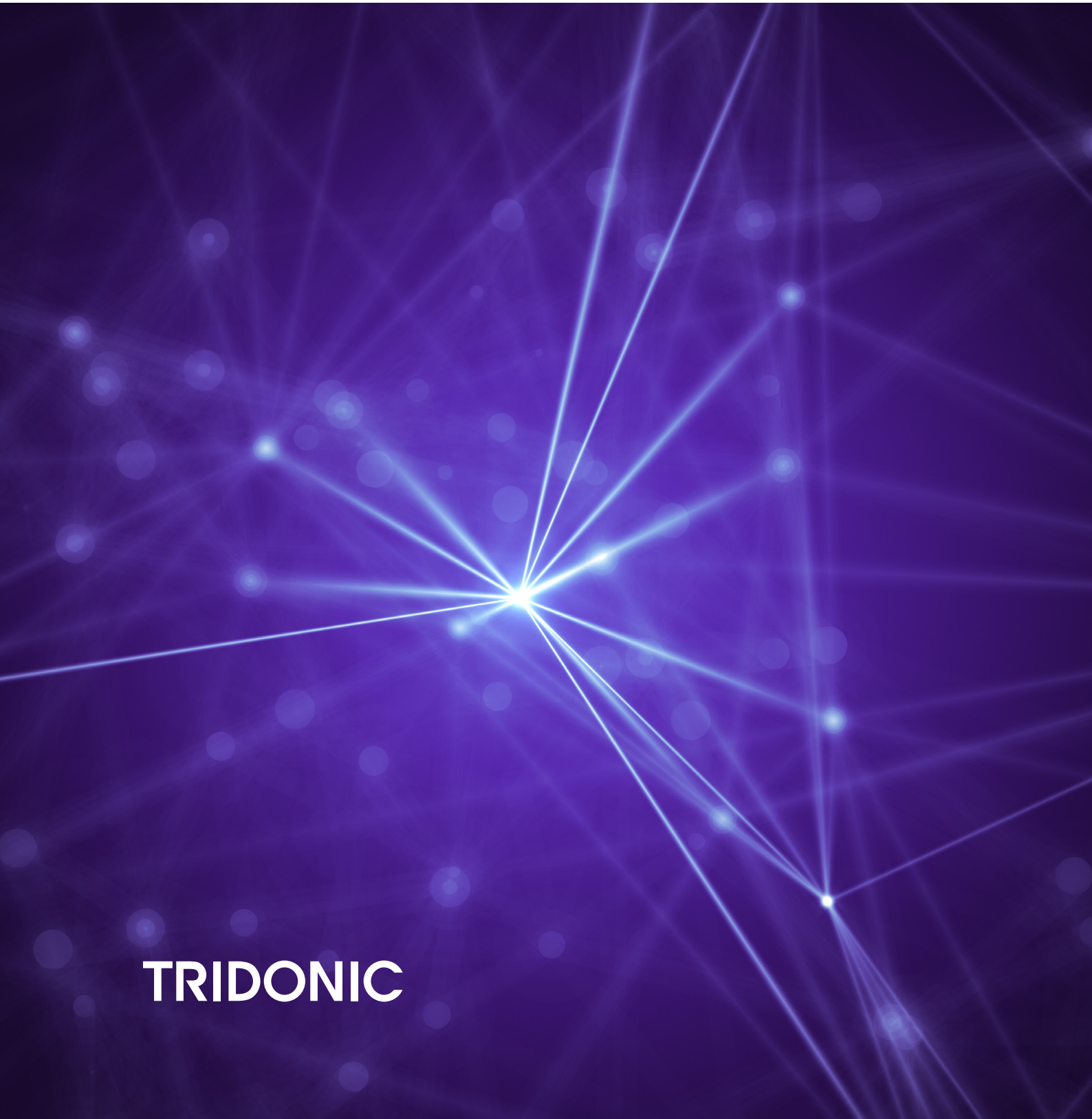
LED driver

Functional Description



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General safety instructions

1. General safety instructions

The instructions in this section have been compiled to ensure that operators and users of LED drivers from Tridonic are able to detect potential risks in good time and take the necessary preventative measures.
The operator must ensure that all users fully understand these instructions and adhere to them. This device may only be installed and configured by suitably qualified personnel.

