Product documentation

LED-Controller 5gang
Ref. No. 39 005 1S LED R
39 005 1S LED E

390051SLEDE

390051SLEDR

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1. Information on the product

1.1. Product catalogue

Product name:	LED-Controller
Use:	Dimming actuator
Bauform:	RMD or ceiling installation
Order No.:	390051SLEDR, 390051SLEDE

1.2. Function

Up to five LED channels can be switched and dimmed via the KNX bus. In total, the dimmer can dim 20A LED current, whereby the power can be distributed as desired over all channels. The total load of the five channels is thereby optimally distributed by the dimming sequencer over the complete switching cycle, which significantly reduces stress on the integrated circuit, as well as on the components of the upstream LED power supply, thereby increasing the expected lifetime of the components

Lighting scenes can be pre-configured, stored and replayed, also using 1-bit group addresses, to implement lighting control with a simple motion detector, for example: The scene then retrieves a specific color mixture, e.g. of the RGB – illuminants.

Sequences are procedures of color controls in the range of seconds to hours. Thus the lighting is changed e.g. with smooth color changes over a certain period of time. The Device has predefined color sequences. This makes the use of this "mood lighting" very easy during commissioning. In addition, the parameterization of own color sequences is possible with the help of the ETS application.

Furthermore, time-controlled sequences are also available, with the help of which the illuminants can be controlled differently depending on the time or relative to sunrise or sunset.

A "stairway lighting function" is also available for all operating modes, which makes it possible to switch off, for example, a light triggered by a motion detector after a parameterizable time.

The Device can be adapted to one of the following applications:

• Five independent channels

• RGBCCT: One channel color (Red / Green / Blue / Cool White / Warm White)

- Application A: Extended RGB: RGB color control with optional automatic white balance
- Application B: Extended TW: RGB color control with optional extended TW range

• RGBW: One channel color (red / green / blue / white) + one independent channel

- Application A: Extended RGB: RGB color control with optional automatic white balance
- Application B: Virtualized TW: RGB color control with virtualized TW range

• RGB: One channel color (Red / Green / Blue) + two independent channels or one Tunable White channel (Cool White / Warm White)

• Two Tunable White channels (cool white / warm white) + one independent channel

• One Tunable White channel + three independent channels

The colors can be controlled either via the primary colors red, green and blue (color mode RGB) or via hue, saturation and brightness (color mode HSV).

The control of the color temperature for Tunable White channels takes place either via the percentage of cold white light or via the specification of a temperature value in Kelvin.

Undervoltage, overcurrent and overtemperature can be detected via communication objects. These protective functions, which have been "implemented in hardware" represent an important feature of the device. In these cases, the protection function automatically switches off the connected LED modules. The shutdown is specific, i.e. if an error is only present on one channel, only this channel will be shut down. After elimination of the error, the dimmer restarts automatically.

In addition, the device has an integrated reverse polarity protection, so that during commissioning possible damage due to reverse polarity of the input is excluded. The output (connection of the LED modules) is not critical for the device in this respect.

In addition to these integrated protection functions, protection functions for illuminants or power supply units can also be parameterized. By entering the continuous power and overload capacity of the illuminants or the power supply unit, overload scenarios can be detected. These can be signaled by group objects and, if desired (parameterizable), also lead to shutdown.

The measured values required for these protective functions, such as power supply voltage, current, voltage at the lamp and internal housing temperature, are also made available to the user by means of communication objects. Integrated energy and energy cost counters also provide a detailed cost breakdown of the installed illuminants.

For simple diagnostics and error analysis on the KNX-bus, measured values are available for the average or maximum telegram rate (send direction), as well as a parameterizable telegram rate limitation.

2. Safety instructions and Device components

2.1. Safety instructions

Electrical devices may only be mounted and connected by electrically skilled persons. Serious injuries, fire or property damage possible. Please read and follow manual fully. Danger of electric shock. During installation and cable routing, comply with the regulations and standards which apply for SELV circuits. These instructions are an integral part of the product and must remain with the end customer.

2.2. Device components

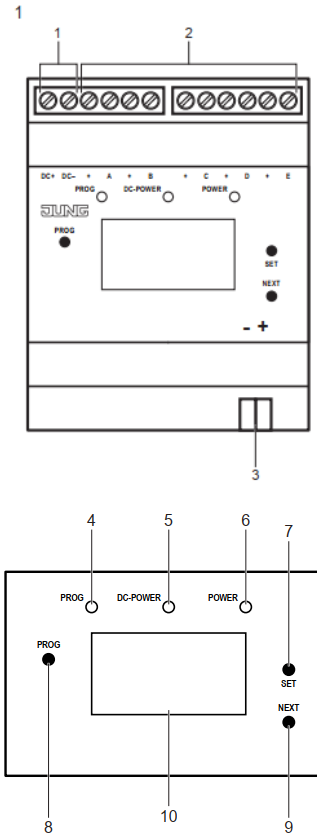


Figure 1: 390051SLEDR

1. KNX
2. LED-Modules
3. Power suppy
4. LED PROG
5. LED DC-POWER
6. LED POWER
7. Button SET
8. Button PROG
9. Button NEXT
10. Display

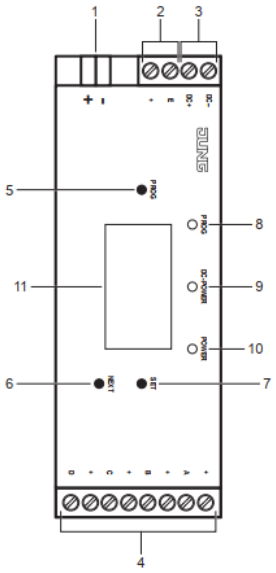


Figure 2: 390051SLEDE

1. KNX
2. LED-Modules
3. Power supply
4. LED-Modules
5. Button PROG
6. Button NEXT
7. Button SET
8. LED PROG
9. LED DC-POWER
10. LED POWER
11. Display

3. Function

3.1. System information

The device can be updated. Firmware can be easily updated. The device is KNX Data Secure capable. KNX Data Secure offers protection against manipulation in building automation and can be configured in the ETS project. Detailed specialist knowledge is required. A device certificate, which is attached to the device, is required for safe commissioning. During mounting, the certificate must be removed from the device and stored securely. Planning, installation, and commissioning of the device are carried out with the aid of the ETS, version 5.7 and above

3.2. Intended use

- Dimmer to control LEDs, LED modules, LED spots, halogen lamps and incandescent lamps of between 5 V ... 48 V (pulse width-modulated)
- 39005 1S LED R: Mounting on DIN rail according to EN 60715 in distribution boxes
- 39005 1S LED E: Mounting in false ceilings on surfaces or in/under furniture

3.3. Product characteristics

- Dimmer for colour temperature and coloured light control (RGB/HSV)
- Different dimming characteristics settable (soft dimming, deep-down dimming)
- PWM frequency settable (211 ... 1200 Hz)
- Commissioning with display support
- Free configuration of the channels
- Integrated scenes and bit scenes
- Predefined and freely-definable sequences
- Time-controller dimming or Human Centric
- Lighting (HCL)
- Staircase light function
- Disabling function
- Measurement and meter function
- Diagnostics/message of the protection function via
- KNX group addresses and shown on display
- Electronic overtemperature switch-off of the load current (automatic reset)
- Protection functions for LED modules and power supply

4. Mounting and electrical connection

4.1. Information for electrically skilled persons

DANGER

Electrical shock on contact with live parts in the installation environment. Electrical shocks can be fatal. Before working on the device, disconnect the power and cover live parts in the area

4.2. Mounting

- 39005 1S LED R: Mount device on DIN rail
- 39005 1S LED E: Mounting the device in false ceilings, on surfaces or in/under furniture

4.3. Connection

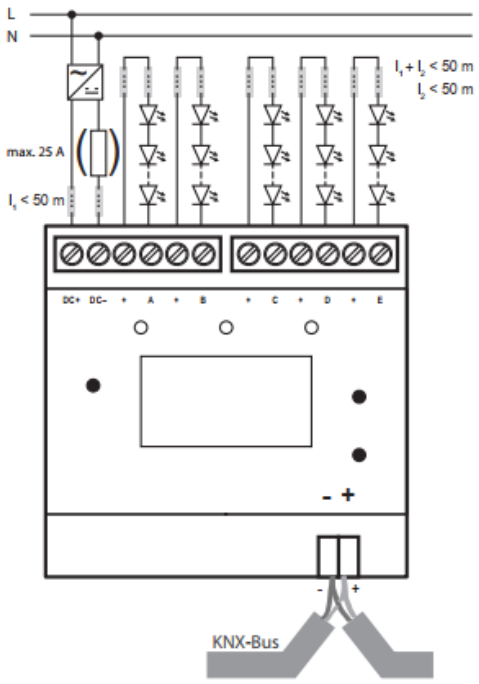


Figure 3: 390051SLEDR

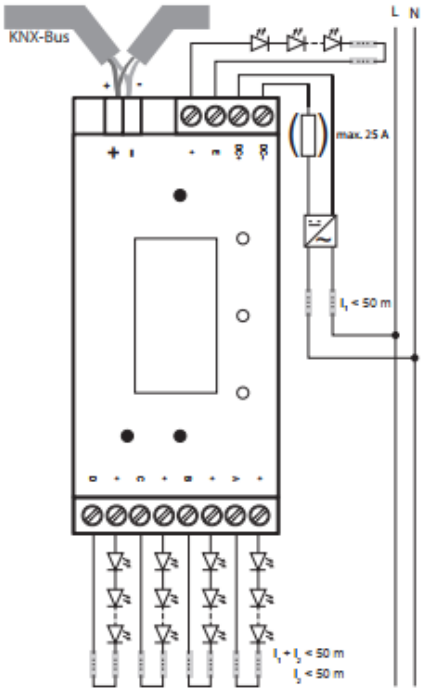


Figure 4: 390051SLEDE

Requirements

- Power supply (5 ... 48 V DC)
- KNX bus connection
- For position of the connections, see device components
  - Connect the power supply to the DC+ and DC- according to the connection
  - DC-POWER LED lights up in yellow

With power supplies with a rated current < 25 A and overload and/or overcurrent function, it is not necessary to use a fuse.

- Connect KNX
- Connect the LED modules

4.3.1. Connection plan

KNX bus, LED power supply and LED modules must be connected to the device according to the specification. The following applies for the assignment of colors to the outputs:

Channel Mode	**Cannel A**	**Cannel B**	**Cannel C**	**Cannel D**	**Cannel E**
RGBCCT	Red	Green	Blue	Cold white	Warm white
RGBW + 1x IC	Red	Green	Blue	White	Independent single channel
RGB + 2x IC	Red	Green	Blue	Independent single channel	Independent single channel
RGB + 1 x TW	Red	Green	Blue	Cold white	Warm white
2x TW + 1x IC	Cold white	Warm white	Cold white	Warm white	Independent single channel
1x TW + 3x IC	Cold white	Warm white	Independent single channel	Independent single channel	Independent single channel
5 x IC	Independent single channel	Independent single channel	Independent single channel	Independent single channel	Independent single channel

Table 1: Channel assignment

Connect the external power supply to the screw terminals DC+ and DC- according to the connection diagram. When using a power supply whose rated current is less than 25 A and which also has an overload or overcurrent protection function, it is not necessary to install the fuse shown in the above diagram. The power supply must be certified according to the lamp standards IEC 61347-1 and 61347-2-13. We recommend the Enertex LED PowerSupply 160.

If the overload or an overcurrent protection function is not available in the set power supply, the additional fuse against it is necessary. If the power supply does not meet the lamp standards, the operation is not allowed.

Lead wires to lighting are to be connected to the terminal A+, B+, C+, D+ or E+ according to the connection diagram. If the total current is permissible (observe the conductor crosssection!), a common forward conductor can be used for several lamp strings.

In this case, this forward conductor can be connected to any + terminal, since the outputs A+, B+, C+, D+ or E+ are internally connected to each other.

Return conductors from lighting are to be connected to terminal A-, B-, C-, D- or E- according to the connection diagram. The maximum load per channel and the maximum total load over all channels must not be exceeded!

4.3.1.1. Connection plan RGBCCT

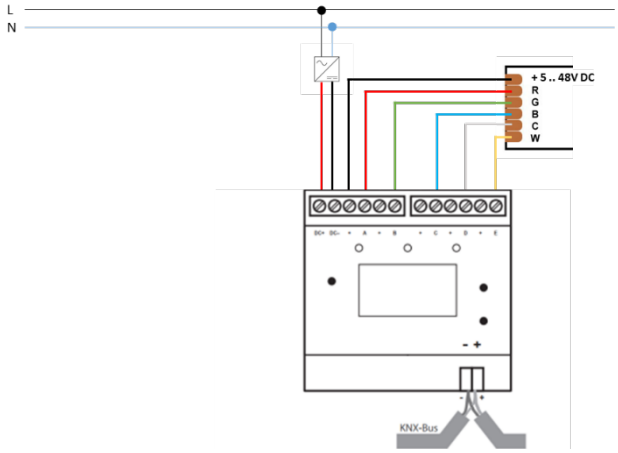


Figure 5: RGBCCT

+:	5 ... 48V DC
Channel A:	R
Channel B:	G
Channel C:	B
Channel D:	CW
Channel E:	WW

4.3.1.2. Connection plan RGBW

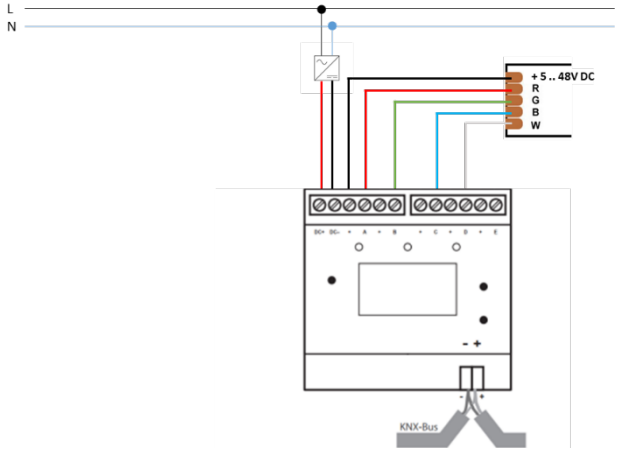


Figure 6: RGBW

+:	5 ... 48V DC
Channel A:	R
Channel B:	G
Channel C:	B
Channel D:	W
Channel E:	single channel

4.3.1.3. Connection plan RGB + TW

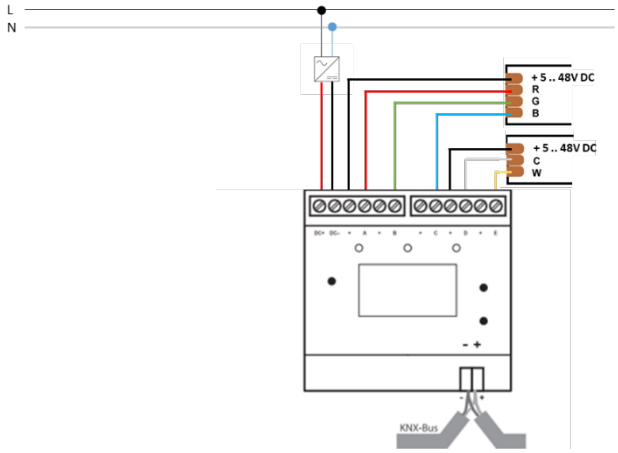


Figure 7: RGB + TW

+:	5 ... 48V DC
Channel A:	R
Channel B:	G
Channel C:	B
Channel D:	CW
Channel E:	WW

4.3.1.4. Connection plan TW

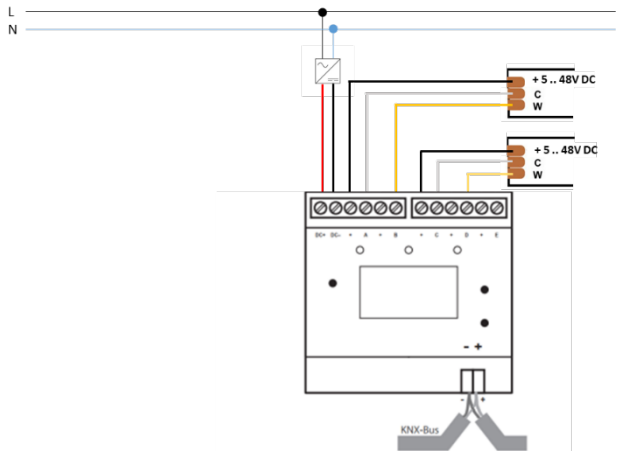


Figure 8: TW

+:	5 ... 48V DC
Channel A:	CW
Channel B:	WW
Channel C:	CW
Channel D:	WW
Channel E:	single channel

4.3.2. Overcurrent shutdown and illuminant

A common characteristic of LED lamps is a very high inrush current, which is often many times higher than the continuous current during operation. For error-free and safe operation, the LED controller must be able to distinguish the inrush current from the continuous current. At this device, the overcurrent shutdown has been dimensioned in such a way that it reliably switches off continuous currents of over 20 A, but does not consider inrush currents of up to 100 A as a fault condition.

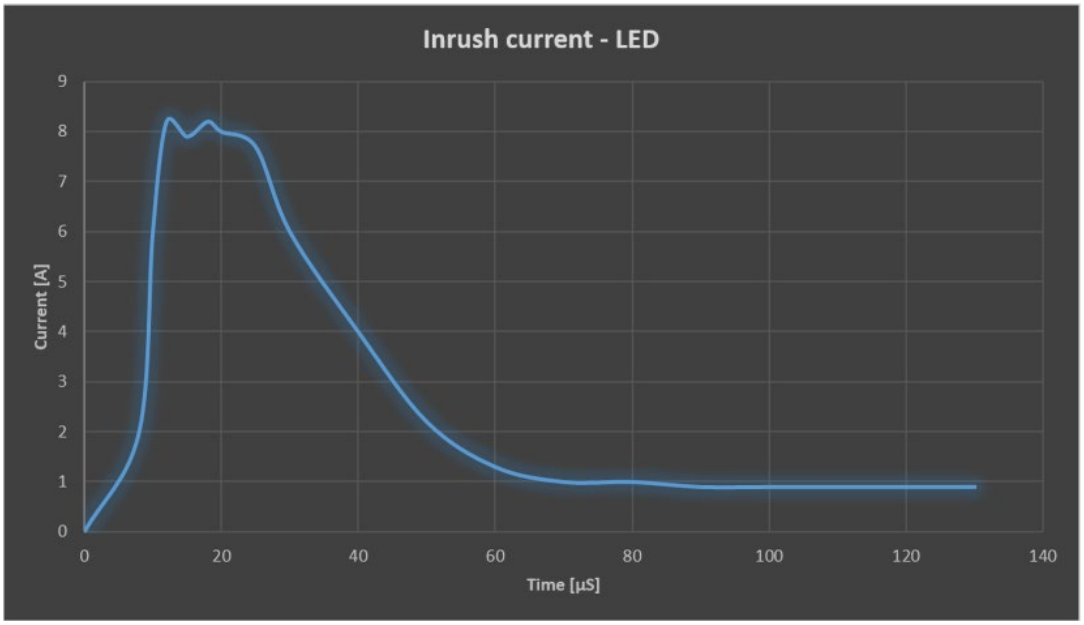


Figure 9: Inrush current

5. Commissioning

5.1. Switch on

After connecting, the device is switched on automatically. The POWER LED turns green.

6. Operation

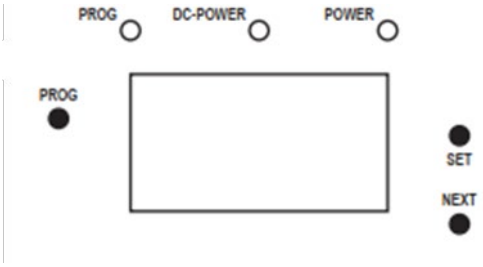


Figure 10: Display

6.1. Display

The display switches itself off automatically after one minute

- Switching on display:
  - Press the NEXT button
- Scrolling through menu:
  - Press the NEXT button repeatedly while the display is switched on
- Menu structure
  - Page 1, 2 and 3:
    - Display of the status of the power supply/ LED modules
    - overvoltage, undervoltage, overtemperature
    - protective functions
    - the overcurrent total/single channel
  - Page 4:
    - 1-Touch-Commissioning and status total
  - Page 5, 6 und 7:
    - 1-Touch-Commissioning status channel A … E
  - Page 8:
    - Test mode of various dimming properties
  - Page 9 and 10:
    - Display of the current measurement, DC voltage measurements, bus and device temperatur
  - Page 11 and 12:
    - Display of the brightness and adjustment of the channels in percent
  - Page 13:
    - Display of various device properties
  - Page 14:
    - Displaying the Data Secure FDSK (Factory Default Setup Key)
      - This is only displayed if the device has not yet been set to secure mode

6.1.1. Commissioning functions

In addition to the simple readout of various measured variables, the integrated display user interface also releases the temporary adjustment of some parameters for optimum adaptation to the illuminant (test modes). This means that by means of these commissioning functions, for example, the desired dimming curve can be quickly determined by trial and error, but the permanent parameterization must then be carried out as usual in the ETS.

Furthermore, the UI offers the possibility of a 1-touch commissioning: In this case, the dimmer moves each channel once to 100% and measures current and voltage there. This is a simple way to verify the correct wiring and dimensioning of the system (power supply, dimming sequencer, lamps).

