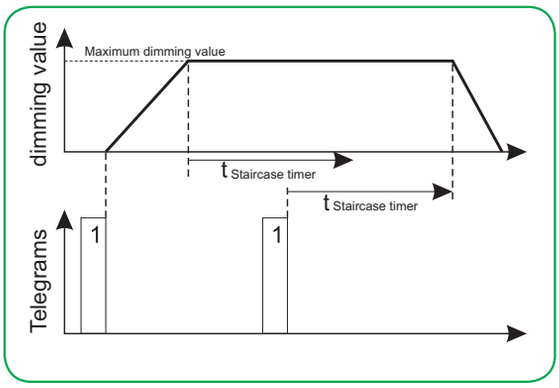
Value: *not retriggerable*

With this value, the staircase lighting function that was started initially proceeds normally, even when additional "1" telegrams are received during the staircase lighting time.

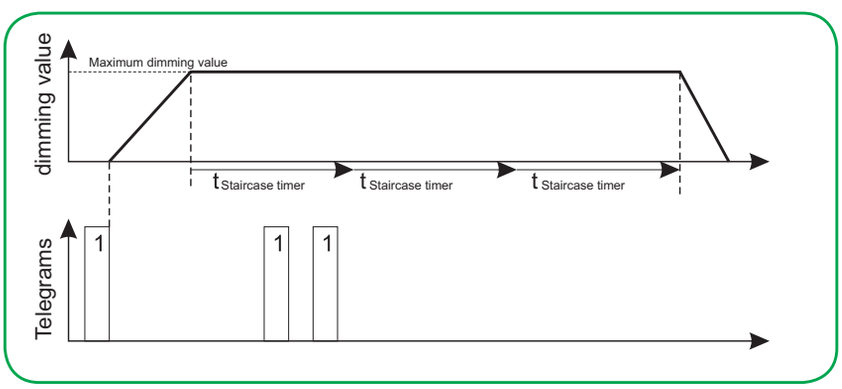


Value: *retriggerable*

If the *Staircase timer object* receives an additional "1" telegram while a staircase lighting function is active, the staircase timer will be restarted. This occurs when a "1" telegram is received while the function is active.



Value: *sum up time*
If the *Staircase timer object* receives a second start signal ("1" telegram) while a staircase lighting function is active, the active staircase lighting time will be doubled. If a third start signal is received, the staircase lighting time will be tripled, then quadrupled with the fourth start signal. The actual staircase lighting time therefore results from the staircase lighting time being multiplied by the number of start signals received. The maximum possible running time for this function is 255 hours.



You can limit the possible running time using the *Max. number of time accumulations* parameter.

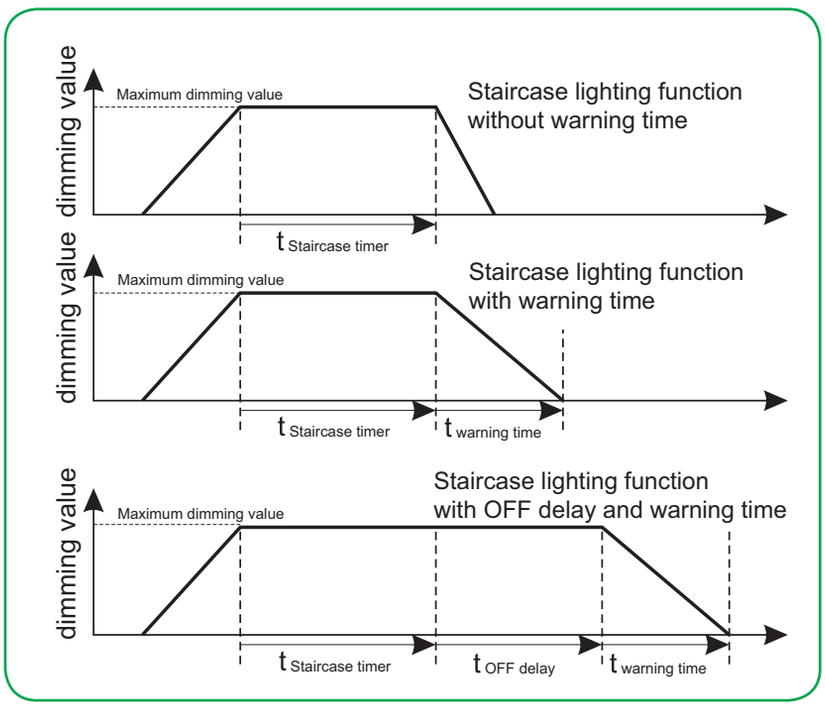
X: Staircase timer	Staircase lighting function	sum up time with manual OFF sum up time without manual OFF
	Max. number of time accumulations (1-255)	**3** (1-255)

Once the staircase lighting time has expired, the dimming output will be dimmed down and switched off. The dimming curve follows the current *Dimming time reduction for staircase lighting switch off* (Dimming speed --> 21). You can use the switch-OFF warning function to change this timed dimming-down behaviour at the end of a staircase lighting function.

X: Staircase timer	Switch-OFF warning for staircase timer	activated
	Warning time for staircase timer in seconds (1-255)	**30** (1-255)

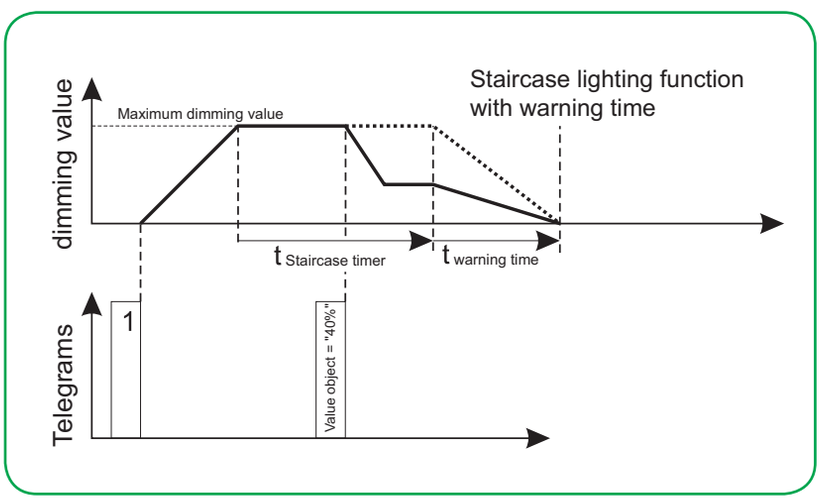
Warning time

If you have activated *Switch-OFF warning for staircase timer* then you can set a warning time as a period between 1 s and 255 s (= 4 min 15 s). This warning time determines how long the dimming-down procedure should last. The active values for the dimming speed and the dimming time reduction are no longer taken into account in this case. The dimming curve is extended or compressed to the set warning time while dimming down. If you have parameterised an OFF delay for the dimmer output, the warning time will begin after the delay period has expired.



Duration of warning period

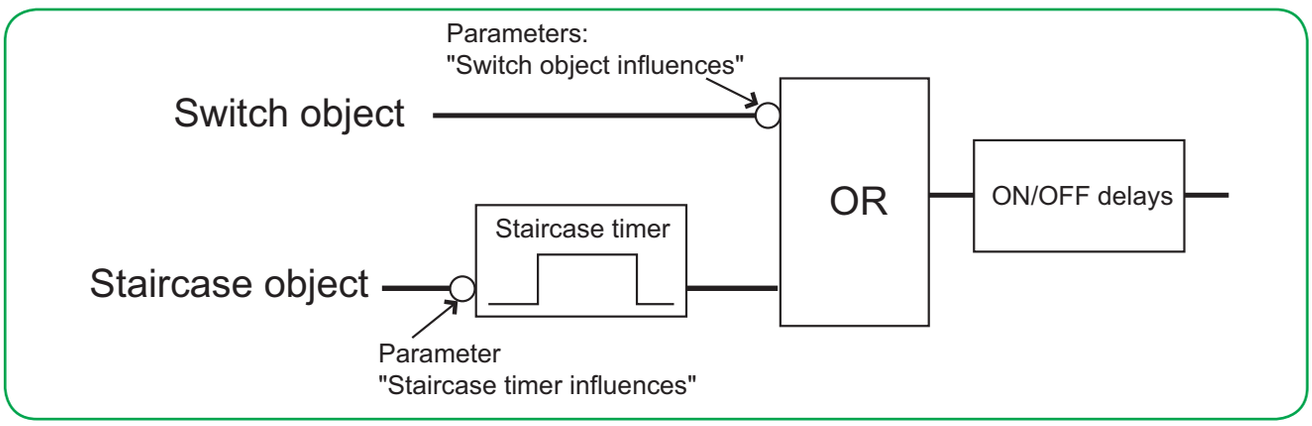
Regardless the output dimming value after the staircase lighting function has expired, the time duration for the dimming-down procedure always corresponds to the warning time when the switch-OFF warning is active (see the following figure).



After the staircase lighting time has elapsed, a new staircase lighting function sequence will be started when a new "1" telegram is received at the *Staircase timer object*, even if the output is still dimming down or a warning time is active.

Logic operation between the switch object and the staircase timer object

In order to control a dimming output, its *Switch object* is connected to its *Staircase timer object* by a logic OR operation.



You can invert the effect of the two object values on this logic operation using parameters.

X: General	Switch object effective	**unchanged**
		inverted
X: Staircase timer	Staircase lighting object effective	**unchanged**
		inverted

Value: *unchanged*
If you set the value to *unchanged*, the logic operation will be formed with the current object value;

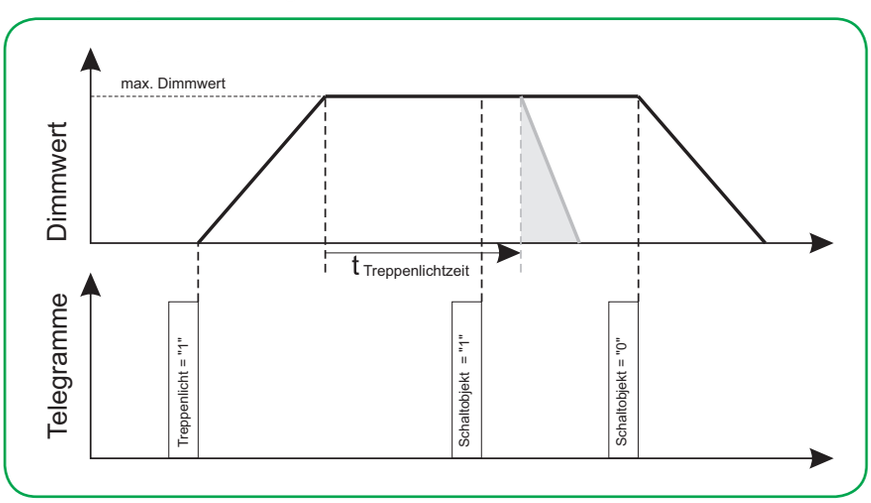
- object value "0" remains "0" and object value "1" remains "1".