1.1. Intended use

1.1.1. Proper use

Operation of LED light modules. The device may only be used for this intended purpose.

1.1.2. Improper use

Use outside of the specified area of application. Extensions and modifications to the product.

⚠ WARNING!

Improper use could result in injury, malfunction or damage to property.
It must be ensured that the operator informs every user of existing hazards.

1.2. Dangers associated with the operation of the system

⚠ DANGER!

Danger of electrocution
Disconnect the power to the entire lighting system before working on the lighting system!

1.3. Environment

⚠ DANGER!

Not to be used in corrosive or explosive environments.

General safety instructions

⚠ CAUTION!

Risk of damage caused by humidity and condensation

_ Only use the LED driver in the intended environment!!

_ Prior to commissioning the system, wait until the control device is at room temperature and completely dry!

1.4. Additional instructions

⚠ CAUTION!

Electromagnetic compatibility (EMC)
Although the device meets the stringent requirements of the appropriate directives and standards on electromagnetic compatibility, it could potentially interfere with other devices under certain circumstances!

Compatibility between LED module and LED driver

2. Compatibility between LED module and LED driver

There are two stages involved in the check for compatibility between the LED module and the LED driver.

_ The requirements for operating together can be checked by comparing the data sheets

_ Subsequent practical tests can ensure that there are no unexpected problems during actual operation

2.1. Comparison of data sheet values with a 5-point guideline

Different values for the two devices need to be considered when comparing the data sheets. The following table shows which values are involved and which requirements they must meet.

Comparison of…	Value in LED module		Value in LED driver	Detailed procedure
(1) Current	I_{rated} @HO	≥	Output current	_ Determine forward current of module _ Check whether LED driver can be operated with the same output current _ Check whether I_{max} of module is greater than or equal to output current of LED driver (including tolerances) ⚠ CAUTION! The I_{max} can be temperature dependent! Refer to the derating curve of the LED module data sheet.
	I_{max}	≥	Output current + tolerances	

turn page... →

Compatibility between LED module and LED driver

<table>
<tr><th>Comparison of…</th><th>Value in LED module</th><th></th><th>Value in LED driver</th><th>Detailed procedure</th></tr>
<tr><td rowspan="3">(2) Voltage</td><td>Min. forward voltage</td><td>≥</td><td>Min. output voltage</td><td rowspan="2">_ Check whether voltage range of LED module is completely within the voltage range of LED driver

⚠ CAUTION!
The forward voltage is temperature dependent!
Refer to the Vf/t_p diagram in the data sheet.</td></tr>
<tr><td>Max. forward voltage</td><td>≤</td><td>Max. output voltage</td></tr>
<tr><td>Min. forward voltage @ min. dim level</td><td>≥</td><td>Min. output voltage</td><td>Only relevant for dimmable LED driver !

ⓘ NOTICE
To ensure full dimming performance the forward voltage of the LED module at min. dim level must be greater than or equal to the min. output voltage of the LED driver.