Navigation in the UI is done by means of the DISPLAY and SET buttons

- NEXT: Next page / Next entry
- SET: Select entry

#	Page name	Designation	Description
1	Alarms 1	UnderVoltage	Alarm undervoltage (LED power supply) Possible status: OK: Voltage OK ALARM: Undervoltage N/A: Value not yet available (first 2 seconds after startup)
		OverVoltage	Alarm overvoltage (LED power supply) Possible status: OK: Voltage OK ALARM: Overvoltage N/A: Value not yet available (first 2 seconds after startup)
		OverTemperature	Alarm overtemperature (dimmer internal) Possible status: OK: Temperature OK ALARM: Overtemperature N/A: Value not yet available (first 2 seconds after startup)
		OverCurrent Total	Alarm overcurrent sum Possible status: OK: Total current OK ALARM: Total overcurrent N/A: Value not yet available (first 2 seconds after startup).
2	Alarms 2	OverCurrent A	Alarm overcurrent channel … Possible status: OK: Channel current OK ALARM: Channel overcurrent N/A: Value not yet available (first 2 seconds after start-up)
		OverCurrent B	
		OverCurrent C	
		OverCurrent D	
		OverCurrent E	

Table 2: User Interface Display

#	Seitenname	Bezeichnung	Description
3	Protection	PowerSupply	Power supply protection Possible status: OK: Power supply protection active, no error CONT: Power supply protection active, continuous power exceeded I2T: Power supply protection active, I²t value exceeded MAX: Power supply protection active, maximum power exceeded UNLOADED: Power supply protection inactive, application discharged N/A: Power supply protection inactive, deactivated in parameters
		Protection A	Illuminant protection channel Possible status: like Protection/PowerSupply
		Protection B	
		Protection C	
		Protection D	
		Protection E	
4	1-Touch-Commissioning 1	START	Use SET to switch to the START menu: START: Starts 1-touch commissioning Cancel: Termination
		Status	Displays the status of 1-touch commissioning - possible status: Standby: 1-touch commissioning has not yet been executed. Dim A: Dim channel A high Check A: Measure current and voltage channel A Dim All: Dim all channels high Check All: Measure total current and voltage Completed: 1-touch commissioning completed N/A: Status undefined
		MaxCurrTot	Maximum total current N/A: Measurement not yet performed
		MaxPoweSup	Maximum power at power supply N/A: Measurement not yet performed
		MinVoltSup	Minimum voltage at power supply (max. power) N/A: Measurement not yet performed
		<Exit>	Change from operating mode to display mode
5	1-Touch-Commissioning 2	MaxCurrA	Maximum current channel A N/A: Measurement not yet performed
		MaxPoweA	Maximum power channel A N/A: measurement not yet performed
		MinVoltA	Minimum voltage on the illuminant A (corresponds to the CO commissioning voltage A). N/A: mesaurement not yet performed
		MaxCurrB	Maximum current channel B N/A: mesaurement not yet performed
		MaxPoweB	Maximum power channel B N/A: mesaurement not yet performed
		MinVoltB	Minimum voltage on the illuminant B (corresponds to the CO commissioning voltage B). N/A: mesaurement not yet performed
6	1-Touch-Commissioning 3	Follow-up channels analog to 1-touch startup 2	Follow-up channels analog to 1-touch startup 2
7	1-Touch-Commissioning 4	Follow-up channels analog to 1-touch startup 2	Follow-up channels analog to 1-touch startup 2

8	Test modes	Test pwm freq 1	Use SET to switch to the frequency test menu. Use DISPLAY to switch through the different frequencies. All channels oscillate with the selected frequency. SET or terminates the test mode. The frequency is not permanently adopted (test mode).
		Test pwm freq 2	
		Test dim curve	Use SET to switch to the dimming curve test menu. Use DISPLAY to switch through the various dimming curves. All channels oscillate with the selected dimming curve. SET or terminates the test mode. The dimming curve is not permanently adopted (test mode).
		Test dim speed	Use SET to switch to the dimming speed test menu. Use DISPLAY to switch through the different speeds. All channels oscillate at the selected speed. SET or terminates the test mode. The speed is not permanently adopted (test mode).
		Switch all	Use SET to switch to the Switch All menu. Use DISPLAY to select whether to switch ON or OFF. SET executes the selected option. All channels oscillate with the selected speed. The menu can be exited by pressing
		<Exit>	Change from operating mode to display mode
9	Current	Current Total	Current measurement total N/A: Value not yet available (first 2 seconds after startup). Current measurement channel N/A: Value not yet available (first 2 seconds after start)
		Current A	
		Current B	
		Current C	
		Current D	
		Current E	
10	Voltage / Temp	PowerSupply	Voltage measurement DC input
		KNX bus	KNX bus voltage
		Temp	Device temperature (corresponds to the communication object Device temperature)
11	Brightness	Brightness A	Channel brightness
		Brightness B	
		Brightness C	
		Brightness D	
		Brightness E	
12	Change Brightness	Brightness A	Use SET to switch to the brightness change menu. Use DISPLAY to select whether to dim up (+) or down (-). <OK> accepts the current dimming value <CANCEL> exit menu
		Brightness B	
		Brightness C	
		Brightness D	
		Brightness E	
		<Exit>	Change from operating mode to display mode

13	Device info	Phy. address	Individual adress (KNX)
		Serial number	Serial number
		FW version	Firmware version
		HW revision	Hardware revision
		Time valid	Displays the current time INVALID, if not set
		Date valid	Displays the current date INVALID, if not set
14	FDSK	FDSK	Key for Secure commissioning not visible if device is in secure mode

6.2. LED displays

There are three LEDs on the front of the device. The LEDs indicate the following device statuses during operation:

- LED PROG lights up red:
  Programming mode is activated
- LED DC-POWER lights up yellow:
  Voltage at DC input is normal
- LED POWER lights up green:
  Device is ready for operation

6.3. Programming mode

Programming Device:

- Press the PROG button.
  PROG LED lights up red
- Terminate programming mode:
  Press the PROG button again

6.4. Master Reset

- Ensure that the device is switched off (disconnect bus voltage)
- Press PROG button, hold it and connect device
  Device switches on.
- Hold PROG button until PROG LED flashes slowly (approx. 1 Hz).
- Release PROG button
- Press PROG button again and hold it until PROG LED flashes fast (approx. 4 Hz).
  The master reset starts.
- Release PROG button

7. Configuration

This chapter provides background information on the various application scenarios and parameterization options of the device. A detailed description of the ETS application follows later in the chapter ETS Application. Within the individual chapters, there are often cross-references to the corresponding parameter descriptions. The parameter descriptions contain cross-references to the explanations.

7.1. Dimming characteristics

The device offers four different dimming curves to choose from:

- Linear
- Exponential
- Power function
- JUNG

The human eye generally perceives brightness values logarithmically, i.e. at twice the light intensity, the human eye does not perceive the brightness to be twice as high, but much lower. Although effects such as pupil aperture and the light-dark adaptation of the visual cones and rods also play a major role, visual perception is often modeled logarithmically. It is assumed that, for example, with double illumination, the "perceived" brightness increases by a factor of only 1.4.

Control via KNX-compliant % values is performed in a total of 255 steps. Therefore, the control of the LEDs is done in 255 discrete steps.

These control points (=brightness of the LED) must be distributed by the devie over the possible dimming range. The dimming characteristic of the dimmer can be set in the ETS application.

Note:

The following statements about perception are partly subjective and may differ from person to person in individual cases. The actual perception also depends on other factors, such as the LEDs, their integrated control circuitry, their characteristic curves, etc. Nevertheless, the tendency of the differences should be clarified.

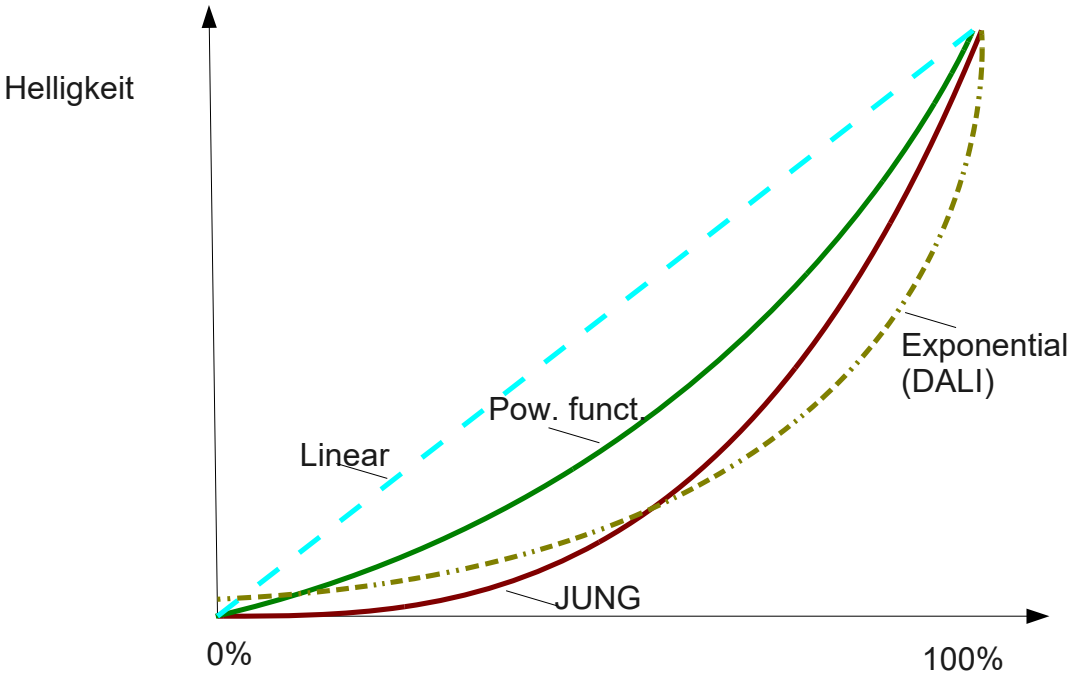


Figure 11: Dimming characteristics

Linear

For humans, an increase in the upper range of the control (> 80% to 100%) is usually perceived as smaller with this characteristic curve. In the lower range (<10%), on the other hand, a small increase in the control value will have a large effect for the human eye. In the range 40 to 60%, the subjective perception of the brightness change is often quite good.

Note: If the CW component is shifted in the cold/warm white operating mode with the corresponding objects, this will result in a slight "dent" in the sum brightness during the dimming process, if a dimming curve other than the linear one is selected. If this behavior is not acceptable, the linear curve must be selected in this case. At the end of the dimming process, the total brightness for each curve is then equal to the initial brightness again.

Exponential

Based on the assumption that the perception is logarithmic, an exponential control is implemented for DALI illuminants, for example (inverse function). This is provided with an offset in the lower range, i.e. when the LEDs are switched on, a clear jump in brightness will be perceptible once. Often the LEDs cannot be dimmed down to the lower limit with this characteristic. In the range up to 40%, the dimming behavior is very soft and largely corresponds to perception. From about 50%, the step is relatively large, so that the increase by a few percentage steps can pretend to the perception of a significantly higher increase. Overall, this dimming curve of the device is based on the DALI standard.

Power function

In the upper dimming range (from 60%), this dimming curve usually reproduces the perception regarding brightness very well. In the range up to 10%, the gradation is better adapted to the eye than is the case with the linear curve, but subjectively less good than the exponential dimming curve. The dimming curve itself is derived as a mathematical power function.

JUNG

This dimming curve is a mixture of the three linear, exponential and potential dimming curves mentioned so far. It can be dimmed very far in the lower range and is adjusted as evenly as possible to the sensation of the eye in all other ranges. This curve has been specially adapted at JUNG to the dimming behavior of the device and connected LEDs and is highly recommended in residential areas.

Genernal note:

For single channel operation the curve "JUNG" is recommended, because here a steady brightness increase/decrease for the eye has been implemented. For RGB and TW channel groups, on the other hand, the linear dimming curve is recommended if the colors or color temperatures are to be changed frequently and value is placed on color-true reproduction. If this is not the case, the "JUNG" curve is also considered to be the more beautiful (more uniform). Depending on the illuminant and the selected dimming curve, it can happen that this only switches on the LEDs from 3% brightness control. To make this comfortable for the user in such situations, a "restriction" of the dimming range can be defined for the dimming channel.

7.2. Dimming behavior

In addition to the effects mentioned for human perception, which result from this splitting of the dimming curves into 255 individual points, an important unique selling point of the device is the "soft" dimming during the transition from a certain starting point to an end point.

Due to a special control of the dimmer, no step, i.e. sudden change in brightness of the illuminants is perceptible even during slow dimming and dimming is continuous at all times

With short dimming times over a larger range, this control ensures that no flickering occurs for the human eye.

Even in the lowest brightness range (<5%), the control releases continuous dimming of the illuminants, so that for the human eye, the LEDs are switched off or on without a noticeable jump in brightness.

With the dimmer, flickering is avoided regardless of the choice of dimming curve; the transitions are always smooth or appear jerk-free.

7.3. Limit dimming range

The dimming ranges can be restricted. The options Restrict and Spread are available for the single channel and Tunable White operating modes, and minimum and maximum values can be parameterized. In RGB operating mode, only maximum values can be specified and it always follows the principle of spreading (=scaling).

An absolute dimming value of 0 leads to switching off in every parameterization.

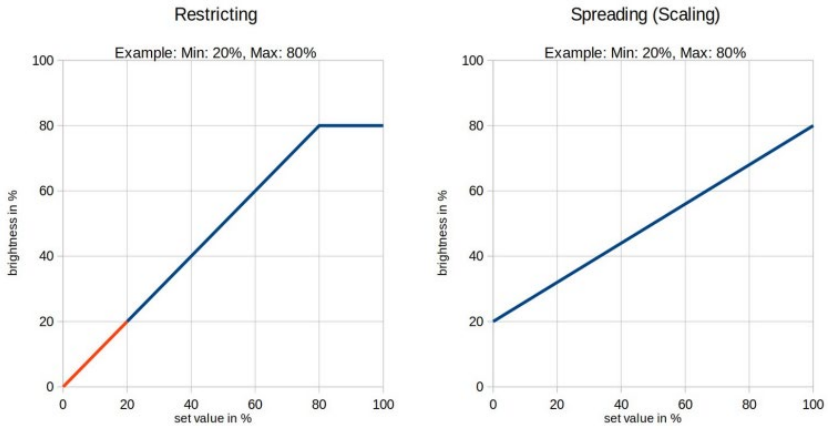


Figure 12: Limit diming range – Comparison

7.4. Measurements and counters

7.4.1. Measurements

The device has integrated measuring circuits for current, voltage, temperature and telegram rate and can show these measured values on the display and, if desired, also make them available via CO. All measured values can be sent to the bus cyclically and/or on change. For the value output of current, voltage and temperature values, different KNX data types are also available in each case.

Line losses: In order to be able to calculate the voltage at the illuminant using the internally measured voltage at the channel, the cable length and cross-section must be parameterized in the application in the "Measurements and counters" tab, as well as whether the channels have a common return line, which is often the case with RGB illuminants, for example.

Note: This information about the conductors is also mandatory for a correct function of the lamp protection (see chapter Alarm objects and protection functions)

7.4.2. Counter

The integrated energy meter counts the energy consumed on the mains side, based on a (parameterizable) average efficiency of the upstream LED power supply. The energy meter also becomes a cost meter by means of a parameterizable electricity price. Both meters can be used as a totalizer and/or per channel/channel group.

7.5. Alarm objects and protection functions

The device provides various 1-bit alarm objects that indicate the activity of the integrated protection circuits for undervoltage (power supply voltage), overtemperature and overcurrent (channel-specific). The thresholds for triggering these protective shutdowns are "cast in hardware" and cannot be parameterized. The protective shutdowns are self-healing, i.e. as soon as the cause of the fault is eliminated, the channels are switched on again

7.5.1. Illuminant protection

Some illuminants that combine several channels (such as Tunable White (TW), RGB, RGBW, RGBCCT) are designed in such a way that the illuminant is thermally overloaded when all channels are fully controlled at the same time.

The device offers a parameterizable protection function that protects the illuminants from thermal overload.

For the activation and the correct function of the illuminant protection, information about the (thermal) continuous power, overload capacity (in %) and the maximum duration of the overload must be provided. In addition, a correct voltage measurement is a prerequisite, which in turn is only possible if the entries for the lines have been made completely.

Separate 1-bit alarm objects are available for exceeding

- the continuous power
- the I²t value
- the maximum power

Optionally, a shutdown can be parameterized for the various overload scenarios. In contrast to the integrated dimmer protection functions, the illuminant protection shutdown is not self-resetting, i.e. as soon as the cause of the error is eliminated, the channels must be switched on again manually.

Example:

- Illuminant: Tunable White
- Continuous power (sum of both channels): 20 W
- Overload capacity: 50 %
- Maximum duration overload: 60 s
  - Trigger of the alarm objects or (if parameterized) of the shutdown
  - CO Continuous power when exceeding a power of 20 W
  - CO-Maximum power when exceeding a power of 30 W
    - CO I²t when exceeding a power of 20 W for more than 60 s or (according to equation 1) of, for example
      - 25 W for more than 48 s, or
      - 35 W for more than 34 s, or
      - 100 W for more than 12 s

$$Time[s] = \frac{ContiniusPower[W] * MaximumOverLoadTime[s]}{MeasuredPower\ [W\ ]}$$

7.5.2. Power supply protection

Analogous to the lamp protection, the dimming sequencer can also protect the upstream LED power supply from overload. For this purpose, specifications must also be made for the continuous power, the overload capacity (in %) and the maximum duration of the overload. Separate 1- bit alarm objects are available for the exceeding of

- the continuous power
- the I²t – value
- the maximum power

Optionally, a shutdown can be parameterized for the various overload scenarios. Like the illuminant protection shutdown, the power supply protection shutdown is not self-resetting, i.e. as soon as the cause of the fault has been eliminated, the channels must be switched on again manually.

The Enertex® LED PowerSupply 160 has an integrated overload protection that throttles the output power to 160W. So, for this power supply, the protection function is not needed at all.

Example:

- Continuous power: 100 W
- Overload capability: 50 %
- Maximum duration overload: 600 s (10 min)
  - Trigger of the alarm objects or (if parameterized) of the shutdown
  - CO Continuous power when exceeding a power of 100 W
  - CO Maximum power when exceeding a power of 150 W
  - CO I²t if a power of 100 W is exceeded for more than 600 s or (also according to equation 1) of, for example
    - 120 W for more than 500 s (~ 8,3 min), or
    - 180 W for more than 333 s (~ 5,6 min), or
    - 200 W for more than 300 s (~ 5 min)

Explanation for I²t shutdown

Illuminant and power supply disconnections can be parameterized in such a way that they come close to the behavior of a fuse. These generally function in such a way that the switch-off occurs as soon as the nominal current is exceeded by a certain amount for a sufficient time. The higher the current, the faster the disconnection.

With reference to the protective functions of the device, we are specifically concerned here with the powers between the parameterized continuous power (powers below this are never switched off) and the maximum power (powers above this are switched off immediately). The powers in between (in Fig. 7 these would be values between 100 and 200 W) are switched off depending on the amount of power after a time of 500 s (at 200 W) to 1000 s (at 100 W).

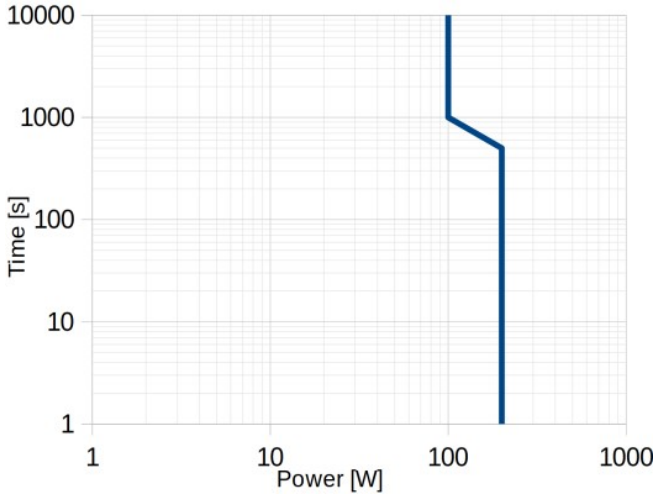


Figure 13: I²t-shutdown

7.6. Channel functions

7.6.1. RGB

The application of the device offers the possibility to control specific colors by means of special RGB parameters and a "Colour-Picker" displayed directly in the ETS (see Fig. 8). In addition, various communication objects are available with which the color channels can be addressed individually or together.

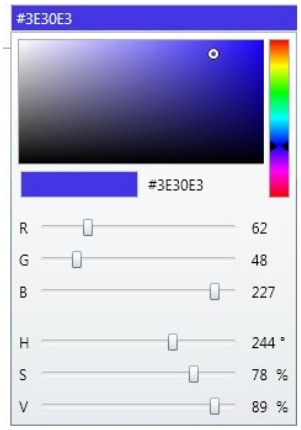


Figure 14: ETS Colour-Picker

For illuminants that have one (RGBW) or two (RGBCCT) white channels integrated, additional functions are available (see corresponding subchapter RGBW or RGBCCT: Extended-RGB).

7.6.2. RGBCCT: Extended-RGB

Automatic white balance

An RGBCCT (R-G-B-Correlated-Color-Temperature) illuminant combines red, green, blue, cool white and warm white LEDs in one illuminant. The application allows the two white channels to be automatically mixed in when the saturation of a color value is lowered. This results in a "nicer" white tone than the white tone mixed by the RGB colors. JUNG was the first to introduce this mode to the market in the present generation of devices and calls it "Extended RGB".

The calculation of the color spaces and the white channel admixture is done internally in the device and does not have to be parameterized by the user. Only the desired color temperature of the white LEDs must be specified. The color mixing can be influenced via dimming curves and, if necessary, brightness limits. However, this is not recommended in normal cases since the JUNG algorithm already achieves optimal results.

Standard Mode

If this automatic mixing is not desired, the brightness can also be parameterized separately or also adjusted during runtime by means of CO.

Example:

- Initial value: Pure blue with 100% saturation and brightness
- New value: Saturation reduced to 50%
    - In the normal RGB application or when automatic mixing is deactivated, saturation reduction is achieved by mixing the R and G channels by 50% each
    - In Extended-RGB mode, the white channels are additionally mixed in to reduce saturation

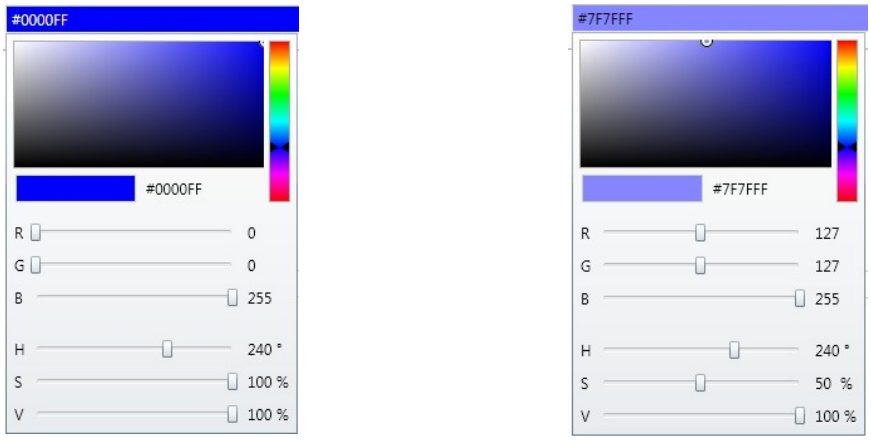


Figure 15: Initial – New Value

A Default value of

- R: 127
- G: 127
- B: 255

Or

- H: 240 °
- S: 50 %
- V: 100 %

thus leads, in addition to the corresponding control of the R/G/B channels, to the admixture of the Tunable White channel with intensity 50% (0% saturation would lead to 100% TW brightness).