Value: *inverted*
If you set the parameter value to *inverted*, the logic operation will be formed using a value which is opposite to the current object value;

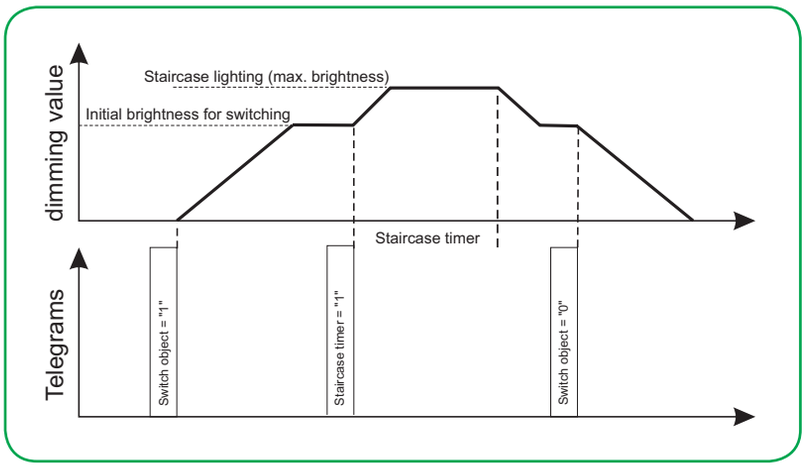
- object value "0" becomes "1" and object value "1" becomes "0".

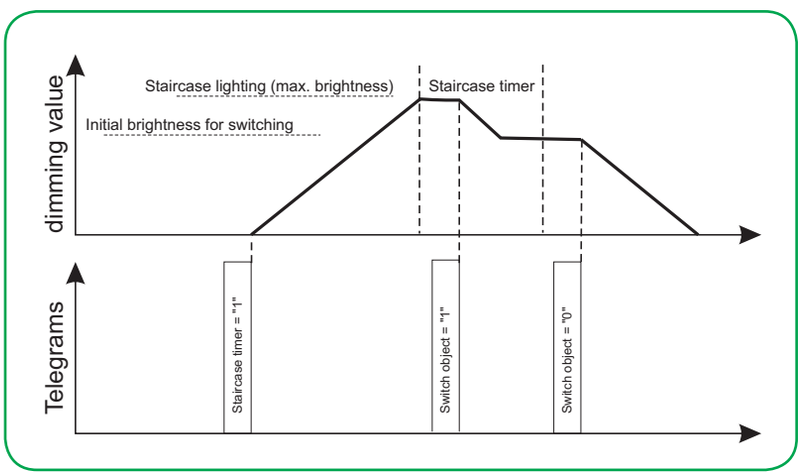
Switching telegram during staircase lighting time

You can overwrite a staircase lighting function that is in progress using a telegram for the *Switch object*. If you do this, the staircase lighting function will continue to run normally in the background.



The brightness of the logic operation result and the dimming speed are defined by the last telegram (see the charts below).





Practical example of cleaning lighting

Implementing temporary permanent light switching

You can use temporary permanent light switching for cleaning lighting, for example. An ON telegram from the *Switch object* causes the light in the staircase lighting function to remain switched on continuously.

For an application of this type, an initial brightness of 100% would be useful.

Practical example for hospital corridors

Staircase lighting function with continuous basic brightness

Another application would be a staircase lighting function combined with a continuous basic brightness for hospital corridors. In order to achieve this, the required basic brightness is parameterised as the initial brightness and the staircase lighting function is switched by a movement detector, for example (see figure above).

See section Logic operation --> 50 for more information on this topic.

Communication objects

You can select the following communication object.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT in ETS4
5	Staircase timer object	Channel X, staircase lighting	1 bit	receiving	1.010 start/stop

7.2 Scenes

You can use the scene functions when you wish to give the user the option of modifying different room functions simultaneously via just one bus telegram. Loading a room scene allows you, for example, to dim the room lighting to a required value, move the blinds into a required position, set the heating control to daytime operation and switch on the power supply to the socket-outlets in a room. Since these functions have different telegram formats and the telegram values can also have different meanings (e.g. value "0" means OFF for lighting and OPEN for blinds), the same setting would require many different telegrams without the scene function.

The scene function allows you to integrate the actuator into a scene controller. There are memory slots for up to 8 different scene values for each output channel. Each of these 8 scene memories can be assigned to one of 64 possible scene numbers (0 to 63). You can save brightness values as scene values in the form of percentages. If the actuator receives a telegram which loads a scene number, the assigned output channel will be dimmed to the saved brightness level. The brightness values for the individual scenes saved during commissioning can be overwritten by the user at a later point if changes are required.

For telegram values from "0" to "63", the brightness values saved for this scene number will be loaded and the dimmer outputs set accordingly.

For telegram values from "128" to "191", the current brightness values of the assigned dimming outputs will be saved as new scene values for the transmitted scene number.

Activating the scene function

General enable

In order to be able to use the scene function for the individual dimming channels, you first have to priority enable the function for the device.

General	Scenes	enabled

If you have set the parameter *Scenes* to the value *enabled*, then the *Scene object* will appear and can then be used to receive scene telegrams.

Channel enable

You can then activate the scene function individually for each channel.

General	Scenes	enabled
X: General	Scenes	enabled
X: Scenes	Overwrite scene values in actuator during download	...
	Same dimming time	...
	Scene 1	...
	...	...
	Scene 8	...

Values

If you have activated the *Scenes* parameter of an output channel, a new parameter tab will appear for this channel. This can be used to set the scene values. You can activate each of the eight scene memories separately. You can assign a scene number (0-63) to and set a brightness value for each of the activated scenes.

X: Scenes	Scene 1	activated
	Scene 1: Scene number (0-63)	**0** (0-63)
	Scene 1: Brightness value in %	**15** (0-100)
	...	...
	Scene 8	...

When setting the brightness values, observe the limits set by the minimum and maximum dimming values.

Loading scene values

The *Scene object* allows you to load saved brightness values. After a telegram is received, the transmitted scene number is evaluated. If one of the eight scene memories has been assigned to this scene number, the saved brightness value will be set.

If several of scene memories 1 to 8 have been assigned to the same scene number, the first memory value will be activated.

Saving scene values

If the *Scene object* receives a new telegram with a value between 128 and 191, the current received dimming value will be saved as the new brightness value.

Example

Settings in ETS

Channel 1	Scene 1	activated at scene number 0	Brightness = 50%
	Scene 2	activated at scene number 1	Brightness = 30%
	Scenes 3 to 8	deactivated	
Channel 2	Scene 1	activated at scene number 0	Brightness = 90%
	Scene 3	activated at scene number 2	Brightness = 50%
	Scenes 2, 4 to 8	deactivated	

Load scene number

Scene number 0	=> Channel 1 dims to 50% => Channel 2 dims to 90%
Scene number 1	=> Channel 1 dims to 30%, => Channel 2 does not respond
Scene number 2	=> Channel 1 does not respond => Channel 2 dims to 50%

Outputs are manually dimmed to new values

Channel 1	=> Brightness = 70%
Channel 2	=> Brightness = 20%

Program scene number 0 (value of telegram 128)

Channel 1	Scene 1 brightness = 70%
Channel 2	does not respond because scene number 0 is not assigned

Note the difference from the first loading procedure for scene number 0 above!

If you activate the parameter *Overwrite scene values in actuator during download*, then the scene values programmed during operation, which are saved in the device for this channel, will be overwritten with your preset values on download. If you don't want to overwrite the values in the device when downloading, then you must disable this parameter.

X: Scenes	Overwrite scene values in actuator during download	deactivated **activated**

Recommendation

The *deactivate* setting is very useful when the end user wants to try out and set the values individually. When a new download is performed, your saved values are not overwritten.

Same dimming time for scene function

This function is explained in section Same dimming time --> 24. After general activation of Same dimming time, you can link the scene function of an output channel with this function.

X: Scenes	Same dimming time	**deactivated** activated

Extension unit function for scenes

This function also allows you to activate or re-program the scene values for the scene memories 0 to 3 using 1-bit telegrams. The extension unit function is activated once for the device.

General	Scenes	enabled
	Extension unit scenes	enabled

If you have enabled the parameter *Extension unit scenes*, the additional communication objects will appear with the 1-bit data format.

- Recall scene 1/2
- Recall scene 3/4
- Save scene 1/2
- Save scene 3/4

You can also use these objects to load or re-program scenes 1 to 4.

- Recall scene 1/2 = "0": Scene number 0 is activated
- Recall scene 1/2 = "1": Scene number 1 is activated
- Recall scene 3/4 = "0": Scene number 2 is activated
- Recall scene 3/4 = "1": Scene number 3 is activated
- Save scene 1/2 = "0": Scene number 0 is programmed
- Save scene 1/2 = "1": Scene number 1 is programmed
- Save scene 3/4 = "0": Scene number 2 is programmed
- Save scene 3/4 = "1": Scene number 3 is programmed

The actions correspond to a normal loading procedure or memory command for scene numbers 0, 1, 2 or 3 using the *Scene object*. The extension unit function is not available for scene numbers 4 to 63. You can only address these scene numbers using the *Scene object*.

Communication objects

You can select the following communication objects.

Communication objects for scenes

No.	Name	Object function	Length	Properties	DPT in ETS
40	Scene object	Scenes	1 byte	receiving	5.010 counter pulses (0-255)
41	Recall scene 1/2	Scene extension unit	1 bit	receiving	1.022 scene
42	Recall scene 3/4	Scene extension unit	1 bit	receiving	1.022 scene
43	Save scene 1/2	Scene extension unit	1 bit	receiving	1.022 scene
44	Save scene 3/4	Scene extension unit	1 bit	receiving	1.022 scene

7.3 Central function

You can use the central function to switch or dim several output channels simultaneously with a telegram. This function is useful, for example, if you want to switch off all the lights at the press of a button when leaving your house, and want to switch on a certain group of lights at the press of a button when you return home. Another application for the central function would be to set the lights to a low dimming value at the press of a button when you are on the way to the bathroom, so as not to wake other people in the house.

If you wish to use the central function for one or more output channels, you will need to priority enable the function for the device first. You will then be able to access three new communication objects that can be individually activated or deactivated using parameters.

General	Central function	enabled
	Central switch object	...
	Central dimming object	...
	Central value object	...

The activated objects appear as new communication objects after activation.

- *Central switch object*
- *Central dimming object*
- *Central value object*

Assigning the output channel to the central function

You can select the assignment of an output channel to the central function individually for each channel during parameterisation.

X: General	Central function	enabled

If you have assigned a channel to the central function, the output value of this dimming output can be controlled not only by the channel-specific *Switch objects*, *Dim-*

ming objects and *Value objects* (Basic functions --> 29), but also via the objects enabled in the central function. The central function controls the assigned group of channels simultaneously.

Switching via a central object

General enable

Following general activation of the central function and activation for an output channel, a new parameter window will appear for this channel. In this parameter window, you can specify how the assigned channel should respond when a new telegram value is received via the *Central switch object*.

General	Central function	enabled
	Central switch object ...	
X: General	Central function	enabled
X: Central function	Same dimming time	...
	Function at central switching value = 0	...
	Function at central switching value = 1	...
	Desired brightness at switching object central = 1 in %	...

First, select how you want the output to react when a new object value is received for the central object. If you wish to set a variable brightness, you can specify the required values other parameters.

Central switch object parameter

Parameter	Values	Meaning
Same dimming time	**deactivated**	First, select how you want the output to react when a new object value is received for the central object. You can then select a brightness in % if required.
	activated	
Function at central switching value = 0	no reaction	
	switch off	
	switch on at selectable brightness	
Desired brightness at switching object central = 0 in %	**100** (5-100)	
Function at central switching value = 1	no reaction	
	switch off	
	switch on at selectable brightness	
Desired brightness at switching object central = 1 in %	**100** (5-100)	

Remember that the set values must lie within the limitations set by the respective minimum and maximum dimming values.

Relative dimming and value dimming via the central function

The two dimming functions in the central function operate in the same manner as the corresponding basic functions (Basic functions --> 29).