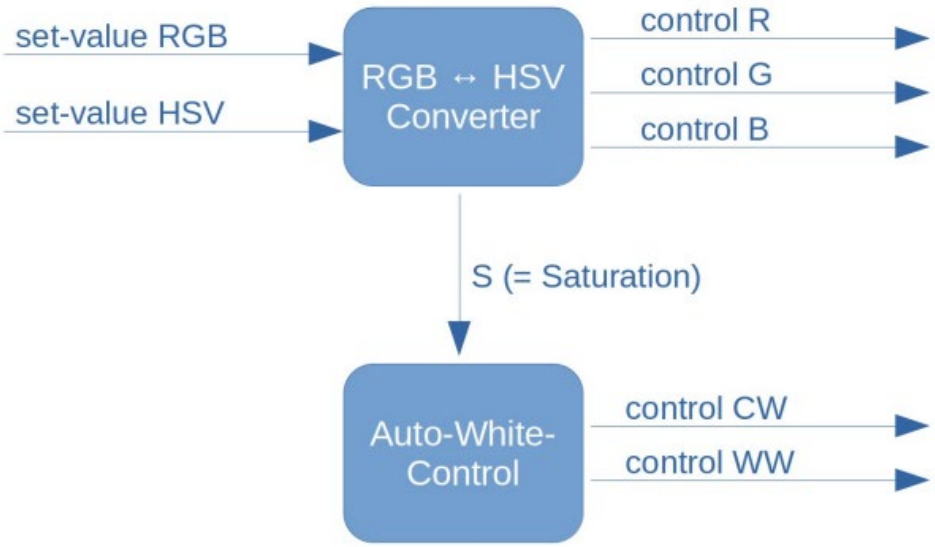


Figure 16: Automatic white balance „Extended RGB“

The mixing ratio of the two white channels can also be parameterized either as "Fix" or separately for the individual application scenarios or also adjusted by means of CO

7.6.3. RGBW

Automatic white balance

An RGBW illuminant combines red, green, blue and white LEDs in one illuminant. The RGBW application allows the white channel to be automatically mixed in when the saturation of a color value is lowered (analogous to RGBCCT: Extended-RGB, with only one white channel). This results in a "nicer" white tone than the white tone mixed by the RGB colors. JUNG was the first to introduce this mode to the market in the present generation of devices and calls this "Extended RGB".

The calculation of the color spaces and the white channel admixture is done internally in the device and does not have to be parameterized by the user. Only the color temperature of the white LED must be specified. The color mixing can be influenced via dimming curves and, if necessary, brightness limits. However, this is not recommended in normal cases, as the JUNG algorithm already achieves optimal results

Standard mode

If this automatic mixing is not desired, the brightness can also be parameterized separately or also adjusted during runtime by means of CO.

7.6.4. Color spaces RGB and HSV

The device offers the possibility to set the color control via RGB objects or HSV objects. In addition, the dimmer calculates the other state objects in each case and outputs them to the bus according to the parameterization.

Technically the RGB - LED illuminants are composed of the three colors red-green-blue. Therefore, the control via an RGB object, which outputs an intensity from 0 to 100% for each of the three colors, is technically easy to realize. The resulting light color is composed of the three color channels, but it is considerably more complex for the user to set a color value CYAN, for example. This is different when using HSV objects. Here the H - value (color angle) specifies the color tone. This is given as a so-called color angle, which corresponds to a color in the color wheel. Each angle value means a different color, e.g. 0° for red, 30° for orange, 60° for yellow and so on. The color transitions are fluent.

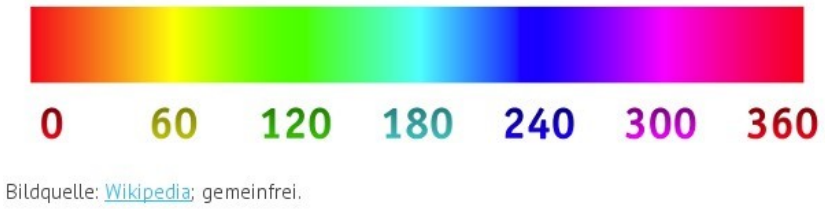


Figure 17: HSV

The S - value (saturation) indicates the color saturation. S = 0% means white light and S = 100% complete lighting only in the set color tone. "White" is to be understood in the context of the possibilities of the illuminant, because white light is only created by mixing the three colors (see section White balance). However, this white light is not always pleasant or sufficiently white for human perception, so RGBW illuminants offer an additional white LED channel that is adjusted to an appropriate white light by the manufacturer. When working with RGBW illuminants, this additional white channel is available in the application and can also be specified in the sequence. The saturation value S is not directly influenced by the white channel, the two values S and white channel are to be considered separately.

The V- value (brightness value) specifies the brightness of the lighting. 0% means OFF and 100% maximum brightness.

Limit dimming range

The white light is provided by mixing the control of the individual color channels. Depending on the LED illuminant, the resulting white light may not be considered optimal by the user, so that an adjustment of the white light must be made. The device can be used to define the mixing ratio of the three individual channels.

If you set the white balance (CO) to ON via telegram, you specify the setting via the RGB or HSV values which best matches the desired white light at maximum brightness. Then set the object to OFF. Then the values are stored. If, for example, the illuminant has a blue component that is a little too high for a pleasant white light, R=100%, G=100%, B=80% will be determined during the white balance. After ending the white balance, the dimmer is controlled relative to this, i.e. the blue component from 0 to 80% is scaled to the value range 0 to 100%.

Note: This scaling is retained when the device is restarted and the application is downloaded from the ETS. It can only be overwritten by a new white balance.

Alternatively, these maximum values can also be defined by means of parameters.

7.6.5. Color temperature control

Tunable White

A Tunable White illuminant consists of white LEDs of two different color temperatures - a cool white and a warm white tone.

By allocating two channels (a TW channel pair) of the device, it can take over the control of brightness and color temperature of the illuminant.

The mixing ratio of the two channels can be permanently parameterized for different application scenarios but can also be changed at runtime by means of group addresses. The mixing ratio is specified as "% cold white" by default but can also be specified directly in Kelvin instead if the color temperatures of the two white channels (cold and warm white) are made known / parameterized to the application accordingly. The latter could be advantageous, for example, if different tunable white illuminants are used in a room and an adjustment of the color temperatures is to be undertaken.

The warm white light color (2000 to 3300 K) is often perceived by people as pleasantly calming. The cold white light color (from 6000 K) describes a white color spectrum with an increased blue component. This increased blue component causes the observer to be in a heightened state of alertness. Therefore, it can be advantageous, e.g. in office rooms, to increase the cold white portion in the morning and the warm white portion in the evening. By means of a timecontrolled sequence, a course of the day with its different color temperatures can be easily mapped (cf. chapter Time-controlled dimming and Human Centric Light (HCL)).

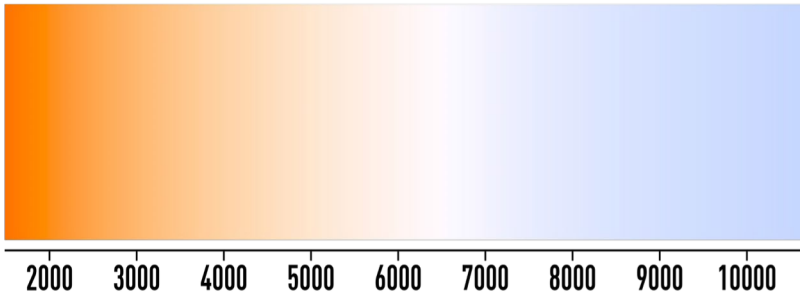


Figure 18: Color temperature in Kelvin

RGBCCT: Extended-TW

An RGBCCT (R-G-B-Correlated-Color-Temperature) illuminant combines red, green, blue, cool white and warm white LEDs in one illuminant. The "Extended-TW" application allows to extend the color temperature range of the Tunable White channel by automatically mixing color channels R, G and B in both directions. In addition to the temperature values of the two white channels cool white and warm white, the extended limits (also in Kelvin) must be specified. JUNG was the first to introduce this mode in the present generation of devices on the market and calls this "Extended TW". The user does not have to make any complex calculations here or carry out tests with the individual illuminants. Only the light temperature of the white LEDs must be specified. The JUNG algorithm automatically determines the optimal control. To allow additional color control, the COs for RGB control are also visible in this mode.

Example:

- Parameterization:
  - Color temperature illuminant warm white: 2700 K
  - Color temperature illuminant cold white: 6000 K
  - Minimum value: 1000 K
  - Maximum value: 10000 K
- Without TW-Extended, color temperatures between 2700 and 6000 K can be achieved by mixing the two white channels.
  - With TW-Extended - by mixing the three color channels - the warm white range is extended up to 1000 K and the cool white range up to 10000 K.
  - Note: The %-coldwhite parameters or CO then also no longer refer only to the white channels, but to the extended limits, e.g.:
    - 0% CW → 1000 K
    - 100% CW → 10000 K

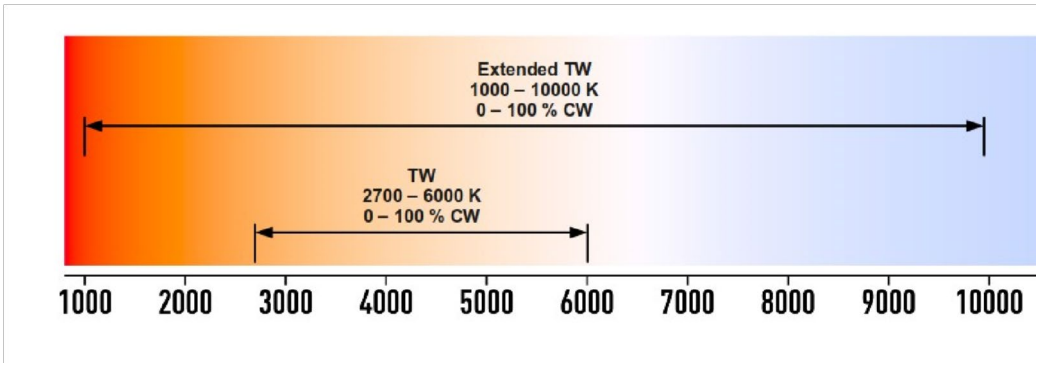


Figure 19: Example Extended-TW

RGBW: Virtualized TW

A Tunable White application can also be realized with a 4-channel RGBW illuminant (Simulated Tunable White). By mixing the color channels (red/green in the direction of warm white and blue/green in the direction of cool white) with the actual white tone of the white LED, significant shifts in the color temperature can be realized. Analog to the Extended-TW with RGBCCT illuminants, the color temperature of the white LED as well as the maximum color temperatures must be specified in the parameter set.

The user does not have to make complex calculations or carry out tests with the individual illuminants. The JUNG algorithm independently determines the optimal control. To additionally allow color control, the COs for RGB control are also visible in this mode.

Example:

- Parameterization:
  - Color temperature illuminant white: 5000 K
  - Minimum value: 1000 K
  - Maximum value: 10000 K
- With activated Virt-TW, a Tunable White is now realized internally by mixing color.
- Note: The %-cold white parameters or CO then also refer to the extended limits, e.g.:
  - 0% CW → 1000 K
  - 100% CW → 10000 K

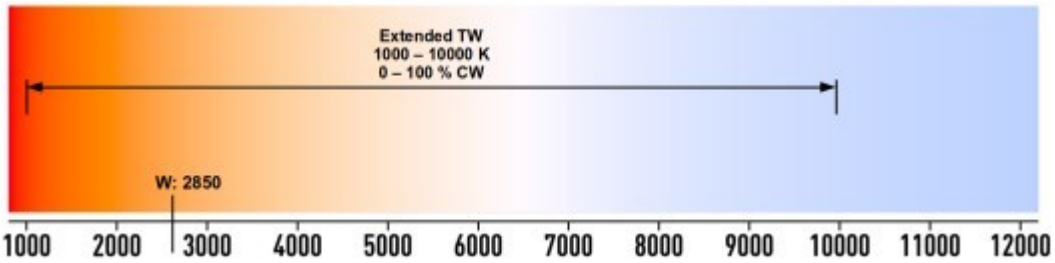


Figure 20: Example Virtualized TW

RGB: Virtualized TW

The implementation of a Tunable White simulation for a 3-channel RGB illuminant was deliberately omitted. The color intensities of individual illuminants are so different that a simple parameter set as in the RGBW: Virtualized TW is not purposeful, or only unsatisfactory results can be achieved depending on the illuminant.

Dim-2-Warm

This functionality can be used to simulate the dimming behavior of earlier halogen illuminants whose color temperature shifts towards warm white as the brightness decreases. For this purpose, two points are defined, each with brightness and color temperature.

Example:

	Brightness	Color Temperature
Threshold value 1	10 %	2500 K
Threshold value 2	60 %	4000 K

Table 3: Example Dim-2-Warm

Result:

- Total brightness of 10 % and less → Color temperature 2500 K
- Total brightness between 10 and 60 % → Linear interpolation of color temperature between 2500 and 4000 K
- Total brightness greater than 60 % → Color temperature 4000 K
    - If Dim-2-Warm is activated, the color temperature cannot be adjusted otherwise by means of parameters or COs.

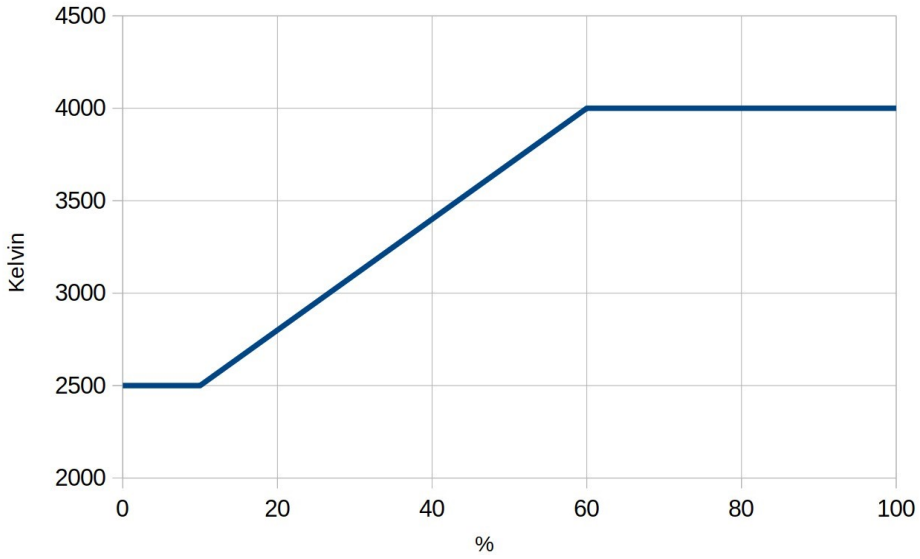


Figure 21: Example: Dim-2-Warm

7.6.6. Time-controlled dimming and Human Centric Light (HCL)

Via integrated timers, it is possible to run through sequences that are dependent on the time of day. These times, which are accompanied by changes in brightness or color value, can be parameterized as fixed times or relative to sunrise or sunset. A mixture of fixed and relative times is also possible. Up to ten time points with associated brightness or color values can be parameterized. The parameterized time points do not have to be chronological. They are automatically put into the correct order daily at 00:00 after calculation of the sunrise and sunset for the day.

Human Centric Light (HCL) describes time-controlled dimming in the Tunable White operating mode. This is less about changing the overall brightness and more about shifting the color temperature within the specified spectrum.

Thet ollowing figure shows typical starting points for an HCL cycle: The day begins in the morning hours with a very warm light similar to sunrise, before the color temperature increases more and more in the course of the morning, i.e. it becomes colder. In the midday hours, the light (as well as the sun at its zenith) is at its coldest. In the course of the afternoon, the temperature decreases again, i.e. becomes warmer, and culminates in its warmest point with the sunset.

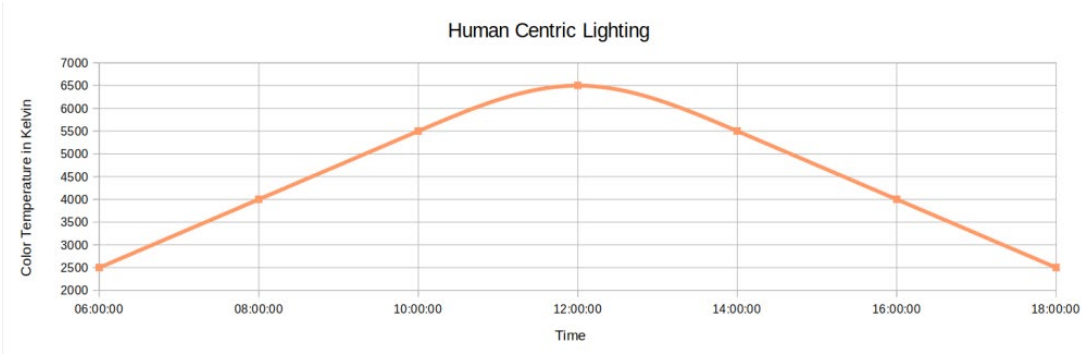


Figure 22: Human Centric Lighting

8. ETS Application

8.1. Specification

ETS: from Version 5.7.4

8.2. Parameter

Note: Depending on the parameterization, some setting options may not be available. In these cases, they are not displayed in the ETS.

8.2.1. General

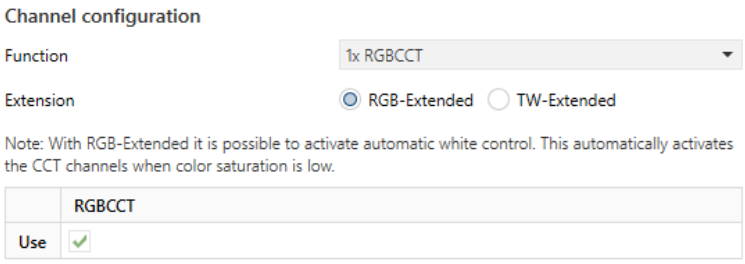


Figure 23: General

Parameter	Selection	Description
Function	5x Single channel (EK) 1x RGBCCT 1x RGBW + 1x EK 1x RGB + 2x EK 1x RGB + 1x TW 2x TW + 1x EK 1x TW + 3x EK	Determination of the operating mode: • RGB: Red/Green/Blue • RGBW: Red/Green/Blue/White • RGBCCT: Red/Green/Blue/Cold White/Warm White • TW: Tunable White: Cold White + Warm White
Extension	RGB-Extended TW-Extended	Restriction: The parameter is only available if • Operating Mode: 1x RGBCCT Specifying the type of extension for RGBCCT: • RGB Extended: RGB operation mode where white can be automatically mixed in. • TW-Extended: TW operating mode in which the warm white and cool white limits can be extended by mixing in the corresponding color. Further explanations of the two extensions can be found in the chapters RGBCCT: Extended-RGB or RGBCCT: Extended-TW
Use	Checkbox	Release of the channel / channel group

Table 4: Parameter General

8.2.1.1. Configuration

General settings

Note: A general parameter is valid for all channels / channel groups. For some parameters, it is possible to specify whether they are to be defined for all channels or channel- / channel group-specific.

PWM frequency	488 Hz

Note: In general, lower PWM frequencies are recommended to achieve the lowest possible minimum brightness. Higher frequencies can be used if, for example, flickering can be detected at lower frequencies.

Behaviour at bus voltage return	◉ All channels identical ○ Each channel individual
	Values before bus voltage failure
Switch-on delay	All channels identical
	0 s
Switch-off delay	All channels identical
	0 s
Status output behaviour	◉ All channels identical ○ Each channel individual
	At the end of the dimming process
Cyclical status output	◉ All channels identical ○ Each channel individual
	Off
Telegram rate limit (Tx)	50 T / s
Enable external power relay?	◉ No ○ Yes

Table 5: Configuration

Parameter	Selection	Description
PWM Frequency	211 Hz 488 Hz 600 Hz 832 Hz 1000 Hz 1200 Hz	Determination of the PWM frequency. This applies to all channels. Recommendation: 488 Hz Note: Generally lower PWM frequencies are recommended to be able to dim down as far as possible. Higher frequencies can be used if flickering can be detected at the lower frequencies.
Behavior on bus voltage recovery	All channels identical Each channel individual Illuminant Off Last value Fixed value	Determines whether the behavior on bus voltage recovery is to be defined globally or channel/channel group-specifically. If All channels identical: Illuminant Off: All channels are off Last value: Each channel dims to the brightness value it had before bus voltage failure Fixed value: All channels dim to one parameterizable brightness value
Brightness of all channels	0 – 100 %	Restriction: The parameter is only available if • Behavior on bus voltage recovery: Global and Fixed value Switch-on brightness after bus voltage recovery
Switch-on delay	All channels identical All channels identical with day / night Distinction Each channel individual Each channel individual with day / night distinction	Definition of whether the switch-on delay (switch-on by means of switch object) is to be defined globally or channel/channel group-specifically. In both cases, it is also possible to determine whether there should be a distinction between day and night.
Switch-on delay	0 – 60 s	Restriction: The parameter is only available if • Switch-on delay: Identical Definition of the switch-on delay in seconds, independent of the time of day.
Switch-on delay day	0 – 60 s	Restriction: The parameter is only available if • Switch-on delay: All channels identical with day / night Distinction Definition of the switch-on delay for day in seconds
Switch-on delay night	0 – 60 s	
Switch-off delay	Analog to switch-on delay	Analog to switch-on delay
Behavior status output	All channels identical Each channel individual At the end of the dimming process During the dimming process in defined % steps + At the end During dimming in defined time steps + At the end	Determines whether the behavior on bus voltage recovery is to be defined globally or channel/channel group-specifically. If All channels identical: All relevant status objects are output at the end of the dimming process During the dimming process in defined % steps + At the end: All relevant status objects are output at the end of the dimming process and also in parameterizable percentage steps during the dimming process During the dimming process in defined time steps + At the end: All relevant status objects are output at the end of the dimming process and in parameterizable time steps during the dimming process.
Status output all	5 % 10 % 20 % 50 % or. 1 – 60 s	Restriction: The parameter is only available if • Behavior Status output: During the dimming process in defined % steps or At the end or During the dimming process in defined time steps + At the end Defining the step size of the status outputs during the dimming process

Cyclic status output	All channels identical Each channel individual off 1 min 5 min 10 min 30 min 60 min	Definition of whether the behavior Cyclic status outputs (regardless of whether a dimming process is currently running or not) is to be set globally or channel/channel group-specifically. If All channels identical: Selection of the step size for the cyclical status output of all relevant status objects
Telegram rate limitation (Tx)	5 – 50 Telegrams / s	Limitation of the transmission power of the device in order not to overload the bus load during status outputs in projects with a high base load. Telegrams that cannot be sent immediately due to the limitation are buffered and successively written to the bus.
Release external mains relay	Yes No	Enabling of the external switching actuator to switch off the LED power supply on the mains side when there is no demand

Table 6: Configuration

8.2.1.2. Dimming settings

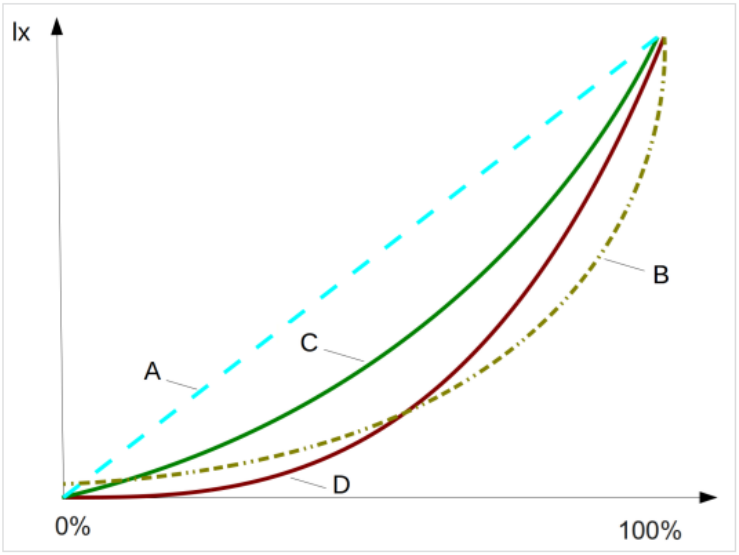
General settings

Note: A general parameter is valid for all channels / channel groups. For some parameters, it is possible to specify whether they are to be defined for all channels or channel- / channel group-specific.

Dimming characteristics: All channels identical / Each channel individual

Linear (A)

For single channel, the "JUNG" characteristic is recommended, as a continuously increasing / decreasing brightness perceived by the human eye has been implemented. For RGB and TW, on the other hand, the linear dimming characteristic is recommended.



Switch when dimming: All channels identical / Each channel individual

No / Yes

Definition of dimming speed absolute	Time per dimming process
Definition of dimming speed relative	Time per dimming process
Dimming speeds	All channels identical
Dimming speed absolute	3 s
Dimming speed relative	3 s
Switch-on speed	3 s
Switch-off speed	3 s

Figure 24: Dimming settings

Parameter	Selection	Description
Dimming curve	All channels identical Each channel individual Linear (A) Exponential (B) Power function (C) JUNG (D)	Definition of whether the dimming curve is to be set globally or channel/ channel group-specifically. If All channels identical: Selection of the dimming curve (see also Dimming curve) Note: For single channel operation, the "JUNG" curve is recommended, as a continuous brightness increase/decrease is implemented for the eye. For RGB and TW channel groups, on the other hand, the linear dimming curve is recommended.
Switching during dimming	All channels identical Each channel individual Yes No	Definition of whether the behavior Switch on dimming is to be defined for all channels or for specific channels/channel groups. If All channels identical: Definition of whether a relative dimming command may also be used to switch on. Note: Internally, staircase lighting, scenes, bit scenes, disable functions, sequences and time-controlled dimming are also treated as absolute dimming operations. Therefore, when using these functions, it is recommended to set the parameter to "Yes" in any case, if the switch object is not to be switched on first before each action.
Dimming speed Absolute day	Time per dimming operation Time from 0 → 100	Restriction: The parameter is only available, If • General/Function no RGB(CCT/W) channel group contains Definition of whether the absolute / relative dimming speeds parameterized in the further course refer to the individual dimming process (independent of the step width) or always to the step 0 → 100 % and are then scaled accordingly. For RGB(CCT/W) channel groups, only the former is available. For TW channel groups both definitions are available, but it is also recommended to use the former.
Dimming speed Relative day	Time per dimming operation Time from 0 → 100	
Dimming speed	All channels identical All channels identical [day / night distinction] Each channel individual Each channel individual [day / night distinction]	Definition of whether the dimming speeds (switching on by means of a switch object) are to be defined on a cross-channel or channel/channel group-specific basis. In both cases, it is also possible to specify whether there should be a distinction between day and night.
Dimming speed Absolute day	0 – 60 s	Restriction: The parameter is only available if • Dimming speeds: identical with distinction day / night Definition of dimming speed for absolute / relative dimming processes in seconds during the day
Dimming speed Relative day	0 – 60 s	
Switch on speed day	0 – 60 s	Restriction: The parameter is only available if • Dimming speeds: identical with distinction day / night Definition of the dimming speed for switch-off processes in seconds during the day. The value refers to the process of 100 → 0 %. For lower output brightness, the time is scaled accordingly

Switch off speed	0 – 60 s	Restriction: The parameter is only available if • Dimming speeds: identical with distinction day / night Definition of the dimming speed for switch-off processes in seconds during the day. The value refers to the process of 100 → 0 %. For lower output brightness, the time is scaled accordingly
Dimming speed Absolute nigh	Analogous to dimming speed Absolute day	Analogous to dimming speed Absolute day
Dimming speed relative nigh	Analogous to dimming speed relative day	Analogous to dimming speed relative day
Switch on speed night	Analogous to switch-on speed Day	Analogous to switch-on speed Day
Switch off speed night	Analogous to switch-off speed Day	Analogous to switch-off speed Day

Table 7: Parameter dimming settings

8.2.1.3. Time functions

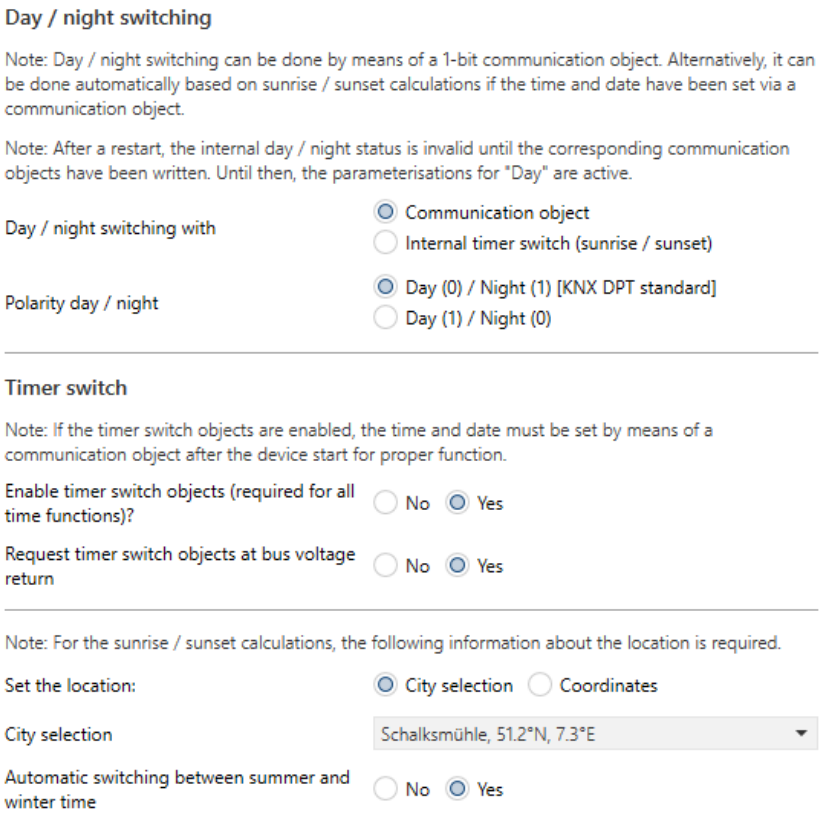


Figure 25: time functions

8.2.1.4. External power relay

Note: This tab is only available if parameter "Release external power relay" under General/ Configuration is set to Yes.

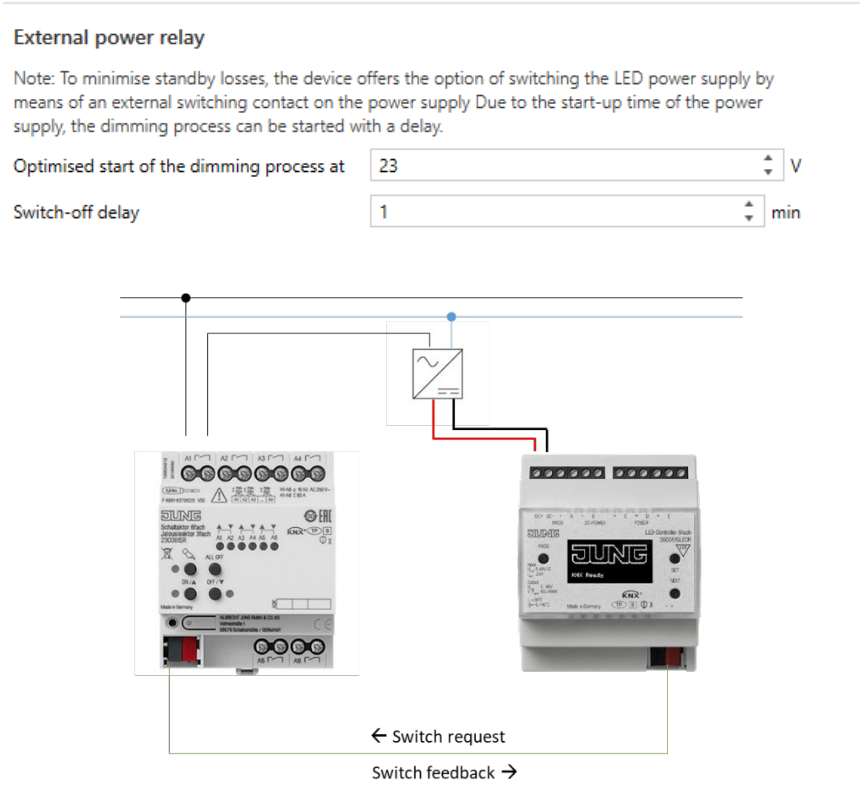


Figure 26: Parameter 8.2.1.4 External power relay

Parameter	Selection	Description
Optimized start of dimming at	4 – 48 V	The switch-on process only starts when the threshold voltage parameterized here is reached after switching on the LED power supply. Recommendation: The value should be 1 to 2 V below the nominal voltage.
Switch-off delay	0 – 180 min	To avoid too frequent switch-off processes of the LED power supply in certain scenarios, a switch-off delay can be parameterized here.
Day / night switching by	CO Internal Timer	Release communication object day/night. This parameter defines whether the day/night switchover is to be performed externally by means of CO or on the basis of an internally calculated sunrise/sunset (only possible if time/date is set by means of CO).
Polarity day / night	day (0) / night (1) day (1) / night (0)	Restriction: The parameter is only available if • Day / night changeover by means of: CO Depending on the parameterization polarity day is set for value 0 (KNX DPT standard) or for value 1.
Release time objects?	Yes No	Release of the communication objects Time and Date. This release is a prerequisite for the use of time-controlled dimming.
Request timer ob-jects on bus volt¬age recovery	Yes No	Restriction: The parameter is only available if • Release time objects: Yes If Yes, time and date objects are automatically requested after device start If Yes, Location selection for sunrise/sunset calculation
Set location	City selection Coordinates	

City selection	Div. City	Selecting the city or entering the coordinates
Longitude East	-180 - +180 °	
Latitude North	-90 - +90 °	
Time zone with regard to world time (UTC)	Div. Time zones	Restriction: The parameter is only available if • Release time objects: Yes • Set location: Coordinates Set time zone against UTC
Automatic switching between summer and winter time	Yes No	Restriction: The parameter is only available if • Release time objects: Yes Defines whether an automatic summer/winter time changeover is to take place.

Table 8: time functions

8.2.2. **Measurements and meter**

Note: This tab is always available.

The information about the line is necessary for the calculation of the voltage drop at the conductor and thus for the voltage measurement at the illuminant (commissioning function), as well as for the illuminant protection functions. If these functions are not used, the parameters can be ignored.

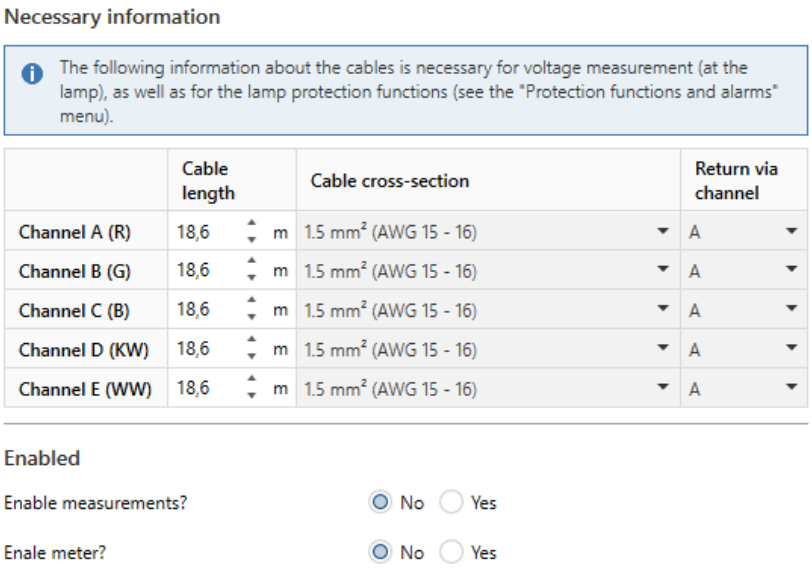


Figure 27: Measurements and counters

Parameter	Selection	Description
Cable length	0,5 – 50 m	Parameterization of the cable length (single) in meters
Conductor crosssection	0,75 mm² 1,5 mm² 2,5 mm² 4,0 mm²	Parameterization of the conductor cross-section.
Return via channel	A B C D E	RGB(CCT/W), as well as TW illuminants often have common return conductors. This can be taken into account here.
Enable measurements	Yes No	Enable measurements tab
Enable counters	Yes No	Enable counter tab

Table 9: Measurements and counters

8.2.2.1. Measurements

Note: This tab is only available if parameter "enable measurements" under Measurements and Counters is set to Yes.

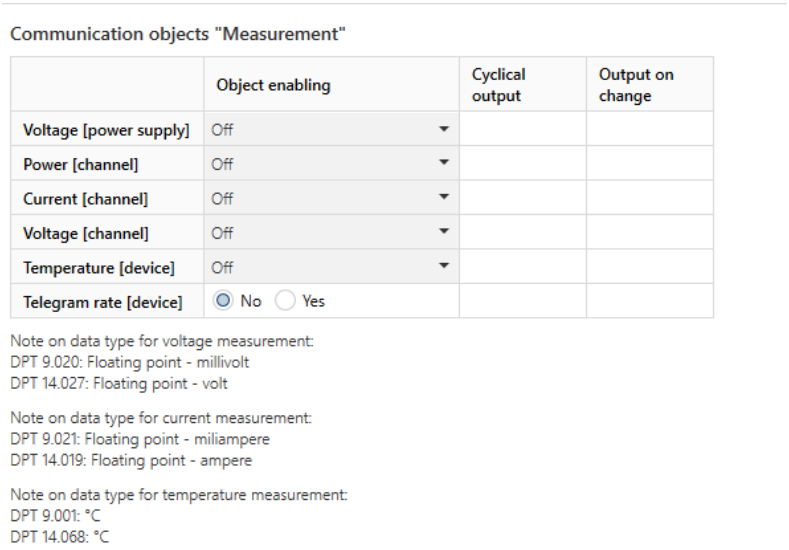


Figure 28: Measurement

Parameter	Selection	Description
Enable objects	Div.	Enabling of the communication objects for the various measured variables. Depending on the measured variable, it can be parameterized whether communication object(s) for the sum variable or individual channels/channel groups are Released and/or the desired DPT.
Cyclic output	Off 1 min 5 min 10 min 30 min 60 min	Restriction: The parameter is only available if • Object release: Not Off or No Cyclic sending of the communication objects of the measured variable
Output at change	Off > 5 % > 10 % > 20 % > 50 %	Restriction: The parameter is only available if • Object release: Not Off or No Automatic sending of the measured value CO in case of changes by a certain percentage value.

Table 10: Measurement

8.2.2.2. Meter

Note: This tab is only available if parameter "Enable meter" under Measurements and meter is set to Yes.

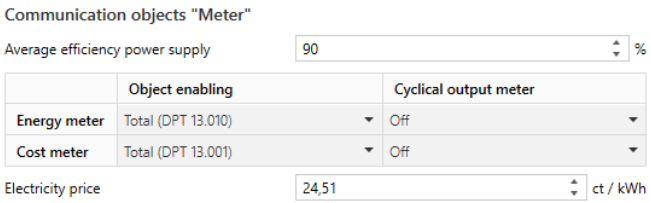


Figure 29: Counter

Parameter	Selection	Description
Enable objects	Off Sum Per channel Sum + Per channel	Enabling of the communication objects for the various counters. It can be parameterized whether communication object(s) are released for the totalizing variable or individual channels/channel groups.
Cyclic output	Off On the quarter hour On the hour To the full day	Restriction: The parameter is only available if • Object release: Not Off Cyclic sending of the communication objects of the respective counters.

Table 11: Counter

8.2.3. Alarm objects and protection functions

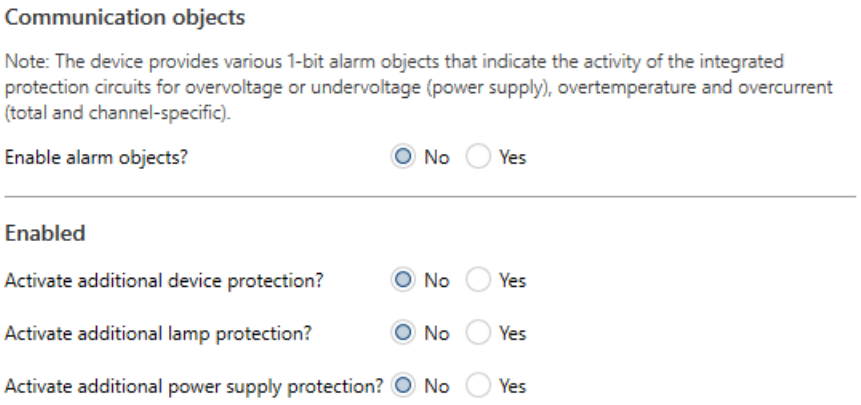


Figure 30: Alarm objects and protection functions

Parameter	Selection	Description
Enable	Yes No	Release communication objects Alarm: undervoltage, overvoltage, overcurrent, overtemperatur
Enable additional device protection	Yes No	Release additional device protection: Provides the option to lower the trigger threshold for the integrated overtemperature shutdown.
Enable lamp protection	Yes No	Release illuminant protection: Provides the possibility to alarm overload scenarios at the illuminant (communication objects) by parameterization of continuous power and inputs for overload capability and to switch off if desired
Enable power supply protection	Yes No	Release power supply protection: Provides the possibility to alarm overload scenarios at the LED power supply (communication objects) by parameterization of continuous power and inputs for overload capability and to switch off if desired.