Central dimming object
Central value object

With these functions, the telegrams also affect the entire group of assigned output channels simultaneously. The *Central dimming object* causes relative dimming operations, while the *Central value object* sets a new absolute dimming value for the group.

Dimming speed of the central function

The dimming speed for operations via the central functions corresponds to the settings for the corresponding basic functions. The dimming time for setting a new brightness value therefore corresponds to the setting of the active set for dimming time reduction for the switching function, relative dimming and value dimming.

Same dimming time for central function

The application also offers you the option of activating the Same dimming time function for the central switching and value dimming functions. This ensures that all the dimming outputs controlled via the central function reach the required dimming value simultaneously. The settings for the dimming speeds are ignored when using this function option (Dimming speed --> 21). You can use a parameter to determine whether an output should also be assigned to the Same dimming time function in relation to the central function.

General	Central function	enabled
	Central switch object ...	
	Same dimming time at central function and scenes	enabled
X: General	Central function	enabled
X: Central function	Same dimming time	**deactivated** activated

Communication objects

You can select the following communication objects.

Communication objects

No.	Name	Object function	Length	Properties	DPT in ETS
45	Central switch object	Central function	1 bit	receiving	1.001 switch
46	Central dimming object	Central function	4 bit	receiving	3.007 dimming control
47	Central value object	Central function	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)

8 Higher priority functions

With the logic operation, priority control and locking functions, the application provides you with three higher priority functions. The functions with higher priority are processed before functions with lower priority.

Priorities	**High priority**
3	Locking function
2	Logic operation or priority control
1	Switching, dimming, value dimming, time functions, scenes, central functions
Low priority	

Alternatively, you can activate the logic operation or priority control functions for an output channel using a parameter.

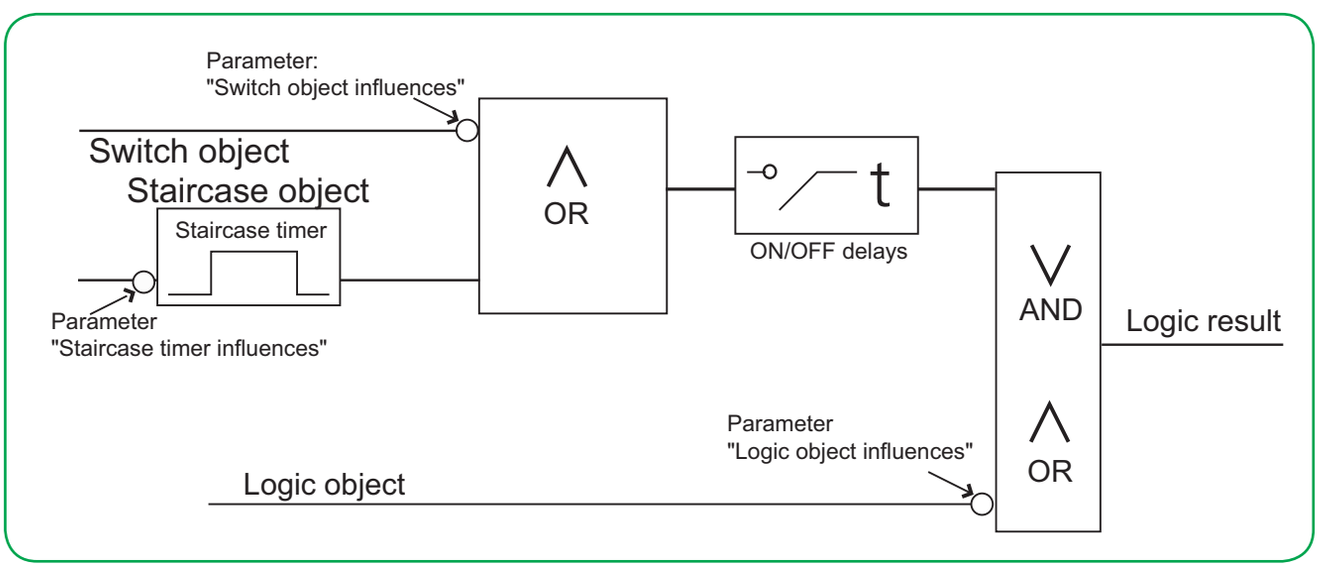
X: General	Higher priority function	**deactivated** logic operation priority control

You can also use a parameter to activate a locking function with the highest priority for each output channel.

X: General	Locking function	**deactivated** activated

8.1 Logic operation

Every output channel for which you have selected the logic operation as the higher priority function has a *Logic object* (1 bit). The value of this *Logic object* is then logically linked to the value of both the *Switch object* and the *Staircase timer object* of this output channel. The OR logic operation between the switch object and staircase timer object is described in the section Logic operation between the switch object and the staircase timer object --> 42.



X: General	Higher priority function	Logic operation
X: Logic operation	Logic operation	**OR**
		AND
	Logic object effective	**unchanged**
		inverted
	Value of logic operation object after bus voltage recovery or download	**0**
		1
	Brightness with logic object "1" in %	**100** (0-100)
	Brightness with logic object "0" in %	**0** (0-100)

The AND function and OR function are available as logic operations.

Parameter: *Brightness with logic object "1" in %*

Selectable brightness

You can use the *Logic object* to overwrite the current brightness of a switch or staircase lighting function and set it to a parameterisable brightness value.

- Brightness with *Logic object* "0" in % with an AND logic operation
- Brightness with *Logic object* "1" in % with an OR logic operation

With an OR logic operation, the parameterised brightness is specified with an object value "1". With an AND logic operation, it is specified with an object value "0".

Parameter: *Logic object effective*

Inversion

You can invert the effect of the current object values on this logic operation.

- If you set the value to *unchanged*, the logic operation will be formed using the current object value.
  - Object value "0" remains "0" and object value "1" remains "1".
- If you set the parameter value to *inverted*, the logic operation will be formed using a value which is opposite to the current object value.
  - Object value "0" becomes "1" and object value "1" becomes "0".

However, the *Central switch object* cannot be inverted.

The switch object and *staircase timer object* are also combined via an OR logic operation when the logic function is inactive (Logic operation between the switch object and the staircase timer object --> 42).

Brightness and inversion settings

The following example shows how the settings for brightness and inversion can be combined. A switch object and a logic object are activated with the following settings:

Example

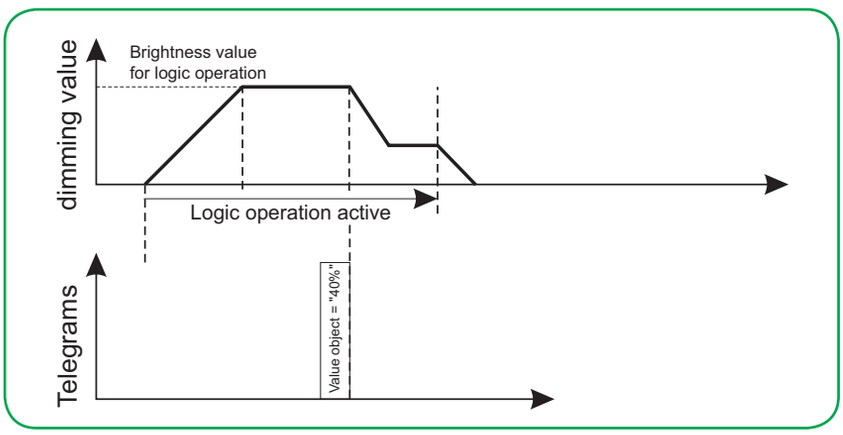
- *Logic operation*: OR
- *Brightness with logic object "1" in %*: 60
- *Logic object effective*: inverted

Actions	Output
The switch object and logic object have the value "0"	Output is switched off
The logic object receives the value "0"	
Value "0" is inverted to "1"	Switch on to 60%
The logic object receives the value "1"	
Value "1" is inverted to "0"	Output switches off
The switch object receives the value "1"	Output switches to 100%

You can also use telegrams for the *Dimming object* and *Central dimming object* (4 bit) or *Value object* and *Central value object* (1 byte) and use scene telegrams to modify the brightness value of the dimming output even while a logic function is active.

Here, the output can also be switched on or off, even when you have selected different properties for when the logic function is active. Otherwise, an active logic function can only be overridden by the locking function with a higher priority.

Each time a telegram is received via the *Switch object*, the *Central switch object* or the *Staircase timer object* (before the warning), the logic function will be updated and the logic operation result re-calculated.



The brightness of the logic operation result and the dimming speed are defined by the last telegram.

Bus voltage recovery or download

Parameter: *Value of logic operation object after bus voltage recovery or download*

The properties at the output are calculated using the value of the logic object and the selected logic operation.

Parameter	Value	Logic operation	Properties of each channel
Value of logic operation object after bus voltage recovery or download	0	AND	The output assumes the brightness value that is parameterised for the logic operation. This value is determined via a further parameter: *Brightness with logic object "0" in %* (0 - 100)
	0	OR	The logic operation has no effect on the output status.
	1	AND	The logic operation has no effect on the output status.
	1	OR	The output assumes the brightness value that is parameterised for the logic operation. This value is determined via a further parameter: *Brightness with logic object "1" in %* (0 - 100)

Examples of transition to normal mode can be found in section Examples with logic operation function --> 72.

After a bus voltage failure when mains voltage is present, the system transfers to Exception mode --> 77. The logic operation is then inactive and the channel keys can be used to dim and switch.

8.2 Priority control

If you have selected priority control for a channel, then the *Priority control object* for this channel will be available to you, together with a new parameter tab for further function settings. The *Priority control object* has a length of 2 bits and the following data format.

Bit 1	Bit 0	Output properties
1	1	Priority control, dimming output: on
0	1	End of priority control
1	0	Priority control, dimming output: off
0	0	End of priority control

X: General	Higher priority function	Priority control
X: Priority control	Behaviour at start of priority control ON	...
	Desired brightness at start of priority control ON in %	...
	Behaviour at start of priority control OFF	...
	Required brightness at start of priority control OFF in %	...
	Behaviour at end of priority control	...
	Desired brightness at end of priority control in %	...
	Behaviour of priority control after bus voltage recovery	...

Activating priority control

The priority control for the output is activated when the value "1" is received on bit 1.

Settings at start of priority control

Depending on bit 0 of the received telegram, the assigned dimming output is set according to your parameter settings.

Behaviour at start of priority control and dimming output: on

(Bit 1 = "1" and bit 0 = "1")

Values when priority control active

Parameter	Values	Meaning
Behaviour at start of priority control ON	no reaction	The assigned dimming output is set here.
	switch off	
	switch on at selectable brightness	
Desired brightness at start of priority control ON in %	**100** (5 ... 100)	The dimming output is set to this value.

Behaviour at start of priority control and dimming output: off

(Bit 1 = "1" and bit 0 = "0")

Parameter	Values	Meaning
Behaviour at start of priority control OFF	no reaction	The assigned dimming output is set here.
	switch off	
	switch on at selectable brightness	
Required brightness at start of priority control OFF in %	100 (5 ... 100)y	The dimming output is set to this value.

Value: *no reaction*

The dimming output remains at its current brightness value at the start of priority control. While priority control is active, this output value can only be changed by the locking function. A locking function has the highest priority.

Value: *switch off*

The dimming output is switched off.

Value: *switch on at selectable brightness*

The dimming output is set to the defined brightness value.

Deactivating priority control

The priority control dimming output remains in the selected status until priority control is enabled again by a new telegram with the value "0" on bit 1. You can use parameters to set how a dimming output should respond when priority control is removed again.