Table 12: Alarm objects and protection functions

8.2.3.1. Additional device protection

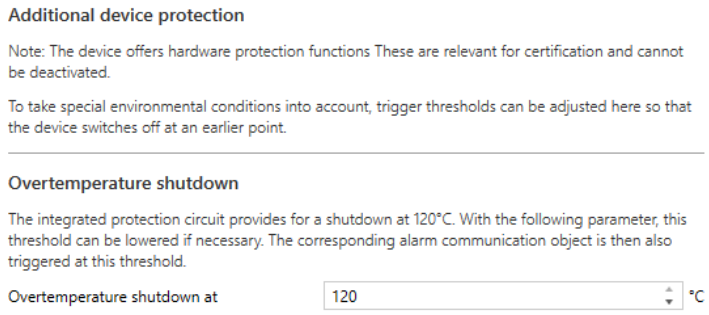


Figure 31: Additional device protection

Parameter	Selection	Description
Overtemperature shutdown at	60 – 120 °C	Defining the threshold above the overtemperature shutdown is triggered

Table 12: Additional device protection

8.2.3.2. Illuminant protection

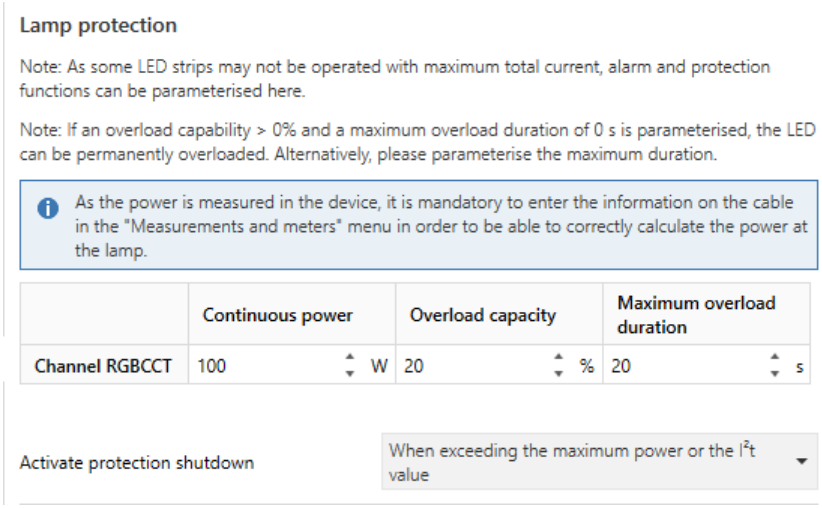


Figure 32: Illuminant protection

Parameter	Selection	Description
Continuous power	1 – 480 W	Parameterization of the continuous power of the illuminants of the channel / channel group in watts.
Overload capacity	0 – 100 %	Parameterization of the overload capacity of the illuminant of the channel / channel group in percent. Recommendation: 20%
Maximum duration overload	0 – 36000 s	Parameterization of how long the overload parameterized under "Overload capacity" may be present. If 0 is parameterized here, the illuminant may be permanently overloaded. Recommendation: 20 s
Enable protective shutdownn	Off When the continuous power is exceeded When exceeding the I²t value When the maximum power is exceeded When exceeding the maximum power or the I²t value	Definition of whether lamp overload should lead to shutdown. Options: Shutdown at: - Exceeding of the parameterized continuous load - Exceeding of the parameterized maximum load - Exceeding the I²t threshold defined by overload capacity and duration (see chapter Illuminant protection) Recommendation: When exceeding the maximum power or the I²t value

Table 13: Illuminant protection

8.2.3.3. Power supply protection

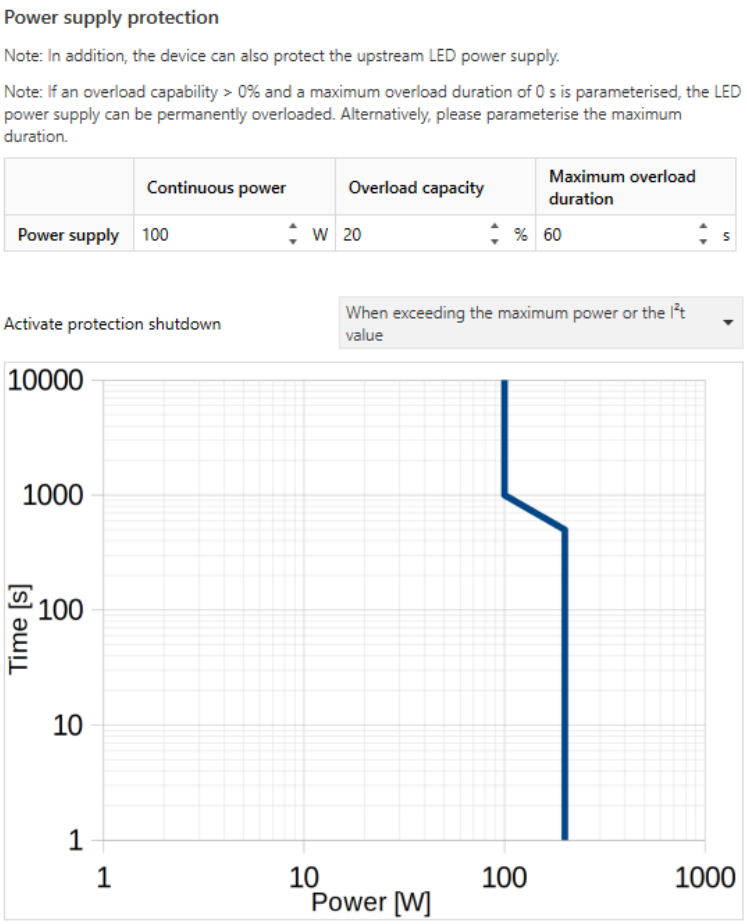


Figure 33: Parameter Netzteilschutz

Parameter	Selection	Description
Continuous power	1 – 1000 W	Parameterization of the continuous power of the channel / channel group in watts.
Overload capacity	0 – 100 %	Parameterization of the overload capacity of the channel / channel group in percent. Recommendation: 20%
Maximum duration overload	0 – 36000 s	Parameterization of how long the overload parameterized under "Overload capacity" may be present. If 0 is parameterized here, the power supply may be permanently overloaded. Recommendation: 60 s
Enable protective shutdownn	Off When the continuous power is exceeded When exceeding the I²t value When the maximum power is exceeded When exceeding the maximum power or the I²t value	Definition of whether power supply overload should lead to shutdown. Options: Shutdown at: • Exceeding of the parameterized continuous load • Exceeding of the parameterized maximum load • Exceeding of the I²t threshold defined by overload capacity and duration (see chapter Power supply protection) Recommendation: When exceeding the maximum power or the I²t value

Table 14: Parameter Netzteilschutz

8.2.4. Channel configuration

8.2.4.1. Single channel

Note: This channel is only available if an "Operating mode" is selected under General that con tains at least one individual channel and this is selected under "Use" (see General).
Note: The parameters that are parameterized as "Each channel individual" under General / Configuration also appear in this case here in the channel in the corresponding tabs. Selection and description are analogous to "All channels identical"

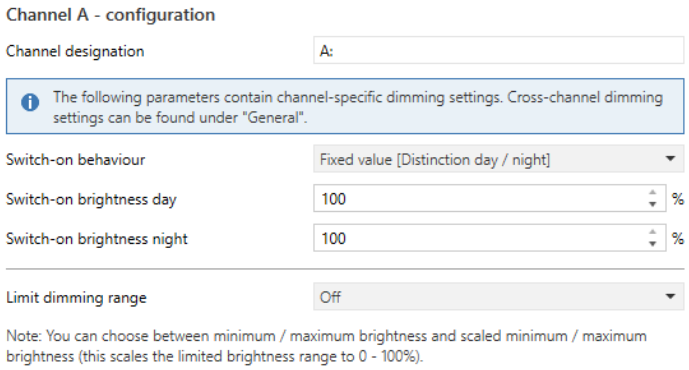


Figure 34: Single Channel

Parameter	Selection	Description
Name	Text	Free definition of a channel name. This is used for the parameter tabs and for the names of the communication objects for an optimum overview
Switch on behavior	Fixed value Fixed value [day / night distinction] Last value Last value [day / night distinction]	Definition of the switch-on behavior (switching on via switch object): Fixed value or Last value (this is saved when switching off). In both cases, it is also possible to specify whether there should be a differentiation between day and night.
Switch-on brightness	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value Definition of the channel brightness for the switch-on process
Switch-on brightness day	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] Definition of the channel brightness for the switch-on process
Switch-on brightness night	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] Definition of the channel brightness for the switch-on process
Limit dimming range	Off Limit Limit [day / night distinction] Scalable limit Scalable limit [day / night distinction]	Definition of whether the dimming range for the channel is to be limited. Two alternatives are available for this: Scalable limit: The range between parameterized minimum and maximum brightness is scaled to 0 to 100 %. Limit: The range between the parameterized minimum and maximum brightness is not scaled to 0 to 100 %. If values greater than the maximum value or less than the minimum value are dimmed, the maximum value or minimum value is dimmed. Absolute dimming 0% always switches off. In both cases, it is also possible to specify whether there should be a distinction between day and night.

Minimum brightness	0 – 100 %	Restriction: The parameter is only available if • Limit dimming range: Not "Off Defining the brightness for the channel.
Maximum brightness	0 – 100 %	
Maximum brightness day	0 – 100 %	Restriction: The parameter is only available, If • Limit dimming range: Limit [day / night distinction] oder Scalable limit [day / night distinction] Defining the brightness for the channel.
Maximum brightness night	0 – 100 %	Restriction: The parameter is only available, If • Limit dimming range: Limit [day / night distinction] oder Scalable limit [day / night distinction] Defining the brightness for the channel.

Table 15: Single channel

8.2.4.2. RGB - Configuration

Note: The RGB channel group is only available if an "Operating mode" containing the channel group is selected under General and this is selected under "Use" (see General).
Note: The parameters that are parameterized as " Each channel individual " under General / Configuration also appear in this case here in the channel in the corresponding tabs. Selection and description are analogous to " All channels identical ".

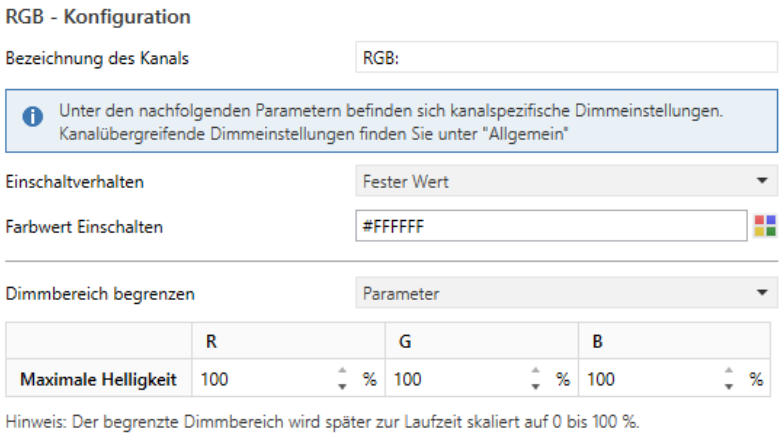


Figure 35: RGB - Configuration

Parameter	Selection	Description
Name	Text	Free definition of a channel name. This is used for the parameter tabs and for the names of the communication objects for an optimum overview
Switch on behavior	Fixed value Fixed value [day / night distinction] Last value Last value [day / night distinction]	Definition of the switch-on behavior (switching on via switch object): Fixed value or Last value (this is saved when switching off). In both cases, it is also possible to specify whether there should be a differentiation between day and night.
Switch on value	RGB-value	Restriction: The parameter is only available, If • Switch on behavior: Fixed value Definition of the RGB color value for the switch-on process
Switch on value day	RGB- value	Restriction: The parameter is only available, If •Switch on behavior: Fixed value [day / night distinction] Definition of the RGB color value for the switch-on process
Switch on value night	RGB-Wert	
Limit dimming range	Off CO Parameter	Definition of the maximum brightness of individual channels to be limited. The limited dimming range is later scaled to the values 0 to 100 % at runtime. Options: CO: The limitation is made during operation (see the description of communication object 204 in chapter Communication objects). Parameter: A parameter for defining the max. brightness is available for each channel of the channel group
Maximum brightness	Red: 0 – 100 % Green: 0 – 100 % Blue: 0 – 100 %	Restriction: The parameter is only available if • Limit dimming range: Parameter Definition of the max. brightnesses for the individual channels of the channel group.

Table 16: RGB - Configuration

8.2.4.3. RGBW – White channel

Note: The RGBW channel group is only available if the corresponding operating mode is selected under General and this is selected under "Use" (see General).

Note: The parameters that are parameterized as " Each channel individual " under General / Configuration also appear in this case here in the channel in the corresponding tabs. Selection and description are analogous to " All channels identical ".

Note: The settings of the RGBW application essentially correspond to those of RGB - Configu ration supplemented by settings for the white channel. Only these are shown here.

Figure 36: White Channel

Parameter	Selection	Description
Automatic brightness control White	Yes No	Specifies whether the white channel should be automatically mixed depending on the current saturation value (see RGBW)
Switch-on behavior - brightness	0 – 100 %	Restriction: The parameter is only available, If • Automatic brightness control White - No Defines the switch-on brightness for the white channel

Table 17: White Channel

8.2.4.4. RGBCCT (as RGB-Extended) – White channel

Note: The RGBCCT channel group is only available if the corresponding operating mode is selected under General in conjunction with the RGB-Extended extension and the channel group is selected under "Use" (see General).

Note: The parameters that are parameterized as " Each channel individual" under General / Configuration also appear here in the channel in the corresponding tabs in this case. Selection and description are analogous to " All channels identical".

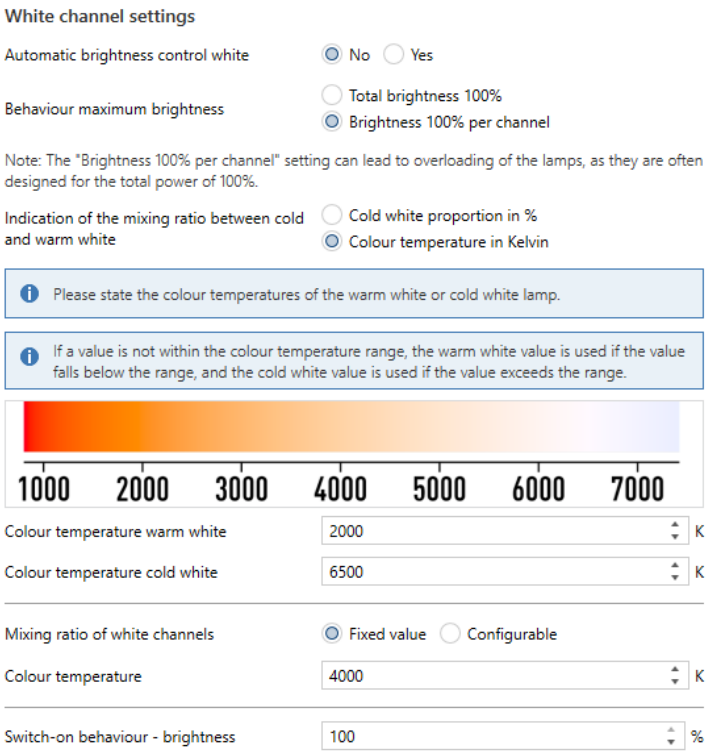


Figure 37: Parameter RGBCCT (as RGB-Extended) – White channel

Parameter	Selection	Description
Automatic brightness control White	Yes No	Specifies whether the white channels should be automatically mixed depending on the current saturation value (see RGBCCT: Extended-RGB).
Behavior Maximum brightness	Total brightness 100 % brightness 100 % per channel	Defines if the Tunable-White brightness refers to the sum brightness of cool and warm white or if 100 % per channel should be controlled. Note: The setting "100 % per channel" can lead to an overload of the illuminants, as they are often only designed for a sum power of 100 %
Specification of the mixing ratio between cold and warm white	Cold white in % Temperature in K	Definition whether all parameters and CO concerning the TW mixing ratio are to be released as "Cold white ratio in %" or as "Light temperature in Kelvin". In the latter case, specifications must be made for the color temperatures of both channels CW and WW
Color temperature warm white	1800 – 3300 Kelvin	Restriction: The parameter is only available, If • Specification of the mixing ratio between cold and warm white: Light temperature in Kelvin Definition of the color temperature of the used illuminant.
Color temperature cold white	4700 – 7000 Kelvin	
Mixing ratio	Fixed Parameterizable	Specifies whether the mixing ratio of the white channels is to be defined as fixed here or whether it is to be flexibly parameterizable for the individual operating modes
Proportion cold white	0 – 100 %	Restriction: The parameter is only available if • Specification of the mixing ratio between cold and warm white: • Mixing ratio of white channels: Fixed Definition of the fixed color temperature for the TW channel group
Farbtemperatur	600 – 11000 Kelvin	
CO Release mixing ratio	Yes No	Restriction: The parameter is only available if • Mixing ratio of the white channels: Parameterizable Release communication object for absolute or relative dimming of TW color temperature.
Switch-on behavior - Brightness	0 – 100 %	Restriction: The parameter is only available, If • Automatic brightness control White: No Definition of switch-on brightness for the TW channel group.
Switch-on behavior - CW ratio	0 – 100 %	Restriction: The parameter is only available, If • Automatic brightness control white: No • Specification of mixing ratio between cold and warm white: Proportion of cold white in %. • Mixing ratio of white channels: Parameterizable Specification of the color temperature for the TW channel group..
Switch-on behavior - color temperature	600 – 11000 Kelvin	Restriction: The parameter is only available, If • Automatic brightness control white: No • Specification of mixing ratio between cold and warm white: • Light temperature in Kelvin • Mixing ratio of white channels: Parameterizable Specification of the color temperature for the TW channel group.

Table 18: Parameter RGBCCT (as RGB-Extended) – White channel

8.2.4.5. Tunable White - Configuration

Note: The TW channel group is only available if an "Operating mode" is selected under General that contains the channel group and is selected under "Use" (see General).

Note: The parameters that are configured as " Each channel individual " under General / Configuration also appear here in the corresponding tabs in the channel. The selection and description are analogous to " All channels identical".

Note: The parameters shown here for Tunable White channel 1 (TW 1) apply analogously to TW 2.

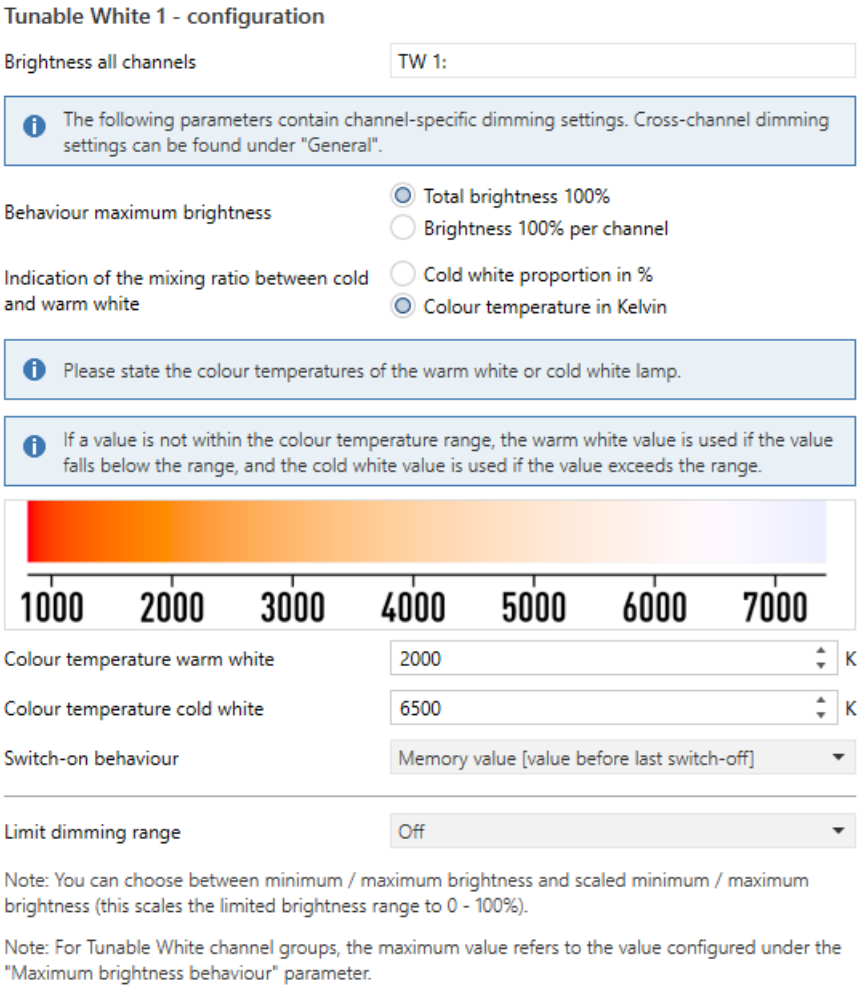


Figure 38: Parameter TW – Configuration

Parameter	Selection	Description
Name	Text	Free definition of a channel group name. This is adopted for the parameter tabs as well as for the names of the communication objects for an optimal overview.
Behavior maximum brightness	Total brightness 100 % Brightness 100 % per Channel	Determination of whether the tunable white brightness relates to the total brightness of cold and warm white, or 100% per channel should be controlled. Note: The setting "100% per channel" can lead to overloading of the lamps, as these are often only designed for a total output of 100%.
Mixing ratio	Cold White % Kelvin	Determination of whether all parameters and CO relating to the TW mixing ratio should be released as "cold white%" or as "light temperature in Kelvin". In the latter case, information about the color temperatures of the two channels CW and WW must be made.
Color Temperatur Warm white	1800 – 3300 Kelvin	Restriction: The parameter is only available, If • Specification of the mixing ratio between cold and warm white: Light temperature in Kelvin. Specifies the color temperature of the illuminant used
Color Temperatur Cold white	4700 – 7000 Kelvin	
Switch-on behavior	Fixed value Fixed value [day / night distinction] Last value Last value [day / night distinction]	Definition of the switch-on behavior (switching on via switch object): • Fixed value or Last value (this is saved when switching off). In both cases, it is also possible to specify whether there should be a distinction between day and night.
Switch on behavior - brightness	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value Definition of the TW brightness for the switch-on process
Switch on behavior – brightness day	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] Definition of the TW brightness for the switch-on process
Switch on behavior – brightness night	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] Definition of the TW brightness for the switch-on process
Switch on behavior – % Cold white	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value • Specification of mixing ratio between cold and warm white: Proportion of cold white in %. • TW 1 / Dimming settings / Activate Dim-2-Warm: No Specification of the CW proportion for the switch-on process
Switch on behavior – % Cold white day	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] • Specification of mixing ratio between cold and warm white: Proportion of cold white in %. • TW 1 / Dimming settings / Activate Dim-2-Warm: No Specification of the CW proportion for the switch-on process

Switch on behavior – % Cold white night	0 – 100 %	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] • Specification of mixing ratio between cold and warm white: Proportion of cold white in %. • TW 1 / Dimming settings / Activate Dim-2-Warm: No Specification of the CW proportion for the switch-on process
Switch on behavior – Color temperature	600 – 11000 Kelvin	Restriction: The parameter is only available, If • Switch on behavior: Fixed value • Specification of mixing ratio between cold and warm white: Light temperature in Kelvin • TW 1 / Dimming settings / Activate Dim-2-Warm: No Specification of the color temperature for the switch-on process.
Switch on behavior Color temperature day	600 – 11000 Kelvin	Restriction: The parameter is only available, If • Switch on behavior: Fixed value [day / night distinction] • Specification of mixing ratio between cold and warm white: Light temperature in Kelvin • TW 1 / Dimming settings / Activate Dim-2-Warm: No Specification of the color temperature for the switch-on process.
Switch on behavior Color temperature night	600 – 11000 Kelvin	
Limit dimm range	Off Limit Limit [day / night distinction] Scalable limit Scalable limit [day / night distinction]	Definition of whether the dimming range for the channel group is to be limited. Two alternatives are available for this: Scalable limit: The range between parameterized minimum and maximum brightness is scaled to 0 to 100 %. Limit: The range between the parameterized minimum and maximum brightness is not scaled to 0 to 100 %. If values greater than the maximum value or less than the minimum value are dimmed, the maximum value or minimum value is dimmed. Absolute dimming 0% always switches off. In both cases, it is also possible to specify whether there should be a distinction between day and night
Minimum brightness	0 – 100 %	Restriction: The parameter is only available if • Limit dimming range: Not "Off Defines the minimum brightness for the channel group
Maximum brightness	0 – 100 %	Restriction: The parameter is only available if Limit dimming range: Limit or Scalable limit [Day / night] Defines the maximum brightness for the channel group
Maximum brightness day	0 – 100 %	
Maximum brightness night	0 – 100 %	

Table 19: TW - Configuration

Tunable White – Dimming settings

Note: The TW channel group is only available if an "Operating mode" containing the channel group is selected under General and this is selected under "Use" (see General).