Values when priority control inactive

Parameter	Values	Meaning
Properties at end of priority control	no reaction	Here you can set how the dimming output should respond when the priority control is removed again.
	switch off	
	switch on at selectable brightness	
	follows secondary functions	
Desired brightness at end of priority control in %	100 (...)	After the priority control, the dimming output is set to the value that has been calculated in the background.

Value: *no reaction*

The dimming output remains at its current output value until the output receives the next switch or dimming telegram.

Value: *switch off*

The dimming output is switched off at the end of priority control.

Value: *switch on at selectable brightness*

The dimming output sets the brightness value you have determined using an additional parameter.

Value: *follows secondary functions*

Telegrams for the secondary functions continue to be processed in the background while a priority control is active, but are not forwarded to the dimming outputs. After

priority control has been deactivated, the last valid value of the secondary function is performed.

Dimming speed of priority control

The dimming speed for brightness changes during priority control is affected by the dimming time reduction that is currently valid for higher priority functions (Dimming speed --> 21). The following example illustrates the properties before, during and after priority control.

Example

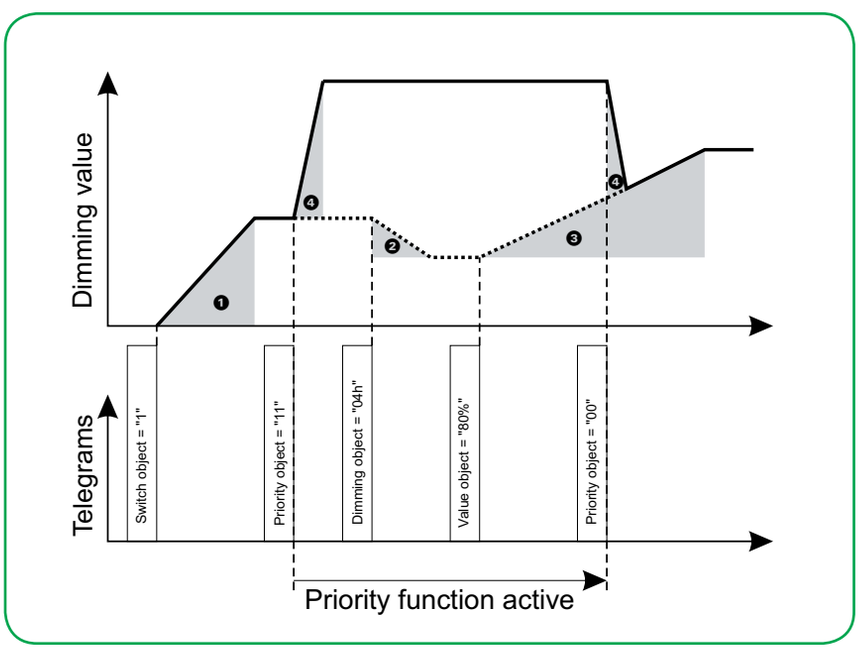
You have applied the following settings:

X: General	Higher priority function	Priority control
X: Priority control	Behaviour at start of priority control ON	switch on at selectable brightness
	Desired brightness at start of priority control ON in %	100
	Properties at end of priority control	follows secondary functions

After priority control is activated, the dimming time reduction settings for higher priority functions are used to dim to 100%.

During priority control, telegrams for secondary functions are received but not executed.

After priority control is finished, the dimming time reduction for higher priority functions is used to dim to the current dimming value. The lights will then continue to be dimmed at the dimming speed of the secondary function that is currently active.



❶: Dimming time reduction for switching telegrams and staircase lighting switch-on.
❷: Dimming time reduction for dimming telegrams.
❸: Dimming time reduction for value telegrams.
❹: Dimming time reduction for higher priority functions.

Value of priority control after bus voltage failure

The mains and bus voltage may fail while priority control is active. You can specify the priority control properties for when the bus voltage recovers by setting a parameter.

Parameter	Values	Properties of each channel
Behaviour of priority control after bus voltage recovery	**inactive**	Priority control is not active and has no effect on the output status.
	active OFF	Priority control is active and the parameterised properties are executed. The brightness value at the output is determined via a further parameter: *Behaviour at start of priority control OFF*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	active ON	Priority control is active and the parameterised properties are executed. The brightness value at the output is determined via a further parameter: *Behaviour at start of priority control ON*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	as before bus voltage failure	Priority control will be set to the status that was active before the bus voltage failure. The output has the same brightness value as before the failure.

Examples of transition to normal mode can be found in section Examples with priority control --> 74.

After a bus voltage failure when mains voltage is present, the system transfers to Exception mode --> 77. Priority control is then inactive and the channel keys can be used to dim and switch.

8.3 Locking function

If you have activated the locking function for a channel, then the *Locking object* (1 bit) will appear for this channel, together with a new parameter tab where you can select further function settings.

X: General	Locking function	activated
X: Locking function	Locking	...
	Behaviour at start of locking	...
	Desired brightness at start of locking in %	...
	Behaviour at the end of locking	...
	Desired brightness at end of locking in %	...
	Status of locking after bus voltage recovery	...

Activating the locking function

First, specify the switch-ON behaviour for the locking function.

Activation

Parameter	Values	Meaning
Locking	at object value = "0"	Here you can set for which object value the function is activated.
	at object value = "1"	

If the *Locking object* receives a telegram with the object value "0" or "1" for activation, the locking function will be started. It will remain active until the *Locking object* receives a telegram with the opposite object value. You can use additional setting options to specify the properties of the dimming output at the start and the end of a locking function.

Value on activation

Parameter	Values	Meaning
Behaviour at start of locking	**no reaction**	The dimming output remains at its current value at the start of a locking function. This value can now no longer be changed as long as the locking function is active.
	switch off	The dimming output is switched off and remains in this state until the end of the locking function, or until the locking function receives the first active switching or dimming telegram.
	switch on at selectable brightness	The dimming output sets the brightness value that you determine via the parameter *Desired brightness at start of locking in %*.
Desired brightness at start of locking in %	**100** (5-100)	Required brightness value

Deactivating the locking function

The locked dimming output remains in the selected status until the locking function is enabled again by a new telegram with the value "0" or "1". You can use parameters to set how a dimming output should respond when the locking function has been removed again.

Value on deactivation

Parameter	Values	Meaning
Behaviour at the end of locking	**no reaction**	The locking function is deactivated without the dimming output responding. The output remains at its current brightness value until the next active switching or dimming telegram.
	switch off	The dimming output is switched off at the end of the locking function.
	switch on at selectable brightness	The dimming output sets the brightness value that you determine via the parameter *Desired brightness at end of locking in %*.
	follows secondary functions	Telegrams for the secondary functions continue to be processed in the background while a locking function is active, but are not forwarded to the dimming outputs. After the end of the locking function, the dimming output is set to the value that has been calculated in the background for the secondary functions.
Desired brightness at end of locking %	**100** (5-100)	Required brightness value

Dimming speed of the locking function

The dimming speed for brightness changes during a locking function is affected by the dimming time reduction for higher priority functions (Dimming speed --> 21). The following example illustrates the properties before, during and after a locking function.

Example

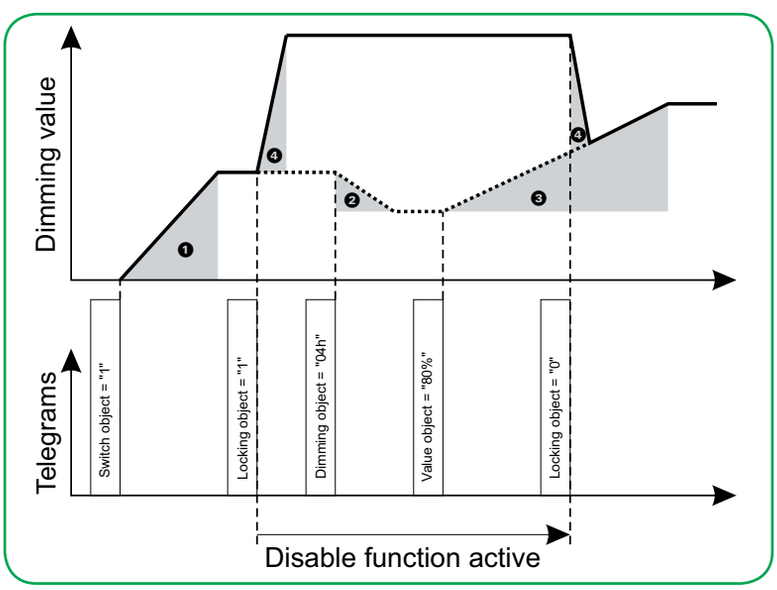
You have applied the following settings:

X: General	Locking function	activated
X: Locking function	Locking	at object value "1"
	Behaviour at start of locking	switch on at selectable brightness
	Desired brightness at start of disable function in %	100
	Behaviour at the end of locking	follows secondary functions

After the locking function is activated, the dimming time reduction settings for higher priority functions are used to dim to 100%.

During the locking function, telegrams for secondary functions are received but not executed.

After the locking function is finished, the dimming time reduction for higher priority functions is used to dim to the current dimming value. The lights will then continue to be dimmed at the dimming speed of the secondary function that is currently active.



❶: Dimming time reduction for switching telegrams and staircase lighting switch-on.
❷: Dimming time reduction for dimming telegrams.
❸: Dimming time reduction for value telegrams.
❹: Dimming time reduction for higher priority functions.

Value of the locking function after bus voltage failure

The mains and bus voltage may fail while the locking function is active. You can specify the status of the locking function for when the bus voltage recovers by setting a parameter.

Parameter	Values	Properties of each channel
Status of locking after bus voltage recovery	**inactive**	The locking function is not active and has no effect on the output status.
	active	After bus voltage recovery, the locking function will be directly active. The brightness value at the output is determined via a further parameter: *Behaviour at start of locking*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	as before bus voltage failure	The locking function is set to the status that was active before the bus voltage failure. The output has the same brightness value as before the failure.

Examples of transition to normal mode can be found in section Examples with locking function --> 76.

After a bus voltage failure when mains voltage is present, the system transfers to Exception mode --> 77. Locking function is then inactive and the channel keys can be used to dim and switch.

8.4 Communication objects

You can select the following communication objects.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT in ETS
6	Logic object	ChannelX, high.priority funct.	1 bit	receiving	1.* 1-bit, 1.010 switch
6	Priority control object	ChannelX, high.priority funct.	2 bit	receiving	2.001 dimming control
7	Locking object	ChannelX, high. priority funct.	1 bit	receiving	1.* 1-bit, 1.010 switch

9 Status reports

The application provides you with numerous options for reporting the current device status and the status of the dimming channels via communication objects. Based on these status reports, you can trigger certain control processes in the system or enable and locking functions. In addition to this, status reports are also suitable for displaying current operating statuses by means of visualisation software.

The status reports of the output channels are made available via communication objects. You can set the transmission characteristics of these status objects to one of the following values using parameters.

Value: *deactivated*
The status object is not active.

Value: *active status response object*
When the status changes, the new status will be transmitted automatically.

Value: *passive status object*
The *Status object* does not transmit its values. However, the current status is available in each case, and can be read out by other bus devices.

9.1 Status error (all channels)

A communication object is available to report error statuses that interrupt operation at a channel output. You can activate a shared report for all the actuator's channels via a parameter.

General	Status error	...

After activation, the additional communication object appears with the label *Status feedback error* or *Status error*, depending on which parameters are set.

When the bus voltage is present, the following events are reported at an output channel.

- Mains voltage failure
- Short circuit
- Overload

The error message is issued regardless of the output channel at which this error occurs. The object contains the value "1". An on-site fault analysis can be performed using the LEDs on the device. Once the error has been rectified and the device is operating correctly again, the object will receive the value "0".