Note: The parameters that are parameterized as " Each channel individual " under General / Configuration also appear in this case here in the channel in the corresponding tabs. Selection and description are analogous to " All channels identical ".

Note: The parameters shown here for Tunable White channel 1 (TW 1) apply analogously to TW 2.

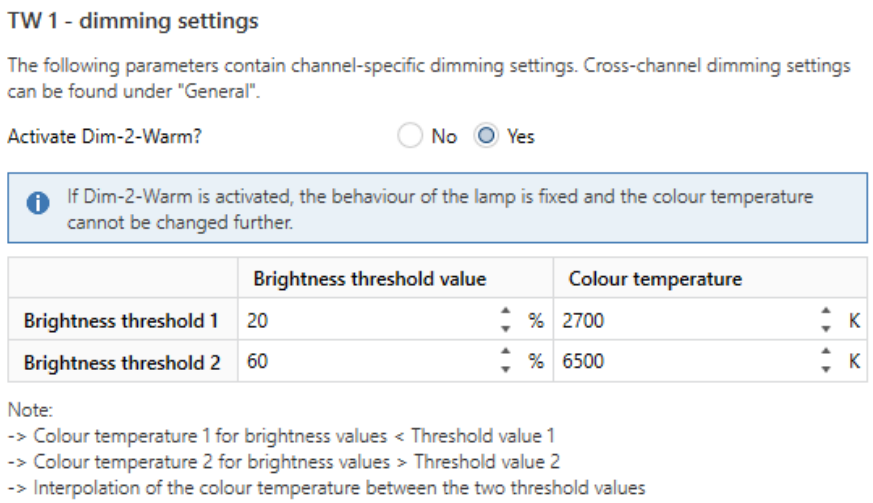


Figure 39: Dimming settings

Parameter	Selection	Description
Dim-2-Warm	Yes No	Activate Dim-2-Warm Note: If active, all parameters and communication objects concerning the mixing ratio are not released for the entire channel group
Threshold values brightness	0 – 100 %	Restriction: The parameter is only available if • Activate Dim-2-Warm: Yes Definition of the two interpolation points.
Color temperature	0 – 100 %	Restriction: The parameter is only available if • Release Dim-2-Warm: Yes • Specification of mixing ratio between cold and warm white: Proportion of cold white in %. Definition of the color temperature in cold white % for the two supporting points.
Farbtemperatur	600 – 11000 Kelvin	Restriction: The parameter is only available if • Release Dim-2-Warm: Yes • Definition of mixing ratio between cold and warm white: Light temperature in Kelvin Definition of the color temperature in Kelvin for the two supporting points

Table 20: Dimming settings

8.2.4.6. RGBCCT (as TW-Extended) - Configuration

Note: The RGBCCT channel group is only available if the corresponding operating mode in connection with the extension TW-Extended is selected under General and the channel group underneath is selected under "Use" (see General).

Note: The parameters that are configured as " Each channel individual " under General / Configuration also appear here in the corresponding tabs in the channel. The selection and description are analogous to " All channels identical".

Note: The settings of the RGBCCT application (as TW-Extended) essentially correspond to those of Tunable White – Dimming settings, supplemented by settings for adding the color channels. Only these are shown here.

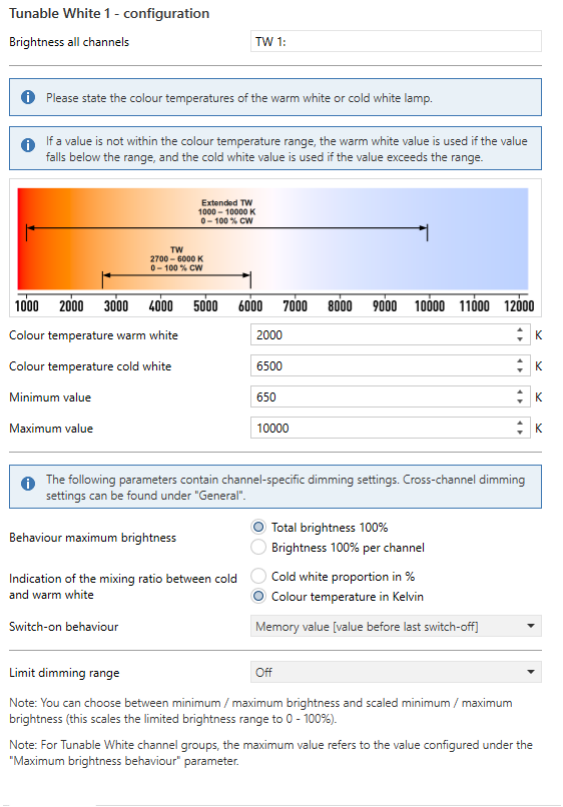


Figure 40: RGBCCT (as TW-Extended) – Configuration

Parameter	Selection	Description
Color temperature warm white	1800 – 3300 Kelvin	Definition of the color temperature of the warm white illuminant used
Color temperature cold white	4700 – 7000 Kelvin	Definition of the color temperature of the cool white light source used.
Minimum color temperature	600 – 1800 Kelvin	Extension of the color temperature range down to the value configured here
Maximum color temperature	7000 – 11000 Kelvin	Extension of the color temperature range upwards to the value configured here

Table 21: RGBCCT (as TW-Extended) – Configuration

8.2.4.7. RGBW (as Virtualized TW) - Configuration

Note: The TW channel group is only available if the RGBW operating mode in connection with the parameter "Activate virtualized tunable white" is selected under General and the channel group is selected under "Use" (see General).

Note: The parameters that are configured as "Each channel individual" under General / Configuration also appear here in the corresponding tabs in the channel. The selection and description are analogous to "All channels identical".

Note: The settings of the RGBW application (with sim. TW) essentially correspond to those of Tunable White – Dimming settings, supplemented by settings for adding the color channels. Only these are shown here.

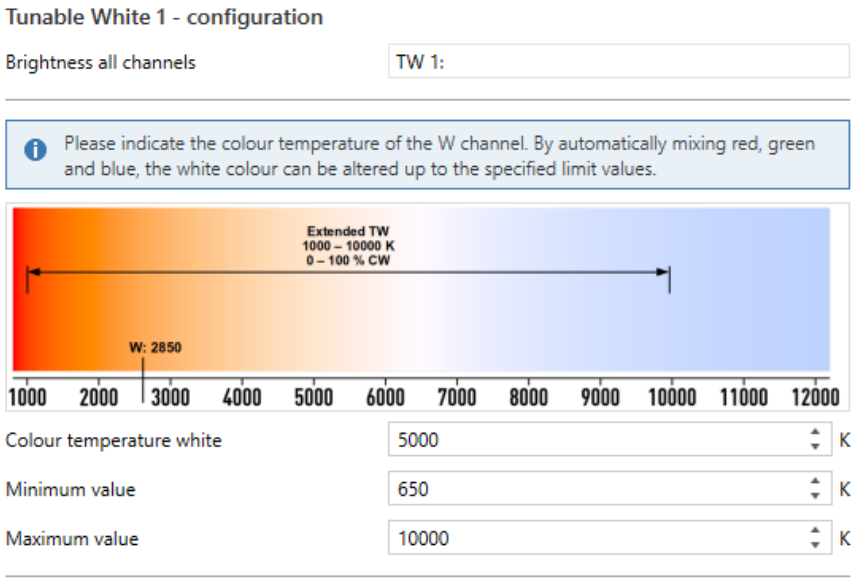


Figure 41: RGBW (as virt. TW) – Configuration

Parameter	Selection	Description
Color temperature white	600 – 11000 Kelvin	Definition of the color temperature of the used white illuminant.
Minimum value	600 – 4500 Kelvin	Extension of the color temperature range down to the here parameterized value
Maximum value	4500 – 11000 Kelvin	Extension of the color temperature range up to the here parameterized value

Table 22: RGBW (as virt. TW) – Configuration

8.2.5. Enabled functions

Note: This tab is available for every channel / every channel group

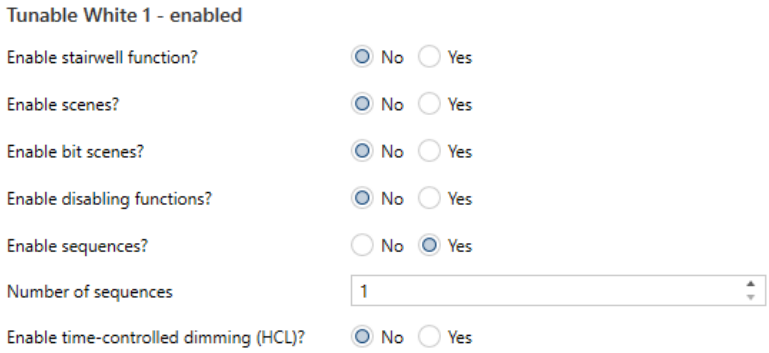


Figure 42: Enabled functions

Parameter	Selection	Description
Stairway	Yes No	Enable stairway lighting function
Scenes	Yes No	Enable scenes
Bitscenes	Yes No	Enable bitscenes
Disabling function	Yes No	Enable disabling functions
Sequences	Yes No	Restriction: The parameter is only available for RGB (CCT / W) and TW channel groups. Release Sequences
Number of sequences	1 - 5	Restriction: The parameter is only available for RGB (CCT / W) and TW channel groups. Set number of sequences
Time-controlled dimming	Yes No	Time-controlled dimming or HCL Note: HCL (=Human Centric Lighting = time-controlled dimming in operating mode Tunable White)

Table 23: Enabled functions

8.2.5.1. Stairway function

The stairway lighting function releases a luminaire triggered by a motion detector, for example, to be switched off again automatically after a parameterized activation time. If a new trigger occurs during the activation time, this can either be ignored, the time restarted or added up.
Furthermore, if desired, a dimming time and brightness can be parameterized. As a warning for the user that the lighting is about to go out, this brightness is controlled for the duration of the dimming time after the activation time has elapsed.
When the stairway lighting function is activated, the switch-on brightness and switch-on speed result from the settings made under Configuration or Dimming settings.
Of course, the so-called "stairway lighting function" can not only be used for stairway lighting but is generally suitable for all areas of application in which the lighting is to go out again automatically after a defined time.

Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (RGBCCT (as RGB-Extended) – White channels).
For other operation modes the parameters for brightness, color selection, CW ratio are reduced accordingly.
Note: This tab is only available if parameter "Release stairway lighting function" under Channel group / Release is set to Yes.

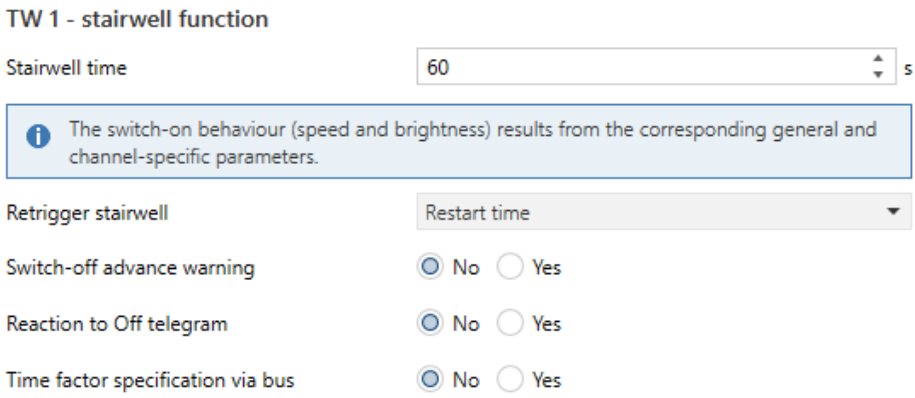


Figure 43: Stairway function

Parameter	Selection	Description
Stairwell time	0 – 3600 s	Definition of the activation duration of the stairway lighting.
Retrigger	No Reaction Start time again Add-up time	Definition of the behavior if a new trigger occurs during the activation time. • No reaction: The current process continues unaffected. • Restart time: The running process continues with the new remaining time = activation time stairway lighting. • Add time: The current process continues with the new remaining time = Old remaining time + Activation time stairway lighting.
Switch off warning	Yes No	Definition of whether a temporary, dimmed value is to be approached after the activation time has elapsed. If no is parameterized here, it is switched off.
Time	0 – 3600 s	Restriction: The parameter is only available if • Switch off warning: Yes Definition of the time for which the dimmed brightness is to be maintained
Value	0 – 100 %	Restriction: The parameter is only available if • Switch off warning: Yes Definition of the dimmed brightness. In single channel mode the value corresponds to the new channel brightness, in TW to the TW brightness and in RGB channel groups the individual colors are scaled starting from the switch-on brightness
Off telegram	Yes No	Definition of whether the stairway lighting can be switched off during the activation time by means of the CO "Switch stairway lighting" OFF.
Timer factor	Yes No	Release the "Stairway lighting time factor" communication object, which can be used to assign an integer factor to the parameterized activation time.
Activate staircase function via "Staircase timer" objectv	Yes No	Defines whether sending a factor to CO "Stairway timer factor" also starts the stairway lighting function immediately or not.

Table 24: Stairwell function

8.2.5.2. Scenes

The device has a scene function. Using the 8-bit scene address, up to eight different scenes can be stored per channel or channel group (e.g. RGB). Each scene can be assigned a scene number (1 ... 64). The scene is to be understood as a specific lighting setting. When controlling the scenes, the brightness value is changed with the speed of the absolute dimming.
Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (see RGBCCT (as RGB-Extended) – White channels). For other operation modes the parameters for brightness, color selection, CW proportion are reduced accordingly.
Note: This tab is only available if parameter "Release scenes" under Channel group / Releases is set to Yes.

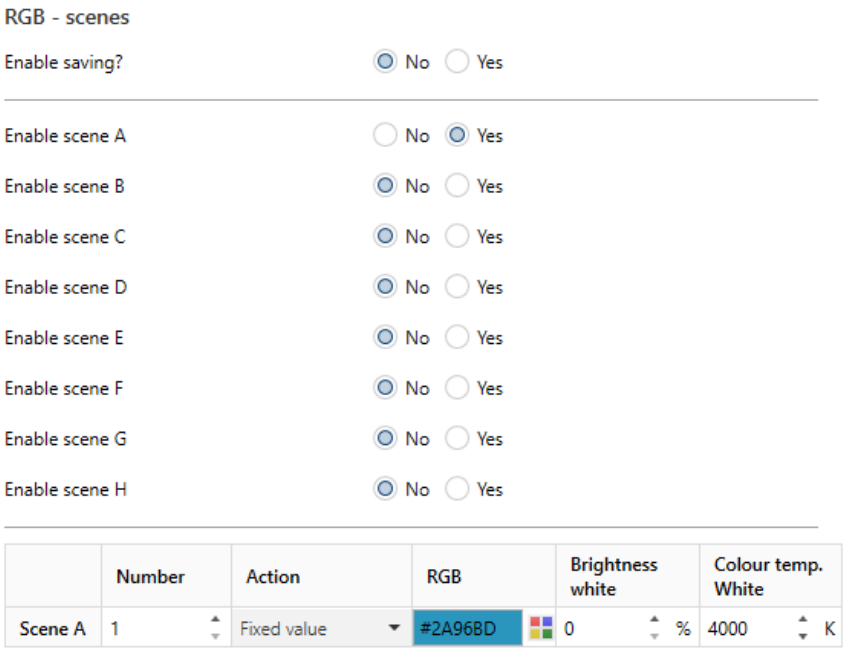


Figure 44: Scenes

Parameter	Selection	Description
Saving	Yes No	Defines whether the parameterized brightnesses for a scene can also be overwritten (saved) during operation.
Overwrite saved brightness when reprogramming the application program	Yes No	Restriction: The parameter is only available, If • Enable saving: Yes Defines whether the brightness saved during operation is to be overwritten with a reprogramming of the application via ETS.
Scene [A-H]	Yes No	Release parameters of the selected scene and communication object.
Scene number	1 – 64	Determination of the scene number. This number can be called up or saved (overwritten) during operation via the scene object.
Scene action	Brighness Switch on value No change	Defines what happens when a scene is called up: Brightness value: A parameterized brightness is approached. Switch-on value or switch-on value day / night: The switch-on brightness is approached. If a day / night distinction is parameterized for the switchon behavior, the corresponding value is approached. No change: The current brightness value remains unchanged.
RGB	RGB-value	Restriction: The parameter is only available, If • Scene Action: Brightness value Defines the RGB color value for the scene
Brighness white	0 – 100 %	Restriction: The parameter is only available, If • Szene Aktion: Helligkeitswert • Weißkanäle / Automatische Helligkeitssteuerung Weiß: No Defines the TW brightness for the scene
Color temperature white	0 – 100 %	Restriction: The parameter is only available, If • Scene Action: Brightness value • White channels / Automatic brightness control White: No Defines the TW Color temperature for the scene

Table 25: Scenes

8.2.5.3. Bit scenes

For each channel or channel group (e.g. RGB), the device 5x has five bit scene objects. This allows, for example, a specific lighting setting to be specified directly with any single pushbutton. Two bit scenes can be loaded with each of these objects (one parameterization each for 0 and 1). When the bit scenes are activated, the brightness value is changed at the speed of the absolute dimming.
Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (see RGBCCT (as RGB-Extended) – White channels). For other operation modes the parameters for brightness, color selection, CW proportion are reduced accordingly.
Note: This tab is only available if parameter "Release bit scenes" under Channel group / Releases is set to Yes.

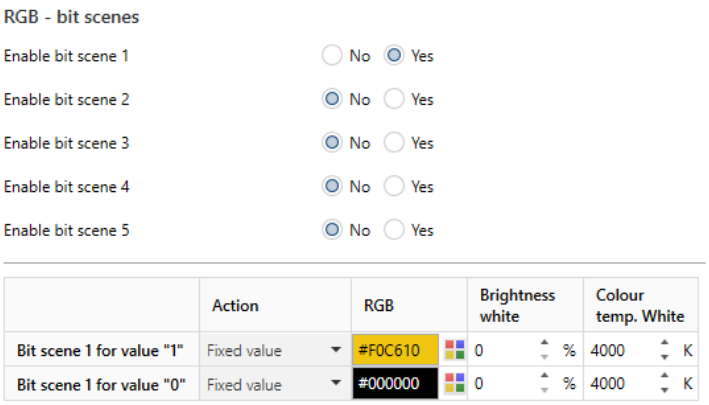


Figure 45: Bit scenes

Parameter	Selection	Description
Enable bit scene	Yes No	Release the parameters and communication objects of the selected Bit scenes
Aktion	Brightness value Switch on value switch-on value day / night No change	Defines what happens when the bitscene is called up for the value 1 or 0: • Brightness value: A parameterized brightness is approached. • Switch-on value or Switch-on value day / night: The switch-on brightness is approached. If a day / night distinction is parameterized for the switchon behavior, the corresponding value is approached. No change: The current brightness value remains unchanged.
RGB	RGB-value	Restriction: The parameter is only available, If • Action: Brightness value Defines the RGB color value for the bit scene
Brighness white	0 – 100 %	Restriction: The parameter is only available, If • Action: Brightness value • White channels / Automatic brightness control White: No Defines the TW brightness for the bit scene.
Color temperature white	0 – 100 %	Restriction: The parameter is only available, If • Action: Brightness value • White channels / Mixing ratio of the white channels: Parameterizable Definition of the cold white ratio of the white channels for the bitscene

Table 26: Bit scenes

8.2.5.4. Disabling functions

Two separate disable objects are available for each channel or channel group (e.g. RGB). These objects can be used to set the channel or channel group to a locked or unlocked state via a 1-bit group address. In the locked state, all objects except the lock objects are ignored. The other channels / channel groups can continue to be used and operated without restriction during this time.
Various actions can be carried out in conjunction with the disabling or enabling process:

- Dimm to brighness value
- Dimm to switch-on
- No change
- As before

When the locking functions are activated, the brightness value is changed at the speed of the absolute dimming.
Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (see RGBCCT (as RGB-Extended) – White channels). For other operation modes the parameters for brightness, color selection, CW proportion are reduced accordingly.
Note: This tab is only available if parameter "Release locking functions" under Channel group / Releases is set to Yes

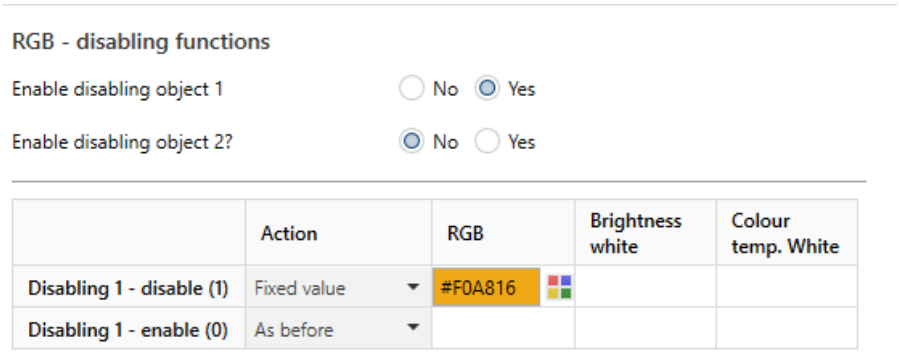


Figure 46: disabling functions

Parameter	Selection	Description
Disable function [1/2]	Yes No	Release parameters and communication objects of the selected lock.
Disable / enable	Brightness value Switch-on value switch-on value day / night No change As before	Defines what happens during locking/unlocking in addition to the actual locking/unlocking of the channel (group) brightness: • Brightness value: A parameterized brightness is approached. • Switch-on value or Switch-on value day / night: • The switch-on brightness is approached. If a day / night distinction is parameterized for the switchon behavior, the corresponding value is approached. • No change: The current brightness value remains unchanged. • As before: When unlocking, the value that was active before locking is approached. When locking, the behavior corresponds to that of "No change"
RGB	RGB-value	Restriction: The parameter is only available if • Enable / disable Action: Brightness value Defines the RGB color value for the lock function
Brighness white	0 – 100 %	Restriction: The parameter is only available if • Action: Brightness value • White channels / Automatic brightness control White: No Defines the TW brightness for the disable function.
Color temperature white	0 – 100 %	Restriction: The parameter is only available if • Action: Brightness value • White channels / Mixing ratio of white channels: Parameterizable Definition of the cold white ratio of the white channels for the disable function

Table 27: Disabling functions

8.2.5.5. Sequences

In all operating modes except single channel, up to five optionally predefined or freely definable sequences can be started or stopped by means of CO.
Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (see RGBCCT (as RGB-Extended) – White channels). For other operation modes the parameters for brightness, color selection, CW proportion are reduced accordingly.

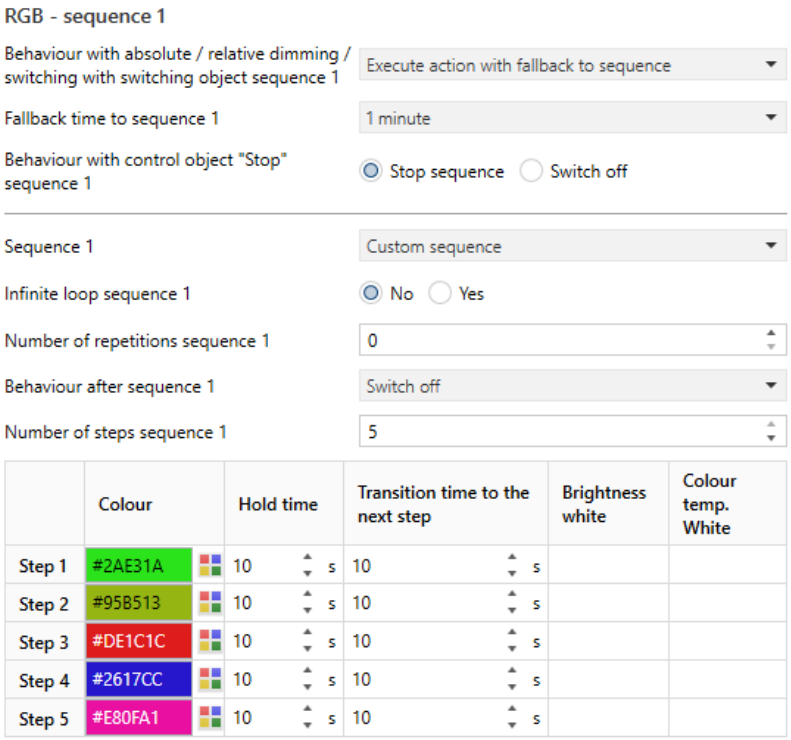


Figure 47: Sequences

Parameter	Selection	Description
Behavior with absolute / relative dimming / switching with switch object	• Execute action with fallback to sequence • Execute action without fallback to sequence • Locked (No reaction)	Defines the behavior for an Absolute / Relative dimming action or a switching action during a running sequence: • Execute action with fallback: The dimming/switching operation is executed, after a parameterized time has elapsed, the sequence is continued. • Execute action without fallback: The sequence is aborted and the dimming/switching operation is executed. • Locked (no reaction): The dimming/switching function is not executed
Fallback time	Various time durations between 1 minute and 24 hours	Restriction: The parameter is only available, If • Behavior for absolute / relative dimming / switching with switch object: Execute action with fallback to sequence Definition of the duration after which the sequence is continued after an interruption.
Behavior with "Stop" control object	• Stop sequence • Switch off	Definition of what happens when Stop is written to the "Sequence start / stop" communication object: • Stop: sequence is stopped and current brightness values are retained • Switch off: Sequence is stopped and channel group is switched off

Sequence	• User-defined sequence • Predefined sequence • Random sequence • Random color temperature	Sequence Type Definition: • User defined: Free definition of steps with brightnesses and times • Predefined sequence: Selection of a predefined sequence • Random sequence: Channel brightnesses, as well as times (up to parameterized maximum values) randomly • Random color temperature: Similar to random sequence, but with defined steps
Endless loop	Yes No	Restriction: The parameter is only available, If • Sequence: Not "Random sequence Defines whether the sequence is to run in an endless loop (until aborted by CO Sequence Stop)
Numers of repetitions	0 - 255	Defines how many times in a row the sequence should be repeated
Behavior after sequence	Hold last value Switch off Start sequence 1 Start sequence 2 Start sequence 3 Start sequence 4 Start sequence 5	Defines what should happen after a sequence has finished: • Hold last value: Sequence is ended, brightnesses of the last step are kept • Switch off: Sequence is ended, channel group is switched off • Start sequence [1-5]: sequence is finished, a new one is started
Number of steps	2 - 5	Defines the number of steps of a sequence
Predefined sequence	Div. operating mode dependent predefined sequences	Restriction: The parameter is only available, If • Sequenz: „Vordefinierte Sequenz“ Selection of a predefined sequence. Their definitions can be found at the following tables
Total Sequence Duration	1 – 65535 s	Definition of how long a run of a predefined sequence should last (the hold and transition times are stored there relative to the total duration)
Color	RGB-value	Defines the RGB color value for a step of a sequence.
Hold time	1 – 65535 s	Defines the time for which a specific color value is held for the step of a sequence
Transition time	1 – 65535 s	Defines the dimming time for the transition from one step to the next
Brighness white	0 – 100 %	Restriction: The parameter is only available, If • Sequenz: „Benutzerdefinierte Sequenz“ Festlegung der TW-Helligkeit für den Schritt einer Sequenz.
Color temperature	0 – 100 %	Definition of the TW brightness for the step of a sequence
Maximum hold time	1 – 65535 s	Definition of the maximum hold time for a random sequence. For each random step a random number between 0 and this max. dwell time is determined
Maximum tansition time	1 – 65535 s	Definition of the maximum transition time for a random sequence. For each random step, a random number between 0 and this maximum transition time is determined

Table 28: Sequences

Name	Steps	Repetitions	Step	R	G	B	Holding time proportionate to total time [%]	Transition time proportionate to total Time [%]
Amber room	5	0	1	255	179	56	0	20
			2	255	186	25	0	20
			3	255	198	25	0	20
			4	255	204	0	0	20
			5	255	191	0	0	20
Warm colors	2	0	1	255	0	132	0	50
			2	251	255	0	0	50
Cold colors	2	0	1	102	252	255	0	50
			2	174	71	255	0	50
Rainbow colors	3	0	1	255	0	0	0	34
			2	0	255	0	0	33
			3	0	0	255	0	33
TV	3	0	1	64	183	128	30	0
			2	82	128	161	20	0
			3	39	216	98	50	0
Sunset	4	0	1	255	242	0	0	25
			2	255	119	0	0	25
			3	255	0	0	0	25
			4	0	0	0	0	25
Warp	2	2	1	0	0	219	20	40
			2	0	179	224	0	40
Stroboscope	2	5	1	255	255	255	50	0
			2	0	0	0	50	0
Good morning	4	0	1	0	0	0	0	40
			2	51	128	0	0	40
			3	94	61	43	0	15
			4	255	242	230	5	0
Glow	4	0	1	0	3	0	0	30
			2	51	3	0	0	30
			3	94	5	0	0	20
			4	255	3	0	0	20
Comfort	4	0	1	99	79	26	0	40
			2	115	92	51	0	40
			3	26	5	0	0	15
			4	18	3	0	0	5

Table 29: RGB Sequences

Name	Anzahl an Schritten	Anzahl an Wiederholungen	Schritt	Rot	Grün	Blau	Haltezeit anteilig An Gesamt zeit [%]	Übergangszeit anteilig an Gesamt zeit [%]
Red	2	0	1	153	61	61	0	50
			2	255	0	0	0	50
Green	2	0	1	115	153	61	0	50
			2	149	255	0	0	50
Railway station	2	0	1	102	128	128	0	50
			2	102	111	128	0	50
Night light	2	0	1	51	24	15	0	50
			2	51	51	28	0	50
Green und yellow	2	0	1	125	255	125	0	50
			2	151	153	14	0	50

Table 30: RGB Sequences

Name	Anzahl an Schritten	Anzahl an Wiederholungen	Schritt	TW-Helligkeit	Anteil KW	Haltezeit anteilig An Gesamt zeit [%]	Übergangszeit anteilig an Gesamt zeit [%]
Sunrise	4	0	1	25	0	0	50
			2	153	0	0	20
			3	204	127	0	15
			4	255	127	15	0
Sunset	4	0	1	255	127	0	20
			2	204	102	0	30
			3	51	76	0	50
			4	0	0	0	0
Alarm	2	0	1	100	255	50	0
			2	100	255	50	0
Warp	3	0	1	127	0	20	20
			2	204	127	0	20
			3	127	0	20	20
Stroboscope	2	5	1	255	127	50	0
			2	0	127	50	0
Candle light	3	0	1	204	0	50 (*)	5 (*)
			2	255	10	20 (*)	5 (*)
			3	204	0	20 (*)	0 (*)

Table 31: TW Sequences

(*) For the TW sequence "Candlelight" the relative times represent maximum values. Random values between 0 and maximum value are determined for each sequence run

8.2.5.6. Time-controlled dimming or HCL

Note: The function is shown here for the operating mode RGBCCT (as RGB Extended) with deactivated automatic white admixture, as this offers the maximum number of parameters. The parameters Color Temperature White are also shown here in Cold White %. The parameters can also be set in Kelvin if the parameter "Specification of mixing ratio between warm and cool white" is changed accordingly (see RGBCCT (as RGB-Extended) – White channels). For other operation modes the parameters for brightness, color selection, CW proportion are reduced accordingly.

Note: This tab is only available if the time objects under General / Time functions are released, as well as the parameter "Release time-controlled dimming" under Approvals. In addition, the communication objects Date and Time must be written once for the correct function after the device start.

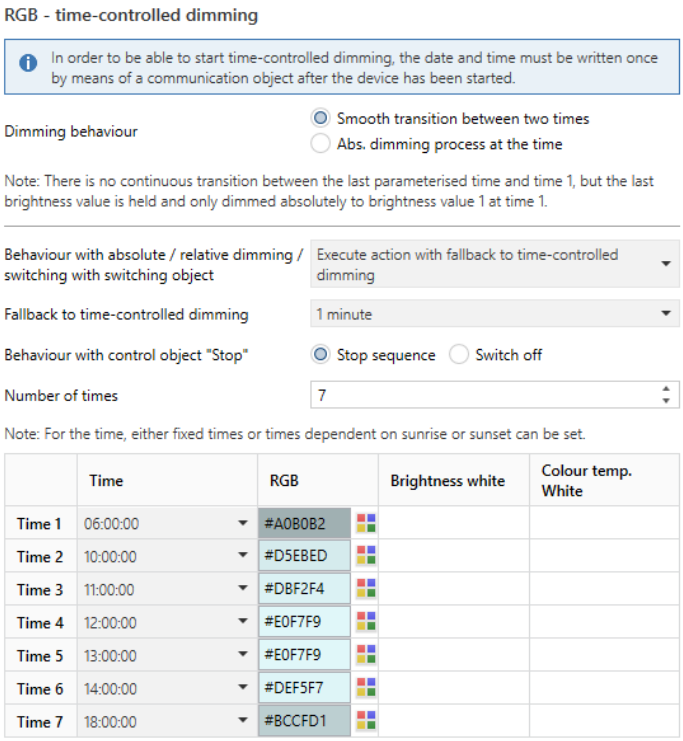


Figure 48: HCL

Parameter	Selection	Description
Dimming behaviour	• Smooth transition between two points in time • Abs. dimming at time	Defines the basic behavior of time-controlled dimming: Uniform transition: • Between two successive interpolation points, there is a uniform transition of the parameterized brightnesses. Exception: Between the last parameterized setpoint of a day and the first of the following day, the last brightness value is held instead and only dimmed absolutely to its brightness value at the time of the first setpoint of the following day. • Abs. dimming process at the time: When each setpoint is reached, its brightness is dimmed absolutely. The brightness is maintained between the setpoints.
Behavior with absolute / relative dimming / switching with switch object	• Execute action with fallback to time-controlled dimming • Execute action without fallback to time-controlled dimming • Locked (no reaction)	Defines the behavior for an Absolute / Relative dimming action or a switching action during a running sequence: • Execute action with fallback: The dimming/switching operation is executed, after a parameterized time has elapsed, the sequence is continued • Execute action without fallback: Time-controlled dimming is canceled and the dimming/switching operation is executed. • Locked (no reaction): The dimming/switching function is not executed
Fallback time to time-controlled dimming	Various time durations between 1 minute and 24 hours.	Definition of the duration after which the sequence is continued after an interruption.
Behavior with "Stop" control object	Stop sequence Switch of	Definition of what happens when Stop is written to the "Time-controlled dimming start / stop" communication object: • Stop: Time-controlled dimming is stopped and current brightness values remain. • Switch off: Time-controlled dimming is stopped and channel group is switched off
Number of time Points	2 – 10	Definition of the number of time points (interpolation points)
Time	Selection of a time Sunrise +/- Offset sunset +/- offset	Definition of a control point
RGB	RGB-Wert	Defining the value of the channels for a control point
Bightness white	0 – 100 %	
Colortemperature white	0 – 100 %	

Table 32: HCL

8.3. Communication objects

Note: Depending on the parameterization, some objects may not be available.

ID	Name	Object function	Description and approval	Lenght	DptTyp
1	Time	Time	Set the time of the internal real-time clock. This is required for the time-controlled dimming functions and for automatic day/night switching.	3 Bytes	DPST-10-1
2		Date	Set the date of the internal real-time clock. This is required for the time-controlled dimming functions and for the astro function (calculation of sunrise and sunset).	3 Bytes	DPST-11-1
3		Date / time	Set time and date of the internal real-time clock (combined CO)	8 Bytes	DPST-19-1
4		Day / night	Set the device to day or night mode. Depending on this, different switch-on brightnesses can be parameterized, for example (see parameter description).	1 Bit	DPST-1-24
6	Relay	Switch external mains relay	Switch object for an external switch actuator for demand-dependent switching on/off of the LED power supply	1 Bit	DPST-1-1
7		Switch external mains Relay state	Status feedback object of the external switching contact	1 Bit	DPST-1-1
8	Alarm	Undervoltage	Returns alarm (1) if the measured power supply voltage falls below the value of 4 V.	1 Bit	DPST-1-5
9		Overvoltage	Returns alarm (1) when the measured power supply voltage exceeds the value of 53 V	1 Bit	DPST-1-5
10		Overtemperature	Returns alarm (1) when the measured internal device temperature exceeds the value of 125°C	1 Bit	DPST-1-5
11		Overcurrent total	Returns alarm (1) when the measured current exceeds the value of 20 A	1 Bit	DPST-1-5
12		Overcurrent A		1 Bit	DPST-1-5
13		Overcurrent B		1 Bit	DPST-1-5
14		Overcurrent C		1 Bit	DPST-1-5
15		Overcurrent D		1 Bit	DPST-1-5
16		Overcurrent E		1 Bit	DPST-1-5

20		Current total	Returns the measured total current	4 Bytes	DPST-14-19
21		Current channel A	Returns the measured channel current	4 Bytes	DPST-14-19
22		Current channel B		4 Bytes	DPST-14-19
23		Current channel C		4 Bytes	DPST-14-19
24		Current channel D		4 Bytes	DPST-14-19
25		Current channel E		4 Bytes	DPST-14-19
26		Lamp voltage at start-up Channel A	Returns the measured voltage from 1-Touch-Commissioning for channel A. This measured value represents the voltage at the illuminant under full load. For this, the parameters for the lines must be set in the Measurements and counters tab and the 1-touch commissioning must have been executed once via the display	4 Bytes	DPST-14-27
27		Lamp voltage at start-up Channel B		4 Bytes	DPST-14-27
28		Lamp voltage at start-up Channel C		4 Bytes	DPST-14-27
29		Lamp voltage at start-up Channel D		4 Bytes	DPST-14-27
30		Lamp voltage at start-up Channel E		4 Bytes	DPST-14-27
31		Device temperature	Returns the measured internal device temperature.	4 Bytes	DPST-14-68
32	Measurement	Average telegram rate (T/s) sent over the last minute	Returns the maximum / average telegram rate (telegrams per second) of the telegrams sent by device within the last minute	2 Bytes	DPST-7-1
33		Average telegram rate (T/s) sent over the last 5 minutes		2 Bytes	DPST-7-1
34		Average telegram rate (T / s) sent over the last 15 minutes		2 Bytes	DPST-7-1
35		Max. Telegram rate (T / s) sent within the last minute		2 Bytes	DPST-7-1
36		Max. Telegram rate (T / s) sent within the last 5 minutes		2 Bytes	DPST-7-1
37		Max. Telegram rate (T / s) sent within the last 15 minutes	Returns the maximum / average telegram rate (telegrams per second) of the telegrams sent by device within the last minute	2 Bytes	DPST-7-1
38		Power supply voltage	Gibt die am Eingang (LED-Netzteil) gemessene Spannung zurück. Freigabe: Parameter „Objektfreigabe“ unter Messungen und Zähler / Messungen	4 Bytes	DPST-14-27
39		Power total	Returns the (total) power expected from the power supply voltage and total current	4 Bytes	DPST-14-56
40		Power channel A		4 Bytes	DPST-14-56
41		Power channel B		4 Bytes	DPST-14-56
42		Power channel C		4 Bytes	DPST-14-56
43		Power channel D		4 Bytes	DPST-14-56
44		Power channel E		4 Bytes	DPST-14-56

45	Meter	Absorbed energy lifetime total	Returns the energy absorbed by the power supply. The average efficiency of the LED power supply unit parameterized under Counter is included here. The value refers to the entire lifetime of the device and cannot be reset.	4 Bytes	DPST-13-10
46		Absorbed energy lifetime channel A or Absorbed energy lifetime channel RGBCCT resp. Recorded energy lifetime channel RGBW resp. Absorbed energy lifetime channel RGB	Analogous to CO "Total Absorbed Energy Lifetime", but reduced to the energy absorbed by channel X. For the operating modes RGBCCT, RGBW, or RGB, the CO stores the energy value of the entire channel group	4 Bytes	DPST-13-10
47				4 Bytes	DPST-13-10
48				4 Bytes	DPST-13-10
49				4 Bytes	DPST-13-10
50		Absorbed energy lifetime channel E or. Absorbed energy lifetime channel TW 2	Analogous to CO "Absorbed energy lifetime total", but reduced to the energy absorbed by channel E. For the Tunable White operating mode, the CO stores the energy value of the TW 2 channel group	4 Bytes	DPST-13-10
51		Absorbed energy since last analysis reset Total	Analogous to CO "Total absorbed energy lifetime", but with a different analysis interval that can be reset using CO "Perform analysis reset"	4 Bytes	DPST-13-10
52		Absorbed energy since last analysis reset Channel A or Absorbed energy since last analysis reset RGBCCT or Absorbed energy since last analysis reset RGBW or Absorbed energy since last analysis set RGB	Analogous to CO "Absorbed energy since last analysis reset total", but reduced to the energy absorbed by channel X. For the operating modes RGBCCT, RGBW, or RGB, the CO stores the energy value of the entire channel group	4 Bytes	DPST-13-10
53				4 Bytes	DPST-13-10
54				4 Bytes	DPST-13-10
55				4 Bytes	DPST-13-10
56				4 Bytes	DPST-13-10
57		Costs lifetime total	Returns the cost (in ct) of the energy absorbed by the network. The average efficiency of the LED power supply unit parameterized under Counter and the electricity price parameterized there are included here. The value refers to the entire lifetime of the device and cannot be reset	4 Bytes	DPST-13-1
58		Costs lifetime channel A or Costs lifetime RGBCCT resp. Costs lifetime RGBW resp. Costs lifetime RGB	Analogous to CO "Costs lifetime total", but reduced to the costs generated by channel A. For the operating modes RGBCCT, RGBW, or RGB, the CO stores the counter reading of the entire channel group	4 Bytes	DPST-13-1

Table 33: Communication objects

59	Meter	Cost lifetime channel X	Analogous to CO "Cost lifetime total", but reduced to the costs generated by channel B	4 Bytes	DPST-13-1
60				4 Bytes	DPST-13-1
61				4 Bytes	DPST-13-1
62				4 Bytes	DPST-13-1
63		Costs since last analysis reset total	Analogous to CO "Total lifetime costs", but with a different analysis interval that can be reset using CO "Perform analysis reset"	4 Bytes	DPST-13-1
64		Costs since last analysis reset channel X or Costs since last analysis reset RGBCCT resp. Costs since last analysis set RGBW resp. Costs since last analysis set RGB	Analogous to CO "Costs since last analysis reset total", but reduced to the costs generated by channel X. For the operating modes RGBCCT, RGBW, or RGB, the CO stores the counter reading of the entire channel group	4 Bytes	DPST-13-1
65				4 Bytes	DPST-13-1
66				4 Bytes	DPST-13-1
67				4 Bytes	DPST-13-1
68				4 Bytes	DPST-13-1
69		Perform analysis reset	Resets the energy and cost counters with the extension "since last analysis reset" to 0	1 Bit	DPST-1-17
70		Electricity price (0.01 cents per kWh)	This CO can be used to transfer a price that deviates from the parameterized electricity price. The value is retained until the next reprogramming and is specified in hundredths of a cent per kWh → Ex.: The transfer of 3111 results in an electricity price of 31.11 cents / kWh	2 Bytes	DPST-7-1
75	Illuminant protection	Channel X continuous power exceeded or Channel RGBCCT Continuous power exceeded resp. Channel RGBW Continuous power exceeded resp. Channel RGB Continuous power exceeded	Returns alarm (1) if the value "Continuous power" parameterized under Alarm objects and protection functions / Illuminant protection is exceeded. Depending on the operating mode, the CO affects channel A (single channel mode) or the channel group RGBCCT, or RGBW, or RGB	1 Bit	DPST-1-5
76				1 Bit	DPST-1-5
77				1 Bit	DPST-1-5
78				1 Bit	DPST-1-5
79				1 Bit	DPST-1-5
80				1 Bit	DPST-1-5
81		Channel X I²t value exceeded	Returns alarm (1) if the I²t threshold for channel X configured under alarm objects and protection functions / light protection is exceeded. Notes on I²t shutdown can be found I n the Illuminant protection chapter. Depending on the operating mode, the CO affects channel A (single channel mode) or the channel group RGBCCT, or RGBW, or RGB	1 Bit	DPST-1-5
82				1 Bit	DPST-1-5
83				1 Bit	DPST-1-5
84				1 Bit	DPST-1-5
85		Channel X maximum power exceeded or Channel RGBCCT maximum power exceeded or Channel RGBW maximum power exceeded or Channel RGB maximum power exceeded	Channel RGB maximum power exceeded Returns alarm (1) if the value configured under alarm objects and protection functions / light protection is exceeded. Depending on the operating mode, the CO affects channel A (single channel mode) or the channel group RGBCCT, or RGBW, or RGB	1 Bit	DPST-1-5
86				1 Bit	DPST-1-5
87				1 Bit	DPST-1-5
88				1 Bit	DPST-1-5
89				1 Bit	DPST-1-5