If you have accessed the parameter *Status error* and entered the value *active status response object*, then the corresponding value will be sent once the bus voltage is restored.

For further information on the display of the device functions, please refer to the following section Status displays --> 63. For information on faults, please refer to section Stop in operation --> 79 and the "What should I do if there is a problem" section in the user manual.

Communication objects

You can select the following communication objects.

Communication objects

No.	Name	Object function	Length	Properties	DPT
48	Status feedback error	Status feedback	1 bit	sending, readable	1.011 status
48	Status error	Status	1 bit	readable	1.011 status

9.2 Status of switch object (channel-specific)

The current status of the channel can be reported for each output channel. You can deactivate the signal object individually for each channel or change the transmission characteristics.

X: General	Status switch	...

Depending on which transmission characteristics you have selected, the designation of the signal object alternates between *Status feedback switch* and *Status switch*.

The value of the signal object of a channel always corresponds to the current output status (ON or OFF). Dimmed corresponds to the ON setting. The status of the signal object also corresponds to the yellow channel status LED (Status displays --> 63). The signal object is set as a status feedback object at the factory. Every time you change the state from OFF to ON or vice versa, the current object value is sent to the bus.

The value of the *Switch object* may differ from the current channel value (e.g. with parameterised delay times). For this reason, you should use the status feedback object for the channel status.

The object value of the signal object as a passive status object always corresponds to the current output value, and can be read by a visualisation.

Communication objects

You can select the following communication objects.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT in ETS4
8	Status feedback switch	Channel X, status feedback	1 bit	sending, readable	1.011 status
8	Status switch	Channel X, status	1 bit	readable	1.011 status

9.3 Status of value object/brightness value (channel-specific)

The current brightness value can be reported for each output channel. You can deactivate the signal object individually for each channel or change the transmission characteristics.

X: General	Status value object / brightness value ...

Depending on which transmission characteristic you have selected, the designation of this object alternates between the values *Status feedback value object / brightness value* and *Status value object / brightness value*.

The value of the signal object of a channel always corresponds to the current dimming value of the output between 0% and 100% in 255 steps.

The signal object is set as a status feedback object at the factory. The current object value is then sent to the bus when the output reaches the dimming value. The object value is sent when:

- A dimming procedure is completed
- The minimum or maximum dimming value has been reached
- A dimming process has been stopped by manual operation

The object value of the signal object as a passive status object always corresponds to the current output value.

Communication objects

You can select the following communication objects.

Communication objects per channel

No.	Name	Object function	Length	Properties	DPT
9	Status feedback value object / brightness value	Channel X, status feedback	1 byte	sending, readable	5.001 percent (0-100%), 5.010 counter impulses (0-255)
9	Status value object / brightness value	Channel X, status	1 byte	readable	5.001 percent (0-100%), 5.010 counter impulses (0-255)

10 Status displays

The actuator has different lighting displays.

- Yellow channel status LED at each output: shows current status of switch outputs.
- Red channel error LED at each output: shows short circuit or overload.
- Green operational LED: shows the operational status of the device.

10.1 Switch output status

The yellow channel status LED indicates the switching or dimming status of an output channel. If the channel is switched off, the status display is also switched off. The status display lights up when the channel is switched on or dimmed (value > 0). The channel status LED corresponds to the status of the object *Status feedback switch* or *Status switch* for the respective channel.

10.2 Short-circuit or overload status

The red channel error LED shows whether the actuator has detected a short circuit or overload for each output (Stops in operation due to overload --> 79). If parameterised accordingly, an error message will also be sent (Status error (all channels) --> 60).

Overload

If an overload occurs at an output channel, the output in question is automatically dimmed down to minimum brightness.

The red channel error LED and the yellow channel status LED light up. You can acknowledge the fault by pressing the channel key. The channel can then be operated normally again. If an overload is detected for a second time, the channel is switched off and displays the same behaviour as in the case of a short circuit.

Short circuit or repeat overload

If there is a short circuit or a repeat overload is detected, the connected load is switched off directly and cannot be switched back on.

The red channel error LED lights up and the yellow channel status LED is turned off.

To remedy this, the mains voltage of the channel in question must be switched off.

Have a qualified electrician rectify the cause (For your safety --> 11).

Once the cause has been rectified, you can use the channel normally again.

Operational status

Mains voltage failure

When the mains voltage fails, the connected loads of one or more channels switch off automatically and can no longer be switched or dimmed.

If the bus voltage is still active, the green operational LED will flash. The red channel error LED and the yellow channel status LED are turned off. If parameterised accordingly, an error message will be sent.

When the bus voltage fails, the operational LED is turned off.

Normal and exception mode

The green operational LED lights up when the application is loaded and the bus voltage is present. The actuator is in normal mode. If there is no bus voltage or the application is not loaded, the actuator is in exception mode. In this case, only the channel keys on the actuator can be used to manually switch and dim. The green operational LED is switched off.

10.3 Overview

	Operational LED **Green** **"RUN"**	**Channel status LED** **Yellow** **"ON"**	**Channel error LED** **Red** **"ERROR"**
Normal mode Application loaded mains and bus voltage present			
Channel switched off	on	off	off
Channel switched on	on	on	off
Exception mode No bus voltage or application not loaded			
Channel switched off	off	off	off
Channel switched on	off	on	off
Stop in operation			
No mains voltage at a configured channel	flashing	off	off
No mains voltage at a configured channel and no bus voltage	off	off	off
Overload Channel is dimmed to minimum	on	on	on
Short circuit or overload Channel switched off	on	off	on

11 Manual operation

Manual operation is carried out using the channel keys. A channel key for each output channel is located at the front of an actuator. You can use this channel key to manually operate the assigned output (channel key operation).

11.1 Enabling/disabling channel key operation

You can specify the operation options for the device using channel keys by setting the following parameters.

General	Channel operation	**enabled** disabled selectable via object

The settings apply for all channel keys. You can permanently enable and disable the manual operation options using the parameter values *enabled* and *disabled*.

Setting via bus telegram

The parameter setting *selectable via object*

displays a new communication object. This can be used to enable and disable channel operation via bus telegrams. The description of the new communication object is *Block channel operation*. Channel operation is disabled when a telegram value of "1" is received and enabled when a telegram value of "0" is received. Operation is always activated following initialisation or application download. It is only disabled once an appropriate telegram is received.

Communication object

The parameter setting *selectable via object* displays the following communication object:

Communication object

No.	Name	Object function	Length	Properties	DPT in ETS4
49	Block channel operation	Operation	1 bit	receiving, readable	1.* 1-bit, 1.010 switching

11.2 Channel operation

If you have switched on the channel button operation or enabled it via an object, then dimming commands (long push-button action) or switch commands (short push-button action) can be generated using the keys.

The channel operation always affects the *Switch object* and the *Dimming object* of the corresponding channel.

Commands from channel button operation that affect the *Switch object* and the *Dimming object* of a channel have the same value as the commands from these objects. The last active command is forwarded to the dimming output. Each push-button action during channel button operation influences the last output value in the same way as a toggle key. This means that the output is switched off after a short push-button action if it was previously switched on, and is switched on if it was previously switched off. A long push-button action on the channel button acts in the same way as a relative dimming command. The output is dimmed up or down for the period of the push-button action, depending on which dimming direction was previously active for a relative dimming command. Relative dimming commands are either generated by a long push-button action on the channel button operation, or via the *Dimming object* or *Central dimming object*.

11.3 Priority of channel button operation

Channel button operation functions with the same priority level as the bus-controlled switching and dimming functions. This means that a manual operation via these functions is not forwarded to the dimming outputs while a higher priority function is active (Higher priority functions --> 50). However, the corresponding operations are processed in the background.

11.4 Channel button operation in exception mode

If a suitable load is connected to a channel and only mains voltage is present (no bus voltage), then the device is in Exception mode --> 77. Before the application is loaded for the first time, exception mode remains active despite a bus voltage being present. Channel button operation is always activated in exception mode. This means that you can turn the output channels on and off via a short push-button action and dim via a long push-button action, without any need for bus telegrams. As long as the key is held down, the lamp will get steadily brighter and darker. Once the maximum or minimum has been reached, the dimming direction is reversed.

In exception mode, most parameter settings are deactivated. Most settings for dimming properties, such as dimming curves, are not taken into account. Settings for higher priority functions are not applied.

- Please note that the alternative *Dimming operation mode leading edge phase LED, ESL/CFL (RL-LED)* cannot be used before appropriate parameterisation and downloading of the application. This operating mode remains active if it has previously been selected and loaded. However, if inductive loads are detected, the actuator switches to RL operating mode (Dimming operation mode and loads --> 13). Please note that loads may only be exchanged when the mains voltage is switched off.
- The starting properties setting is taken into account. If the parameter *Always start at 50% brightness (ESL/CFL)* is enabled, then the lamp is also switched on at a minimum of 50% brightness in exception mode (Starting behaviour --> 16).
- As in normal mode, the relay opens during switch-off if parameterised accordingly.

Channel operation is always active in exception mode. Enabling and disabling via parameters and objects only affects normal mode.

12 Normal mode, exception mode and stopping operation

In this section, you will learn about transitions to normal and exception mode, as well as the conditions for stopping operation.

In normal mode, dimmable loads are connected to the channels that are in use, the application is loaded and the bus and mains voltage are present. In this operating mode, all parameterised functions can be performed. Moreover, it is possible to manually switch and dim using the respective channel key, as long as this function is not locked.

In exception mode, the application has not yet been loaded or no bus voltage is present. In this operating mode, only the respective channel key can be used to switch and dim. Parameters for dimming properties and higher priority functions are not taken into account.

If no mains voltage is present, operation stops at the channels in question. Faults such as overloads and short circuits may be caused by stops to operation at the output of the channel in question.

12.1 Normal mode

In normal mode, the application is loaded, the bus and mains voltage are present and dimmable loads are connected. All functions are performed according to the telegrams received. It is possible to perform an operation using the channel keys as long as it has been enabled via telegram or by a parameter.

Transitions

In normal mode, bus and mains voltage must be present. A transition to normal mode takes place after the following events.

- Concurrent return of bus and mains voltage
- Return of mains voltage when bus voltage is present
- Return of bus voltage when mains voltage is present
- Completion of application transmission (download)

When the mains voltage returns, load detection is performed when either switching on or dimming for the first time (value > 0) (Dimming operation mode and loads --> 13).

Transitions to normal mode in basic functions

The basic dimming functions include functions with low priority such as switching, dimming and value dimming. If no higher priority functions, such as logic operations, locking functions or priority control, are active, the properties for the transition to normal mode depend directly on the values selected for the parameter *Behaviour on bus or mains voltage recovery or download*.

X: General	Behaviour on bus or mains voltage recovery or download	...

All parameter settings apply to both the bus or mains voltage return and downloads.

The following overview shows the effects of the different parameter values during the transition to normal mode. Please note that you can affect the switch-ON behaviour using a further parameter.

Values for transitions to normal mode

Parameter	Values	Properties at each output
Behaviour on bus or mains voltage recovery or download	**no reaction**	When the mains voltage returns, the output remains switched off. When the bus voltage returns, the output maintains its existing brightness value. The existing brightness value is either the value before the bus voltage failure or the last value that was set using the channel key. Following a download, the output maintains its existing brightness value.
	switch OFF	When the mains voltage returns, the output remains switched off. When the bus voltage returns and mains voltage is present, any output that is already switched on or dimmed will also be switched off. This also applies after a download.
	switch ON with Switch-ON behaviour	The switch-ON behaviour is determined by another parameter: *Switch-ON behaviour (switching)*: Ⓐ *max. brightness* Ⓑ *selectable brightness* (5% to 100%) Ⓒ *last brightness value (Memory)*

Ⓐ and Ⓑ: When the mains voltage returns, the lighting remains switched off if the bus voltage is not yet present. The selected brightness is only activated once the bus voltage returns.