95	Power supply protection	Power supply continuous power exceeded	Returns alarm (1) if the "Continuous power" value parameterized under Alarm objects and protective functions / Power supply protection is exceeded.	1 Bit	DPST-1-5
96		Power supply I²t value exceeded	Returns alarm (1) if the I²t threshold parameterized under Alarm objects and protective functions /Power supply protection is exceeded. Notes on I²t shutdown can be found in the Power supply protection chapter.	1 Bit	DPST-1-5
97		Power supply maximum power exceeded	Returns alarm (1) if the value "Continuous power" + overload capability (= maximum power) parameterized under Alarm objects and protective functions / Power supply protection is exceeded	1 Bit	DPST-1-5
101	Channel A	Switch	Switch channel A. The switching behavior (switchon behavior (brightness value, switch-on speed, etc.) or corresponding switch-off behavior) depends on the parameterization	1 Bit	DPST-1-1
102		stairway lighting	Switch channel A stairway lighting. The switch-on behavior (brightness value, switch-on speed, etc.) depends on the parameterization. Switching off the stairway lighting can be prevented by means of the parameter "Allow switch-off by CO" under Individual channel / Stairway lighting function.	1 Bit	DPST-1-1
103		Stairway lighting time factor	This CO can be used to assign a factor to the time defined under the "Stairway lighting activation time" parameter. If the parameter "Activate stairway lighting function via stairway lighting time object" under Individual channel / Stairway lighting function is set to Yes, the stairway lighting function is also started immediately when a factor is sent.	1 Byte	DPST-5-10
104		Dimming absolute	Dim channel A absolutely to a percentage value	1 Byte	DPST-5-1
105		Dimming relative	Dim channel A relatively to a percentage value	4 Bit	DPST-3-7
106		Disabling 1	Activates the disabling function	1 Bit	DPST-1-1
107		Disabling 2		1 Bit	DPST-1-1
108		Scene	Activate channel A scene or save current brightness value for scene (the latter only if parameterized accordingly under "Release saving" under Individual channel / Scenes.	1 Byte	DPST-18-1
109		Bit Scene	Enable / disable channel A bit scene	1 Bit	DPST-1-1
110				1 Bit	DPST-1-1
111				1 Bit	DPST-1-1
112				1 Bit	DPST-1-1
113				1 Bit	DPST-1-1
114		Time-controlled dimming Start / Stop	Start / stop time-controlled dimming.	1 Bit	DPST-1-10
115		Status On/Off	Status object, indicates whether channel A is ON (for brightness values greater than 0) or OFF	1 Bit	DPST-1-1
116		Status Brightness	Status object shows channel brightness as value 0 - 100	1 Byte	DPST-5-1
117		Status Disabling	Status object, shows whether channel A is locked (1 for locked)	1 Bit	DPST-1-1
118		Status time-controlled dimming	Status object, indicates whether time-controlled dimming is currently active for channel A (1 for active).	1 Bit	DPST-1-11
121 - 198	Channel B –E	Channel B – Channel E analog to Channel A	Channel B – Channel E analog to Channel A		

201	RGB	Switching	Switch RGB(CCT/W) channel group. The switching behavior (switch-on behavior (brightness value, switch-on speed, etc.) or corresponding switch-off behavior) depends on the parameterization.	1 Bit	DPST-1-1
202		Switch stairway lighting	Switch RGB(CCT/W) channel group stairway lighting. The switch-on behavior (brightness value, switch-on speed, etc.) depends on the parameterization. Switching off the stairway lighting can be prevented by means of the parameter "Allow switch- off by CO" under RGB(CCT/W) / Stairway lighting function.	1 Bit	DPST-1-1
203		Stairway lighting factor	This CO can be used to assign a factor to the time defined under the "Stairway lighting activation time" parameter. If the parameter "Activate stairway lighting function via stairway lighting time object" under RGB(CCT/W) / Stairway lighting function is set to Yes, the stairway lighting function is also started immediately when a factor is sent.	1 Byte	DPST-5-10
204		Store maximum brightness Start / Stop	By sending 0 to this CO, the current brightness val-ues are stored as maximum values for the respective channels of the RGB(CCT/W) channel group. From this point on, the default values are scaled ac-cordingly. By sending 1 to this CO, the stored maximum values for the respective channels of the channel group are reset to Maximum brightness (255). Release: "Limit maximum brightness" parameter under RGB(CCT/W) / Configuration to "CO"	1 Bit	DPST-1-10
205		Dimming absolute R	Dim channel red absolute to a percentage value.	1 Byte	DPST-5-1
206		Dimming absolute G	Dim channel green absolute to a percentage value.	1 Byte	DPST-5-1
207		Dimming absolute B	Dim channel blue absolute to a percentage value.	1 Byte	DPST-5-1
208		Dimming absolute W	Dim channel white absolute to a percentage value.	1 Byte	DPST-5-1
210		Dimming absolute RGBW	Dim channel group RGBCCT or RGBW absolutely. For RGBW, the four individual values correspond to the brightnesses for red, green, blue and white; for RGBCCT, the transferred white value refers to the TW brightness (see CO "TW 1 Dimming absolute brightness").	6 Bytes	DPST-251600
211		Dimming absolute RGB	Dim red/green/blue values of a RGBCCT, RGBW or RGB channel group absolutely.	3 Bytes	DPST-232600
212		Dimming absolute HSV	Dim Hue/Saturation/Value values of a RGBCCT, RGBW or RGB channel group absolutely (explana-tion see chapter Color spaces RGB and HSV). Release: Always available if the channel group RG-BCCT, RGBW or RGB is released. Note: If the CO is described from the ETS group monitor, the RGB ColorPicker appears there. The transmitted value, (e.g. #00FFFF), is not interpreted as RGB, but as HSV, which in the example results in H=0°, S=100% and V=100%, i.e. a pure red.	3 Bytes	DPST-232600
213		Dimming absolute H	Hue value of a RGBCCT, RGBW or RGB channel group absolutely (explanation see chapter Color spaces RGB and HSV).	1 Byte	DPST-5-3
214		Dimming absolute S	saturation value of a RGBCCT, RGBW or RGB channel group absolutely (explanation see chapter Color spaces RGB and HSV).	1 Byte	DPST-5-1
215		Dimming absolute V	Dim value of a RGBCCT, RGBW or RGB channel group absolutely (explanation see chapter Color spaces RGB and HSV).	1 Byte	DPST-5-1
216		Dimming relative R	Dim channel red relatively to a percentage value.	4 Bit	DPST-3-7
217		Dimming relative G	Dim channel green relatively to a percentage value.	4 Bit	DPST-3-7
218		Dimming relative B	Dim channel blue relatively to a percentage value.	4 Bit	DPST-3-7
219		Dimming relative W	Dim channel white relatively to a percentage value.	4 Bit	DPST-3-7
221		Dimming relative RGBW	Relatively dim channel group RGBCCT or RGBW. With RGBW, the four individual values correspond to the brightness levels for red, green, blue and white; with RGBCCT, the transferred values for white relate to the TW brightness (see CO “TW 1 dimming absolute brightness”).	5 Bytes	DPST-252600
222		Dimming relative RGB	Relatively dim red / green / blue values of an RGBCCT, RGBW or RGB channel group	3 Bytes	DPST-254600
223		Dimming relative HSV	Relatively dim Hue/Saturation/Value of an RGBCCT, RGBW or RGB channel group	3 Bytes	DPST-254600

224	RGB	Dimming relative H	Relatively dim Hue of an RGBCCT, RGBW or RGB channel group	4 Bit	DPST-3-7
225		Dimming relative S	Relatively dim Saturation of an RGBCCT, RGBW or RGB channel group	4 Bit	DPST-3-7
226		Dimmen Relativ V	Relatively dim Value of an RGBCCT, RGBW or RGB channel group	4 Bit	DPST-3-7
227		Disabling 1	Activates the disabling function	1 Bit	DPST-1-1
228		Disabling 2		1 Bit	DPST-1-1
229		Scene	Activate channel A scene or save current brightness value for scene (the latter only if parameterized accordingly under "Release saving" under Individual channel / Scenes.	1 Byte	DPST-18-1
230		Bit Scene	Enable / disable channel X bit scene X.	1 Bit	DPST-1-1
231				1 Bit	DPST-1-1
232				1 Bit	DPST-1-1
233				1 Bit	DPST-1-1
234				1 Bit	DPST-1-1
235		Status time-controlled dimming	Status object, indicates whether time-controlled dimming is currently active for channel A (1 for active).	1 Bit	DPST-1-10
236		Sequence Start / Stop	Start / stop sequence of channel group RGB (CCT / W).	1 Bit	DPST-1-10
237				1 Bit	DPST-1-10
238				1 Bit	DPST-1-10
239				1 Bit	DPST-1-10
240				1 Bit	DPST-1-10
241		Status On/Off	Status object indicates whether the channel group RGB (CCT / W) is ON or OFF. It is ON when one or more channels in the channel group have a bright-ness greater than 0.	1 Bit	DPST-1-1
242		Status R	Status object shows the channel brightness of the red channel as a value 0 - 255.	1 Byte	DPST-5-1
243		Status G	Status object shows the channel brightness of the greeb channel as a value 0 - 255.	1 Byte	DPST-5-1
244		Status B	Status object shows the channel brightness of the blue channel as a value 0 - 255.	1 Byte	DPST-5-1
245		Status W	Status object shows the channel brightness of the white channel as a value 0 - 255.	1 Byte	DPST-5-1
247		Status RGBW	Status object shows the channel brightnesses of the channels red, green, blue and white; with RGBCCT the value for white refers to the TW brightness.	6 Bytes	DPST-251600
248		Status RGB	Status object shows the channel brightnesses of the channels red, green and blue. Release: Always available if the channel group RGBCCT, RGBW or RGB is released.	3 Bytes	DPST-232600
249		Status HSV	Status object shows Hue / Saturation / Value values of an RGBCCT, RGBW or RGB channel group (see Color spaces RGB and HSV).	3 Bytes	DPST-232600

Table 34: Communication objects

250	RGB	Status H	Status object shows the H value of an RGBCCT, RGBW or RGB channel group (see Color spaces RGB and HSV).	1 Byte	DPST-5-3
251		Status S	Status object shows the S value of an RGBCCT, RGBW or RGB channel group (see Color spaces RGB and HSV).	1 Byte	DPST-5-1
252		Status V	Status object shows the V value of an RGBCCT, RGBW or RGB channel group (see Color spaces RGB and HSV).	1 Byte	DPST-5-1
253		Status Disabling	Status object, indicates whether RGB(CCT/W) channel group is locked (1 for locked).	1 Bit	DPST-1-1
254		Status Time-controlled dimming	Status object, indicates whether time-controlled dimming for channel group RGB(CCT/W) is currently active (1 for active).	1 Bit	DPST-1-11
255		Sequence	Status object, indicates whether sequence 1 for channel group RGB(CCT/W) is currently active (1 for active).	1 Bit	DPST-1-11
256				1 Bit	DPST-1-11
257				1 Bit	DPST-1-11
258				1 Bit	DPST-1-11
259				1 Bit	DPST-1-11
262	TW 1	Switching	Switch channel group. The switching behavior (switch-on behavior (brightness value, switch-on speed, etc.) or corresponding switch-off behavior) depends on the parameterization.	1 Bit	DPST-1-1
263		Stairway lightning factor	Switch stairway lighting channel group. The switch- on behavior (brightness value, switch-on speed, etc.) depends on the parameterization. Switching off the stairway lighting can be prevented by means of the parameter "Allow switch-off by CO" under TW 1 / Stairway lighting function.	1 Bit	DPST-1-1
264		Stairway lightning factor	This CO can be used to apply a factor to the time defined under the "Stairway lighting activation time" parameter. If the parameter "Activate stairway lighting function via stairway lighting time object" under TW 1 / Stairway lighting function is set to Yes, the stairway lighting function is also started immediately when a factor is sent.	1 Byte	DPST-5-10
265		Dimming absolute brightness	Dim brightness of TW channel group absolutely.	1 Byte	DPST-5-1
266		Dimming absolute color temperature (Portion CW in %)	Dim cold white part of channel group absolutely.	1 Byte	DPST-5-1
267		Dimming absolute color temperature (Kelvin)		2 Bytes	DPST-7-600
268		Dimming absolute transition (brightness and color temperature)	Combined object for simultaneous change (absolute dimming) of brightness and color temperature.	6 Bytes	DPST-249600
269		Dimming relative brightness	Dim brightness of TW channel group relatively.	4 Bit	DPST-3-7
270		Dimming relative color temperature (Portion CW in %)	Dim cold white part of channel group relatively.	4 Bit	DPST-3-7
271		Dimming relative transition (brightness and color temperature)	Combined object for simultaneous changing (rel. dimming) of brightness and color temperature.	3 Bytes	DPST-250600
272		Disabling 1	Activates the disabling function	1 Bit	DPST-1-1
273		Disabling 2		1 Bit	DPST-1-1
274		Scene	Activate channel A scene or save current brightness value for scene (the latter only if parameterized accordingly under "Release saving" under Individual channel / Scenes.	1 Byte	DPST-18-1

275	TW 1	Bit Scene	Enable / disable channel X bit scene X.	1 Bit	DPST-1-1
276				1 Bit	DPST-1-1
277				1 Bit	DPST-1-1
278				1 Bit	DPST-1-1
279				1 Bit	DPST-1-1
280		HCL Start / Stop	HCL (= Human Centric Lighting = time-controlled dimming of a TW channel group) start / stop.	1 Bit	DPST-1-10
281		Sequence Start / Stop	Start / stop sequence 1 of channel group TW 1.	1 Bit	DPST-1-10
282				1 Bit	DPST-1-10
283				1 Bit	DPST-1-10
284				1 Bit	DPST-1-10
285				1 Bit	DPST-1-10
286		Status On/Off	Status object indicates whether the channel group TW 1 is ON or OFF. It is ON if one or more channels of the channel group have a brightness greater than 0.	1 Bit	DPST-1-1
287		Status brightness	Status object shows the brightness of the TW channel group	1 Byte	DPST-5-1
288		Status color temperature (portion CW in %)	Status object displays the mixing ratio of the TW channel group in %.	1 Byte	DPST-5-1
289		Status color temperature (Kelvin)	Status object displays the mixing ratio of the TW channel group in Kelvin.	2 Bytes	DPST-7-600
290		Status Disabling	Status object, indicates whether TW channel group is locked (1 for locked).	1 Bit	DPST-1-1
291		Status HCL	Status object, indicates whether HCL (= Human Centric Lighting = time-controlled dimming for TW channel group) is currently active (1 for active).	1 Bit	DPST-1-11
292		Status Sequenz	Status object, indicates whether sequence 1 for channel group TW 1 is currently active (1 for active).	1 Bit	DPST-1-11
293				1 Bit	DPST-1-11
294				1 Bit	DPST-1-11
295				1 Bit	DPST-1-11
296				1 Bit	DPST-1-11
299 - 333	TW 2	TW 2 analog to TW 1, without RGBCCT extension	TW 2 Analog to TW 1, without RGBCCT extension		

Table 35: Communication objects

9. Firmware-Update

The device can be updated. Firmware can be easily updated

9.1. Display firmware version

The current version of the firmware can be read out from the device via the ETS.

- Execute right click on the device in the ETS
- Select "Info > Device info".
  - Firmware version is displayed behind the square brackets.
    - Example: ... [...] 1.3

9.2. Preparing firmware update

Requirements:

- Only the owner of the ETS software license and the ETS project may perform the firmware update.
- The device must not be protected by a BAU password.

9.3. Performing a firmware update

The update has to be performed with the JUNG firmware update tool. The JUNG firmware update tool can be downloaded from our website. Detailed information about the JUNG firmware update tool can be found in the corresponding manual.

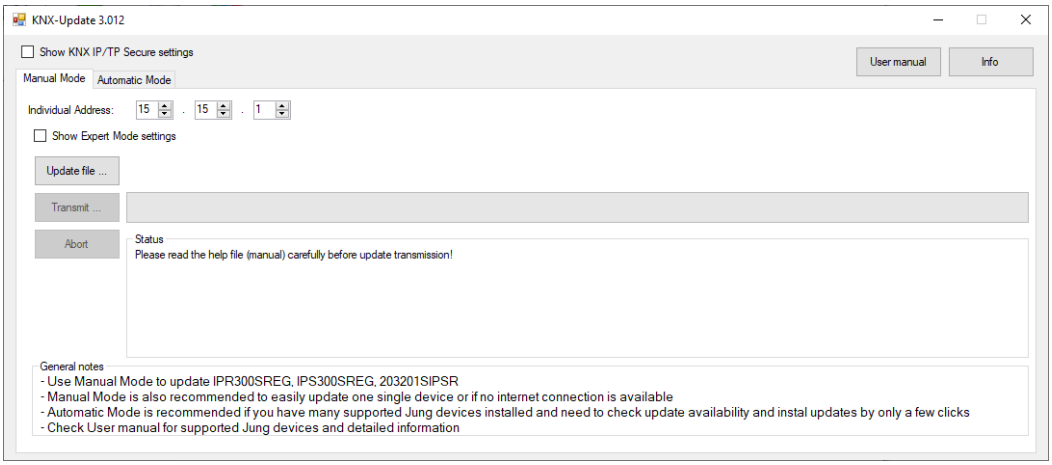


Figure 49: JUNG Update Tool

- Start JUNG firmware update.

Manual mode

- Enter idividual adress
- Select update file with button “Update File”
- Start update with transmit
- Update is performing automatically
- If necessary, reprogram the device via ETS.

Automatic mode

- Add desired line
- Narrow address range if necessary
- Scan line
- Select desired devices
- Press update button
- If necessary, reprogram the device via ETS.

10. Technical Data

	390051S LED E	390051S LED R
Inputs	External power supply: Voltage: 5 ... 48 V DC from operating device according to EN 61347-2-13 (or IEC 61347-2-13) with constant output voltage Max. Current: 25 A. Alternatively a stronger power supply with an additional 25 A fuse at the output can be used. KNX connection: Voltage: 21 ... 32 V DC SELV Current consumption < 30 mA	
Outputs	5 pulse width modulated DC voltage outputs for illuminants: Voltage: 5 ... 48 V DC Max. Current per channel at 5 ... 24 V: Up to 488 Hz (recommended dimming frequency): Channel A ... E at up to 50 m line length (I1 + I2): 15 A Channel E at up to 13 m line length (I1 + I2): 20 A 600 Hz: Channel A ... E at up to 50 m line length (I1 + I2): 12 A Channel E at up to 13 m line length (I1 + I2): 20 A 832 Hz ... 1200 Hz: Channel A ... E at up to 50 m line length (I1 + I2): 7 A Channel E at up to 13 m line length (I1 + I2): 10 A Max. Current per channel at 48 V: 50 % of the max. currents of 5 ... 24V Max. Total current over all 5 channels at 5 ... 24 V: 20 A Max. Total current over all 5 channels at 48 V: 10 A Dimming frequency: 211 ... 1200 Hz, Recommended: 488 Hz	5 pulse width modulated DC voltage outputs for illuminants: Voltage: 5 ... 48 V DC Max. Current per channel at 5 ... 24 V: Up to 488 Hz (recommended dimming frequency): Channel A ... E at up to 50 m line length (I1 + I2): 15 A Channel A at up to 13 m line length (I1 + I2): 20 A 600 Hz: Channel A ... E at up to 50 m line length (I1 + I2): 12 A Channel E at up to 13 m line length (I1 + I2): 20 A 832 Hz ... 1200 Hz: Channel A ... E at up to 50 m line length (I1 + I2): 7 A Channel E at up to 13 m line length (I1 + I2): 10 A Max. Current per channel at 48 V: 50 % of the max. currents of 5 ... 24V Max. Total current over all 5 channels at 5 ... 24 V: 20 A Max. Total current over all 5 channels at 48 V: 10 A Dimming frequency: 211 ... 1200 Hz, Recommended: 488 Hz
Protection functions	Reverse polarity protection Overcurrent shutdown (self-healing) Overtemperature shutdown (self-healing) Undervoltage shutdown (self-healing) Overvoltage shutdown (self-healing)	
Display elements	OLED Display LEDs: „PROG“, „DC-POWER“, POWER“ Button: „PROG“, „NEXT“, „SET“	
Connections	DC voltage supply input: Type: screw terminal, tightening force: 0.5 Nm Conductor cross-section: 0.5 ... 4.0 mm² solid Conductor cross-section: 0.5 ... 4.0 mm² finely stranded without ferrule Conductor cross-section: 0.5 ... 2.5 mm² finely stranded with wire end ferrule Pulse width modulated DC voltage outputs for illuminants: Type: screw terminal, tightening force: 0.5 Nm Conductor cross-section: 0.5 ... 4.0 mm² solid Conductor cross-section: 0.5 ... 4.0 mm² finely stranded without ferrule Conductor cross-section: 0.5 ... 2.5 mm² finely stranded with wire end ferrule KNX connection: Type: black / red connection terminal (type 5.1) Conductor diameter: 0.8 mm solid conductor	
Case	Electronics housing with flange for screw mounting Dimensions: 157,0 (136,0 without flange) x 45,0 x 25,5 mm (L x B x T) Flammability class: UL94-V0 (casing) UL94-V2 (lid)	DIN rail housing for 35 mm mounting rails width: 4 SU Dimensions: 71,5 x 89,6 x 62,9 mm (L x B x H) Flammability class: UL94-V0 (casing) UL94-V2 (lid)
Additional	For indoor use only Only for installation in false ceilings, electrical sockets and on furniture, if not accessible Highest ambient temperature ta = 45 °C Lowest ambient temperature ta min = −5 °C Protection class III Protection class: IP20 Audits: KNX certified Safety: Certificated DIN EN 61347-2-13 IEC 63044-3 EMV: Certificated IEC 63044-5-2 (Living area), IEC 63044-5-3 (Industrial area), Vicinity: Certificated DIN EN 50491-2	For indoor use only For operation in the control cabinet only Highest ambient temperature ta = 45 °C Lowest ambient temperature ta min = −5 °C Protection class III Protection class: IP20 Audits: KNX certified Safety: Certificated DIN EN 61347-2-13 EC 63044-3 EMV: Certified IEC 63044-5-2 (Living area), IEC 63044-5-3 (Industrial area), Vicinity: Certificated DIN EN 50491-2

Table 36:Technical data