Ⓒ: Once the mains voltage has returned, the brightness value at the time of mains voltage failure is restored. When the bus voltage returns, the output maintains its existing brightness value. The existing brightness value is either the value before the bus voltage failure or the last value that was set using the channel key. Following a download, the output maintains its existing brightness value.

Examples of transition to normal mode

The following table shows a sequence of 5 events. The starting point is fault-free operation with starting values. **Examples** Ⓐ to Ⓕ show the behaviour of the outputs depending on the parameters and brightness values set before the failure.

Behaviour at output

		① Starting value (Example)	② Failure Mains + Bus	③ Return Mains	④ Bus	⑤ Switch on 1 bit
	Mains voltage	ON	OFF	ON	ON	ON
	Bus voltage	ON	OFF	OFF	ON	ON
Ⓐ	**Brightness**	30%	OFF	OFF	OFF	80%
Ⓑ	**Brightness**	30%	OFF	OFF	OFF	80%
Ⓒ	**Brightness**	30%	OFF	OFF	OFF	100%
Ⓓ	**Brightness**	30%	OFF	OFF	80%	80%
Ⓔ	**Brightness**	30%	OFF	30%	30%	30%
Ⓕ	**Brightness**	OFF	OFF	OFF	OFF	100%

Parameter selection

	Behaviour on bus or mains voltage recovery or download	Switch-ON behaviour (switch object)
Ⓐ	no reaction	selectable brightness: 80%
Ⓑ	switch off	selectable brightness: 80%
Ⓒ	switch off	last brightness value (Memory)
Ⓓ	switch ON with Switch-ON behaviour	selectable brightness: 80%
Ⓔ	switch ON with Switch-ON behaviour	last brightness value (Memory)
Ⓕ	switch ON with Switch-ON behaviour	last brightness value (Memory)

In examples Ⓐ to Ⓒ, only the parameter for bus or mains voltage recovery affects the behaviour on recovery. The parameter for switch-ON behaviour controls the switch-ON procedure via a 1-bit switching telegram.

In example Ⓒ, the lighting remains switched off once the mains and bus voltage have been recovered. For the switch-ON procedure with 1 bit, no current memory value is available. The lighting is therefore switched on to maximum brightness. A description of the automatic call-up of memory values directly after mains voltage recovery is given in examples Ⓔ and Ⓕ.

In examples Ⓓ to Ⓕ, the parameter *Switch-ON behaviour* also affects the behaviour when the mains and bus voltage return.

In example Ⓓ, *switch ON with Switch-ON behaviour* and the parameter *Switch-ON behaviour* with *selectable brightness* are selected. When the mains voltage returns, the lighting remains switched off. It is only possible to switch on with a specific brightness value when the bus voltage is present. When the bus voltage returns, the lighting is switched on with the selected brightness of 80%.

In examples Ⓔ and Ⓕ, the status that was present before the failure is restored. If the lighting is switched off when the failure occurs, it will also remain switched off when the mains and bus voltage return. For the switch-ON procedure with 1 bit, no current memory value is available. The lighting is therefore switched on to maximum brightness.

Settings for bus voltage recovery or download with higher priority functions such as logic operation, locking function or priority control, can lead to changes in behaviour (Transitions to normal mode with higher priority functions --> 71).

Examples with and without memory function

System does not automatically switch on following voltage recovery

Example without memory function

In a bedroom, the lighting should remain switched off following mains voltage failure and be turned back on manually when needed.

Parameter:

Behaviour on bus or mains voltage recovery or download:
no reaction

When this is selected, the load remains switched off following recovery of the mains voltage. It is switched on via further telegrams, which can be triggered by pressing a key. This parameter value is selected by default.

If only the bus voltage fails, the current lighting state is maintained. No change takes place following bus voltage recovery.

Maintaining the last brightness value

Example with memory function

For living and working areas, automatic recovery of the last set brightness values is required. This property is particularly useful for short downtimes.

Parameter:

- *Behaviour on bus or mains voltage recovery or download*: *switch ON with Switch-ON behaviour*
- *Switch-ON behaviour (switch object)*: *last brightness value (Memory)*

When the mains voltage fails, the lighting turns off. When the mains voltage returns, the last set brightness value is restored.

If only the bus voltage fails, the current lighting state is maintained. When the bus voltage returns, the state that was present at the time of the bus voltage failure is restored.

Transitions to normal mode with higher priority functions

When the bus voltage returns, the transition to normal mode is also determined by the higher priority functions, i.e. the logic operation, priority control and locking function. You can set the respective properties of these functions.

Logic operation and bus voltage recovery

You can select a logic operation for each output channel (Page 50).

You can determine the value of the logic object following bus voltage recovery or download.

X: Logic operation	Value of logic operation object after bus voltage recovery or download	...

After a bus voltage recovery or download, the transition to normal mode occurs. The properties at the output are calculated using the value of the logic object and the selected logic operation.

An AND logic operation is active when the logic object has an internal value of “0”. If this is the case, it is not possible to switch on via the switch object.

An OR logic operation is active when the logic object has an internal value of “1”. If this is the case, it is not possible to switch off via the switch object.

Parameter	Value	Logic operation	Properties of each channel
Value of logic operation object after bus voltage recovery or download	0	AND	The output assumes the brightness value that is parameterised for the logic operation. This value is determined via a further parameter: *Brightness with logic object "0" in %* (0 - 100)
	0	OR	The logic operation has no effect on the output status.
	1	AND	The logic operation has no effect on the output status.
	1	OR	The output assumes the brightness value that is parameterised for the logic operation. This value is determined via a further parameter: *Brightness with logic object “0” in %* (0 - 100)

Activation of the logic operation occurs when a telegram is received at the logic object.

The properties described here can be overridden by activating a locking function.

Examples with logic operation function

The following table shows a sequence of 6 events. The starting point is fault-free operation with starting values. **Examples** Ⓐ to Ⓓ show the behaviour of the outputs and the status of the logic operation. The behaviour depends on the starting values and the set parameters.

Behaviour at output

		① Starting value (Example)	② Failure Bus	③ Return Bus	④ Failure Mains + Bus	⑤ Return Mains	⑥ Bus
	Mains voltage	ON	ON	ON	OFF	ON	ON
	Bus voltage	ON	OFF	ON	OFF	OFF	ON
Ⓐ	**AND**	active	inactive	active	inactive	inactive	active
	Brightness	15%	15%	15%	OFF	OFF	15%
Ⓑ	**AND**	active	inactive	inactive	inactive	inactive	inactive
	Brightness	15%	15%	80%	OFF	OFF	80%
Ⓒ	**AND**	inactive	inactive	inactive	inactive	inactive	inactive
	Brightness	20%	20%	20%	OFF	20%	20%
Ⓓ	**OR**	inactive	inactive	active	inactive	inactive	active
	Brightness	20%	20%	50%	OFF	OFF	50%

Parameter for bus and mains voltage recovery

	Behaviour on bus or mains voltage recovery or download	Switch-ON behaviour (switch object)
Ⓐ	no reaction	
Ⓑ	switch ON with Switch-ON behaviour	selectable brightness: 80%
Ⓒ	switch ON with Switch-ON behaviour	last brightness value (Memory)
Ⓓ	switch off	

Parameter for logic operation function

	Logic operation	Value of logic operation object after bus voltage recovery or download	Brightness with logic object "0"	Brightness with logic object "1"
Ⓐ	AND	"0"	15%	-
Ⓑ	AND	"1"	15%	-
Ⓒ	AND	"1"	-	50%
Ⓓ	OR	"1"	-	50%

In example Ⓐ, the AND logic operation is active after the bus voltage has returned. The output dims to the brightness value of 15%, which is set when the AND logic operation is active. After the mains voltage returns, the logic operation is inactive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage recovers again, the channel dims to 15%.

In example Ⓑ, the AND logic operation is inactive after the bus voltage has returned. The output dims to the brightness value of 80%, which is set for switch-ON behaviour. When the mains voltage returns, the output remains switched off (Examples of transition to normal mode --> 69). When the bus voltage returns, the channel dims to the brightness value of 80%.

In example Ⓒ, the AND logic operation is inactive after the bus voltage has returned. The output remains at the brightness value of 20%, as the switch-ON behaviour is set with memory function. When the mains voltage returns, the output dims back to the brightness value of 20%. When the bus voltage returns, the logic operation remains inactive and the brightness value remains at 20%.

In example Ⓓ, the OR logic operation is active after the bus voltage has returned. The output dims to the brightness value of 50%, which is set when the OR logic operation is active. After the mains voltage returns, the logic operation is inac-

tive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage returns, the channel dims to 50%.

Priority control and bus voltage recovery

You can set priority control for each output channel (Page 53).

You can set the properties after bus voltage recovery.

X: Priority control	Behaviour of priority control after bus voltage recovery ...

After bus voltage recovery, the transition to normal mode occurs. The properties at the output are determined via further parameters.

Parameter	Values	Properties of each channel
Behaviour of priority control after bus voltage recovery	**inactive**	Priority control is not active and has no effect on the output status.
	active OFF	Priority control is active and the parameterised properties are executed. The brightness value at the output is determined via a further parameter: *Behaviour at start of priority control OFF*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	active ON	Priority control is active and the parameterised properties are executed. The brightness value at the output is determined via a further parameter: *Behaviour at start of priority control ON*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	as before bus voltage failure	Priority control will be set to the status that was active before the bus voltage failure. The output has the same brightness value as before the failure.

Activation of the priority control occurs when a telegram is received at the priority control object.

The properties described here can be overridden by activating a locking function.

Examples with priority control

The following table shows a sequence of 6 events. The starting point is fault-free operation with starting values. **Examples** Ⓐ to Ⓓ show the behaviour of the outputs and the status of the priority control. The behaviour depends on the starting values and the set parameters.

Behaviour at output

		① Starting value (Example)	② Failure Bus	③ Return Bus	④ Failure Mains + Bus	⑤ Return Mains	⑥ Bus
	Mains voltage	ON	ON	ON	OFF	ON	ON
	Bus voltage	ON	OFF	ON	OFF	OFF	ON
Ⓐ	**Priority control**	active OFF	inactive	active OFF	inactive	inactive	active OFF
	Brightness	15%	15%	15%	OFF	OFF	15%
Ⓑ	**Priority control**	inactive	inactive	inactive	inactive	inactive	inactive
	Brightness	20%	20%	20%	OFF	20%	20%
Ⓒ	**Priority control**	active OFF	inactive	inactive	inactive	inactive	inactive
	Brightness	15%	15%	80%	OFF	OFF	80%
Ⓓ	**Priority control**	inactive	inactive	active ON	inactive	inactive	active ON
	Brightness	20%	20%	50%	OFF	OFF	50%

Parameter for bus and mains voltage recovery

	Behaviour on bus or mains voltage recovery or download	Switch-ON behaviour (switch object)
Ⓐ	no reaction	
Ⓑ	switch ON with Switch-ON behaviour	last brightness value (Memory)
Ⓒ	switch ON with Switch-ON behaviour	selectable brightness: 80%
Ⓓ	switch off	

Parameter for priority control

	Behaviour of priority control after bus voltage recovery	Desired brightness at start of priority control "OFF"	Desired brightness at start of priority control "ON"
Ⓐ	as before bus voltage failure	15%	
Ⓑ	as before bus voltage failure	15%	
Ⓒ	inactive	15%	
Ⓓ	active ON		50%

In example Ⓐ, the priority control is active after the bus voltage has returned. The output dims to the brightness value of 15%, which is set with a switch-off function when priority control is active (*Priority control "OFF"*). After the mains voltage returns, the logic operation is inactive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage returns, the channel dims to 15%.

In example Ⓑ, the priority control is inactive after the bus voltage has returned. The output remains at the brightness value of 20%, as the switch-ON behaviour with memory function is set. When the mains voltage returns, the output dims back to the brightness value of 20%. When the bus voltage returns, the logic operation remains inactive and the brightness value remains at 20%.

In example Ⓒ, the priority control is inactive after the bus voltage has returned. The output dims to the brightness value of 80%, which is set for switch-ON behaviour. When the mains voltage returns, the output remains switched off (Examples of transition to normal mode --> 69). When the bus voltage returns, the channel dims to the brightness value of 80%.

In example Ⓓ, the priority control is active after the bus voltage has returned. The output dims to the brightness value of 50%, which is set with switch-ON function when the priority control is active (*Priority control "ON"*). When the mains voltage

returns, the priority control is inactive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage returns, the channel dims to 50%.

Locking function and bus voltage recovery

You can set the locking function for each output channel. This has the highest priority and overrides a logic operation or priority control (Locking function --> 56).

You can set the properties after bus voltage recovery.

X: Locking function	Status of disable function after bus voltage recovery ...

After bus voltage recovery, the transition to normal mode occurs. The properties at the output are determined via further parameters.

Parameter	Values	Properties of each channel
Status of locking function after bus voltage recovery	**inactive**	The locking function is not active and has no effect on the output status.
	active	After bus voltage recovery, the locking function will be directly active. The brightness value at the output is determined via a further parameter: *Behaviour at start of locking*: *no reaction* *switch off* *switch on at selectable brightness* (5 - 100%)
	as before bus voltage failure	The locking function is set to the status that was active before the bus voltage failure. The output has the same brightness value as before the failure.

Activation of the locking function occurs when a telegram is received at the locking object.

Examples with locking function

The following table shows a sequence of 6 events. The starting point is fault-free operation with starting values. Examples Ⓐ to Ⓓ show the behaviour of the outputs and the status of the locking function. The behaviour depends on the starting values and the set parameters.

Behaviour at output

		① Starting value (Example)	② Failure Bus	③ Return Bus	④ Failure Mains + bus	⑤ Return Mains	⑥ Bus
	Mains voltage	ON	ON	ON	OFF	ON	ON
	Bus voltage	ON	OFF	ON	OFF	OFF	ON
Ⓐ	**Locking function**	active	inactive	active	inactive	inactive	active
	Brightness	15%	15%	15%	OFF	OFF	15%
Ⓑ	**Locking function**	inactive	inactive	inactive	inactive	inactive	inactive
	Brightness	20%	20%	20%	OFF	20%	20%
Ⓒ	**Locking function**	active	inactive	inactive	inactive	inactive	inactive
	Brightness	15%	15%	80%	OFF	OFF	80%
Ⓓ	**Locking function**	inactive	active	active	inactive	inactive	active
	Brightness	20%	20%	15%	OFF	OFF	15%

Parameter for bus and mains voltage recovery

	Behaviour on bus or mains voltage recovery or download	Switch-ON behaviour (switch object)
Ⓐ	no reaction	
Ⓑ	switch ON with Switch-ON behaviour	last brightness value (Memory)
Ⓒ	switch ON with Switch-ON behaviour	selectable brightness: 80%
Ⓓ	switch off	

Parameter for locking function

	Status of locking after bus voltage recovery	Desired brightness at start of locking
Ⓐ	as before bus voltage failure	15%
Ⓑ	as before bus voltage failure	15%
Ⓒ	inactive	15%
Ⓓ	active	15%

In example Ⓐ, the locking function is active after the bus voltage has returned. The output dims to the brightness value of 15%, which is set when the locking function is active. After the mains voltage returns, the locking function is inactive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage returns, the channel dims to 15%.

In example Ⓑ the locking function is inactive after the bus voltage has returned. The output remains at the brightness value of 20%, as the switch-ON behaviour with memory function is set. When the mains voltage returns, the output dims back to the brightness value of 20%. When the bus voltage returns, the logic operation remains inactive and the brightness value remains at 20%.

In example Ⓒ, the locking function is inactive after the bus voltage has returned. The output dims to the brightness value of 80%, which is set for switch-ON behaviour. When the mains voltage returns, the output remains switched off (Examples of transition to normal mode --> 69). When the bus voltage returns, the channel dims to the brightness value of 80%.

In example Ⓓ, the locking function is active after the bus voltage has returned. The output dims to the brightness value of 15%, which is set when the locking function is active. When the mains voltage returns, the locking function is inactive. In accordance with the setting for mains voltage recovery, the output remains switched off. When the bus voltage returns, the channel dims to 15%.

Example with basic night-time lighting

In a corridor, the lighting is switched and dimmed normally from several operating points during daytime mode. In night-time mode, the lighting is dimmed to 30% brightness, and manual switching and dimming via the operating points in the corridor is deactivated. A separate button is used to switch between daytime and night-time mode. When changing to daytime mode, the system simultaneously switches off the lighting.

Night-time mode is started and stopped using a locking function.

When the bus and mains voltage return, the previous status should be recovered.

Parameter for starting and stopping the locking function

- *Behaviour at start of locking: switch on at selectable brightness*
- *Desired brightness at start of locking: 30%*
- *Behaviour at the end of locking: switch OFF*

Parameter for mains and bus voltage recovery

- *Behaviour on bus or mains voltage recovery or download*: *switch ON with Switch-ON behaviour*
- *Switch-ON behaviour (switch object)*: *last brightness value (Memory)*
- *Status of locking after bus voltage recovery*:*as before bus voltage failure*

As a result of these settings, the mode that was active before the failure will be restored after mains and bus voltage failure. If the failure occurs during daytime operation, the brightness value from before the voltage failure will be restored, and manual operation will be enabled. In night-time mode, the lighting is dimmed back down to 30% and manual operation remains deactivated. If required, the separate button can be used to switch between daytime and night-time modes.

12.2 Exception mode

In exception mode, it is only possible to operate the dimming channels using the channel keys. Both switching and dimming are performed using the channel keys (Channel button operation in exception mode --> 66). A short push-button action allows you to switch, while a long push-button action allows you to steadily dim to brighter and darker levels. Once the maximum or minimum has been reached, the dimming direction is reversed. In this operating mode, the following status displays are visible.

Operational LED (green)	Channel status LED (yellow)	Channel error LED (red)
off	on or off	off

Transitions

In exception mode, mains voltage must be present for each channel and a suitable load must be connected. A transition to exception mode takes place after the following events.

- Bus voltage failure when mains voltage is present
- Activation of mains voltage when application is loaded but bus voltage is not yet present
- Activation of mains voltage when application has not yet been loaded

After a bus voltage failure when mains voltage is present, the outputs remain in their existing state.

After the mains voltage has been enabled but the application has not yet been loaded, all channels remain switched off.

When the mains voltage returns, load detection is performed when either switching on or dimming for the first time (value > 0) (Dimming operation mode and loads --> 13).

Transition to exception mode

After mains voltage recovery and when no bus voltage is present, a transition to exception mode occurs. You can set the behaviour for after mains voltage recovery.

X: General	Behaviour on bus or mains voltage recovery or download	...

The properties at the output for the transitions to exception mode are also affected by another parameter.

Shared values

Parameter	Values	Properties at each output
Behaviour on bus or mains voltage recovery or download	**no reaction**	The output channel remains at its current brightness value. When the mains voltage returns, this always has a value of 0%.
	switch off	The output channel is switched off. When the mains voltage returns, the output remains switched off.
	switch ON with Switch-ON behaviour	The switch-ON behaviour is determined by another parameter: *Switch-ON behaviour (switching)*: *max. brightness* *selectable brightness* (5% to 100%) *last brightness value (Memory)*

Priority functions are not taken into account in exception mode. Operation via the channel keys is always possible.

Examples of the transition to exception mode can be found in section Examples of transition to normal mode --> 69. Here you will also find a description of behaviour when the mains voltage returns and the bus voltage is not present.

Notes

The functions in exception mode are limited to switching and dimming with the respective channel key.

Please note that the alternative *Dimming operation mode leading edge phase LED, ESL/CFL (RL-LED)* cannot be used before appropriate parameterisation and downloading of the application. This operating mode remains active if it has previously been selected and loaded. However, if inductive loads are detected, the actuator switches to RL operating mode (Dimming operation mode and loads --> 13). Please note that loads may only be exchanged when the mains voltage is switched off.

Load detection is performed under the same conditions as in normal mode.

The starting properties setting is taken into account. If the parameter *Always start at 50% brightness (ESL/CFL)* is enabled, then the lamp is also switched on at a minimum of 50% brightness in exception mode. As in normal mode, the relay opens during switch-off if parameterised accordingly.

When the bus voltage returns, the transition to normal mode occurs as long as the application has already been transmitted (Normal mode --> 67).

12.3 Stop in operation

During stops in operation, the channel status can only be changed very slightly, if at all. If the mains voltage fails, the respective channel will switch off and not function at all. If an overload occurs, the channel will be dimmed to minimum brightness. A short circuit or a repeat overload will lead to direct deactivation of the channel in question.

Stops in operation due to overload

If an overload occurs at a channel, the connected lamps will automatically be dimmed down to minimum brightness. If normal mode was activated when the problem occurred, the following status displays will be visible on the actuator.

Operational LED (green)	Channel status LED (yellow)	Channel error LED (red)
on	on	on

If parameterised accordingly, an error message will be sent via the object *Status feedback error*.

Further bus telegrams are not executed.

The temperature is also considered when monitoring the load. The temperature of the actuator increases in relation to the size of the connected load. The temperature also increases if there is insufficient heat dissipation for the actuator. When several dimming actuators are installed next to one another, they might cause each other to heat up. Have a qualified electrician rectify the causes of the overload and the rise in temperature (For your safety --> 11). The change in maximum load values in relation to the ambient temperature can be seen in section "Technical data" in the user manual.

You can acknowledge the fault by pressing the channel key. The channel can then be operated normally again, and the channel error LED switches off. If parameterised accordingly, the value "0" will be sent via the object *Status feedback error*.

If an overload is detected for a second time, the channel is switched off and displays the same behaviour as in the case of a short circuit.

Stops in operation due to short circuit or repeat overload

If there is a short circuit or a repeat overload is detected, the connected load is switched off directly and cannot be switched back on. If normal mode was activated when the problem occurred, the following status displays will be visible on the actuator.

Operational LED (green)	Channel status LED (yellow)	Channel error LED (red)
on	off	on

If parameterised accordingly, an error message will be sent via the object *Status feedback error*.

To remedy this, the mains voltage of the channel in question must be switched off.

Have a qualified electrician rectify the cause (For your safety --> 11).

Once the causes have been removed, you can use the actuator normally again.

When the mains voltage returns, the red channel error LED will switch off. If parameterised accordingly, a message with value "0" will be sent.

When switching on or dimming for the first time (value > 0), load detection is performed (Dimming operation mode and loads --> 13).

If an overload occurs again, the channel is dimmed down to minimum brightness (Stops in operation due to overload --> 79).

Stops in operation due to mains voltage failure

If mains voltage failure occurs at one or more channels, the channels in question will cease to function completely. The channels will switch off and the following status displays will be visible.

Operational LED (green)	Channel status LED (yellow)	Channel error LED (red)
off/flashing	off	off

If the bus voltage is still active, the green operational LED will flash. If parameterised accordingly, an error message will be sent via the object *Status feedback error*.

After the mains voltage is turned back on, a transition to normal mode occurs, provided a bus voltage is present. If no bus voltage is present, a transition to exception mode occurs.

13 Overview of parameters and values

Tab	Parameter	Value*
General	Channel X	**deactivated**
		activated
	Scenes	**disabled**
		enabled
	Extension unit scenes	**disabled**
		enabled
	Central function	**disabled**
		enabled
	Central switch object	deactivated
		activated
	Central dimming object	**deactivated**
		activated
	Central value object	**deactivated**
		activated
	Same dimming time at central function and scenes	**disabled**
		enabled
	Channel operation	**enabled**
		disabled
		selectable via object
	Status error	**deactivated**
		active status response object
		passive status object

Tab	Parameter	Value
Information	Abbreviations: LED = Light emitting diode ESL = Energy-saving lamp CFL = Compact fluorescent lamp RC operating mode = trailing edge phase RL operating mode = leading edge phase RL-LED operating mode = leading edge phase LED, ESL/CFL	
	Select operating mode leading edge phase LED, ESL/CFL (RL-LED) if: – This operating mode is required by the lamp manufacturer – Dimming in automatic mode is poor and RL-LED mode is not forbidden The maximum power in the operation mode RL-LED is significantly reduced For more information about LED compatibility please see: http://schneider-electric.dimmer-test.com	

Tab	Parameter	Value
Same dimming time	Time base for same dimming time	**1 s**, 1 min, 1 hr
	Time factor for same dimming time 1 - 255 Must be > 1s and greater than delay times!	**5** (1-255)
	Time factor for same dimming time selectable via bus	**deactivated**
		activated

* The preset values in the ETS are marked in bold.

Tab	Parameter	Value
X: General	Minimum dimming value in %	**15** (1-100)
	Maximum dimming value in %	**100** (1-100)
	Switch-ON behaviour (switch object)	**max. brightness**
		selectable brightness
		last brightness value (Memory)
	Execute selected Switch-ON behaviour	only if status OFF
		always
	Base dimming curve	**LED or any other lamp; can be altered**
		halogen lamps
		incandescent lamps
	Always start at 50% brightness (ESL/CFL)	**disabled**
		enabled
	Relay opens at status OFF	**enabled**
		disabled
	Dimming operation mode	**automatic**
		Leading edge phase LED, ESL/CFL (RL-LED)
	Dimming object switches channel	not
		only ON, not OFF
		only OFF, not ON
		ON and OFF
	Value object switches channel	not
		only ON, not OFF
		only OFF, not ON
		ON and OFF
	Delay times	**disabled**
		enabled
	Staircase lighting function	**deactivated**
		activated
	Switch object effective	**unchanged**
		inverted
	Scenes	**disabled**
		enabled
	Central function	**disabled**
		enabled
	Higher priority function	**deactivated**
		Logic operation
		Priority control
	Locking function	**deactivated**
		activated
	Behaviour on bus or mains voltage recovery or download	**no reaction**
		switch off
		switch ON with switch-ON behaviour
	Status switch	**active status response object**
		passive status object
		deactivated
	Status value object / brightness value	**active status response object**
		passive status object
		deactivated

Tab	Parameter	Value
X: Base dimming curve	1st threshold value in %	**25** (0-100)
	2nd threshold value in %	**50** (0-100)
	3rd threshold value in %	**75** (0-100)
	Time base of 1st dimming section	**100 ms** (100 ms, 1 s, 1 min, 1 hr)
	Time factor of 1st dimming section (1-255)	**150** (1-255)
	Time base of 2nd Dimming section	**100 ms** (100 ms, 1 s, 1 min, 1 hr)
	Time factor of 2nd dimming section (1-255)	**150** (1-255)
	Time base of 3rd Dimming section	**100 ms** (100 ms, 1 s, 1 min, 1 hr)
	Time factor of 3rd dimming section (1-255)	**150** (1-255)
	Time base of 4th Dimming section	**100 ms** (100 ms, 1 s, 1 min, 1 hr)
	Time factor of 4th dimming section (1-255)	**150** (1-255)
	Dimming curve = Basic dimming curve x dimming time reduction	

Tab	Parameter	Value
X: Dimming time reductions	Dimming time reduction object for dimming curve	**deactivated**
		activated
	Sets for dimming time reduction	
	Format of dimming time reduction	**1 - 100%**
		1 - 255 (corresponds to 1-100 %)
	Set x: dimming time reduction	
	for switching telegrams and staircase lighting, switch on at	**2,** 6, 3, 1% (set 0 to set 3)
	for dimming telegrams to	**6,** 20, 15, 7% (set 0 to 3)
	for staircase lighting switch off at	**50,** 70, 40, 25% (set 0 to 3)
	for value telegrams at	**10**, 30, 15,10% (set 0 to 3)
	for scene telegrams at	**16,** 70, 25, 20% (set 0 to 3)
	for priority functions at	**2,** 5, 3, 1% (set 0 to 3)
	Set 1 - 3	disabled
		enabled

Tab	Parameter	Value
X: Delay times	ON delay	**deactivated**
		retriggerable
		not retriggerable
	Output during ON delay	**switched off**
		at minimum brightness/lower dimming limit
	Time base for ON delay	**1 min** (100 ms, 1 s, 1 min, 1 hr)
	Time factor for ON delay (1-255)	**3** (1-255)
	OFF delay	**deactivated**
		retriggerable
		not retriggerable
	Time base for OFF delay	**1 min** (100 ms, 1 s, 1 min, 1 hr)
	Time factor for OFF delay (1-255)	3 (1-255)

Tab	Parameter	Value
X: Staircase timer	Staircase lighting function	**not retriggerable with manual OFF**
		retriggerable with manual OFF
		sum up time with manual OFF
		not retriggerable without manual OFF
		retriggerable without manual OFF
		sum up time without manual OFF
	Max. number of time accumulations (2-255)	**3** (2-255)
	Time base for staircase timer	**1 min** (1 s, 1 min, 1 hr)
	Time factor for staircase timer (1-255)	3 (1-255)
	Staircase timer effective	**unchanged**
		inverted
	Switch-OFF warning for staircase timer	**deactivated**
		activated
	Warning time for staircase timer in seconds (1-255)	**30** (1-255)

Tab	Parameter	Value
X: Scenes	Overwrite scene values in actuator during download	deactivated
		activated
	Same dimming time	**deactivated**
		activated
	Scene X	**deactivated**
		activated
	Scene X Scene number (0-63)	0-63
	Scene X Brightness value in %	0-100

Tab	Parameter	Value
X: Central function	Same dimming time	**deactivated**
		activated
	Function at central switching value = 0	no reaction
		switch off
		switch on at selectable brightness
	Function at central switching value = 1	no reaction
		switch off
		switch on at selectable brightness
	Desired brightness at switching object central = 0 in %	**100** (5-100)
	Desired brightness at switching object central = 1 in %	**100** (5-100)

Tab	Parameter	Value
X: Logic operation	Logic operation	AND
		OR
	Logic object effective	**unchanged**
		inverted
	Value of logic operation object after bus voltage recovery or download	**0** (presetting for OR)
		1 (presetting for AND)
	Brightness with logic object "0" in % (with AND)	**0** (0-100)
	Brightness with logic object "1" in % (with OR)	**100** (0-100)

Tab	Parameter	Value
X: Priority control	Behaviour at start of priority control ON	no reaction
		switch off
		switch on at selectable brightness
	Desired brightness at start of priority control ON in %	**100** (5-100)
	Behaviour at start of priority control OFF	no reaction
		switch off
		switch on at selectable brightness
	Required brightness at start of priority control OFF in %	**100** (5-100)
	Behaviour at end of priority control	no reaction
		switch off
		switch on at selectable brightness
		follows secondary functions
	Desired brightness at end of priority control in %	**100** (5-100)
	Behaviour of priority control after bus voltage recovery	**inactive**
		active OFF
		active ON
		as before bus voltage failure

Tab	Parameter	Value
X: Locking function	Locking	at object value "0"
		at object value "1"
	Behaviour at start of locking	**no reaction**
		switch off
		switch on at selectable brightness
	Desired brightness at start of locking in %	**100** (5-100)
	Behaviour at the end of locking	**no reaction**
		switch off
		switch on at selectable brightness
		follows secondary functions
	Desired brightness at end of locking in %	**100** (5-100)
	Status of locking after bus voltage recovery	**inactive**
		active
		as before bus voltage failure

14 Overview of communication objects

No.	Name	Object function	Length	Properties	DPT in ETS4
0	Switch object	Channel 1, general	1 bit	receiving	1.001 switch
1	Dimming object	Channel 1, general	4 bit	receiving	3.007 dimming control
2	Value object	Channel 1, general	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
3	Set object	Channel 1, dimming speed	1 byte	receiving	5.010 counter pulses (0-255)
4	Dimming time reduction object	Channel 1, dimming speed	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
5	Staircase timer object	Channel 1, staircase lighting	1 bit	receiving	1.010 start/stop
6	Logic object	Channel1, high.priority funct.	1 bit	receiving	1.* 1-bit, 1.001 switch
6	Priority control object	Channel1, high.priority funct.	2 bit	receiving	2.001 switch control
7	Locking object	Channel1, high.priority funct.	1 bit	receiving	1.* 1-bit,1.001 switch
8	Status feedback switch	Channel 1, status feedback	1 bit	sending, readable	1.011 state
8	Status switch	Channel 1, status	1 bit	readable	1.011 state
9	Status feedback value object / brightness value	Channel 1, status feedback	1 byte	sending, readable	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
9	Status value object / brightness value	Channel 1, status	1 byte	readable	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
40	Scene object	Scenes	1 byte	receiving	5.010 counter pulses (0-255)
41	Recall scene 1/2	Scene extension unit	1 bit	receiving	1.022 scene
42	Recall scene 3/4	Scene extension unit	1 bit	receiving	1.022 scene
43	Save scene 1/2	Scene extension unit	1 bit	receiving	1.022 scene
44	Save scene 3/4	Scene extension unit	1 bit	receiving	1.022 scene
45	Central switch object	Central function	1 bit	receiving	1.001 switch
46	Central dimming object	Central function	4 bit	receiving	3.007 dimming control
47	Central value object	Central function	1 byte	receiving	5.001 percentage (0-100%), 5.010 counter pulses (0-255)
48	Status feedback error	Status feedback	1 bit	sending, readable	1.011 state
48	Status error	Status	1 bit	readable	1.011 state
49	Block channel operation	Operation	1 bit	receiving, readable	1.* 1-bit,1.001 switch
51	Factor for identical dimming time	Same dimming time	1 byte	receiving	5.005 ratio (0-255)

No.

This list provides the numbers for clear identification of a communication object. The numbers 0 to 9 are assigned to channel 1.

Numbers	Channel
0 to 9	**1**
10 to 19	**2**
20 to 29	**3**
30 to 39	**4**

DPT

The data point types (DPT) in this application are not preset. The data point types shown in the communication object lists can be assigned in the ETS4 and ETS5. These are recommended options. For some 1 bit objects general data point types are recommended. During telegram recording with the ETS4 and ETS5 you will see that the *DPT 1.** has the values *$00* and *$01*, while the *DPT 1.001 switch* has the values *On* and *Off*.

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