_ Determine the forward voltage of the LED module at lowest dim level
_ In case there is no data available for the LED module at lowest dim level: take the min. forward voltage minus 20% as an approximation
_ Check whether the forward voltage of the LED module is greater than or equal to the min. output voltage of the LED driver</td></tr>
<tr><td>(3) LF current ripple</td><td>Max. permissible LF current ripple</td><td>≥</td><td>Output LF current ripple (<120Hz)</td><td>_ Check whether max. permissible LF current ripple of LED module is greater than or equal to output LF current ripple of LED driver</td></tr>
<tr><td>(4) Max. peak current</td><td>Max. permissible peak current</td><td>></td><td>Max. output current peak</td><td>_ Check whether max. permissible peak current of LED module is greater than max. output current peak of LED driver</td></tr>
<tr><td rowspan="2">(5) Power (pertinent for multi channel LED driver)</td><td>Min. power consumption</td><td>></td><td>Min. output power</td><td rowspan="2">_ Check whether power range of LED module is completely within output power range of LED driver</td></tr>
<tr><td colspan="3"></td></tr>
</table>

Compatibility between LED module and LED driver

	Max. power consumption	<	Max. output power

Compatibility between LED module and LED driver

2.2. Practical tests

⚠ CAUTION!

Following the comparison of the data sheet values a practical test is required. Only a practical test can ensure that the system components (luminaire, LED driver , LED module, wiring) are coordinated and working properly.

The following aspects must be checked:

2.2.1. Technical aspects

_ Transient behaviour

_ Colour shift

_ Connection during operation

_ Parasitic capacitance

2.2.2. Visual aspects

_ Flickering

_ Stroboscopic effect (video applications)

_ Dimming behaviour

_ Colour change and colour stability

_ Luminous flux

When conducting the tests the following conditions must be considered:

2.2.3. Conditions

_ All tolerances

_ Entire temperature range

_ Different output voltage ranges (with and without load)

_ Entire dimming range

_ Short circuit

ⓘ NOTE

If the values are slightly over or under the specified threshold values or if there are any other concerns or questions please contact your technical support.

Compatibility between LED module and LED driver

2.3. Application of the 5-point guideline

The compatibility check with the 5-point guideline is shown here using two examples.

2.3.1. Example 1

Comparison data for LED driver

LED driver	
Designation	LC 75W 250-750mA
Manufacturer	TRIDONIC

Data sheet values of LED driver	
Output current	700 mA
Output current tolerance	± 3 %
Min. output voltage	45 V (1)
Max. output voltage	107 V (1)
Output LF current ripple	± 5 %
Max. output current peak	Output current + 40 %
Output power	75.0 W

(1) Values at 700 mA

Compatibility between LED module and LED driver

Comparison data for LED module

LED module	
Designation	Module 49x233mm 4000lm 830
Manufacturer	Tridonic

Data sheet values of LED module	
Forward current	700 mA
Max. DC forward current	1,400 mA
Typ. forward voltage	33 V ±10 % (1)
Min. forward voltage	43.6 V (1)
Max. forward voltage	49.8 V (1)
Max. permissible LF current ripple	1,800 mA
Max. permissible peak current	2,000 mA
Power draw	32.14 W

(1) Values at 700 mA

Questions

_ Is the LED driver able to operate two modules?

_ Can the required luminous flux of 3,000 lm be achieved with this combination?

Compatibility between LED module and LED driver

Procedure

Comparison of data sheet values

Comparison of…	Value in LED module		Value in LED driver	Result	Explanation
(1) Current	700 mA	=	700 mA	✓	_ To produce a luminous flux of 3,000 lm, the two LED modules must be operated with a forward current of 700 mA. _ The LED driver can be set so that it delivers precisely this value of 700 mA as the output current.
	1,400 mA	≥	721 mA	✓	_ The output current of the LED driver including tolerances (700 mA + 3 % = 721 mA) is less than or equal to the max. DC forward current of the LED module (1400 mA).
(2) Voltage	87.2 V	>	45 V	✓	_ The voltage range of the LED module (2 x 43.6 V = 87.2 V; 2 x 49.8 V = 99.6 V) lies completely within the voltage range of the LED driver (45 - 107 V).
	99.6 V	<	107 V	✓	
(3) LF current ripple	1,800 mA	>	757.05 mA	✓	_ The Output LF current ripple (5 % of output current plus tolerances: [700 mA + 3 %] + 5 % = 757.05 mA) of the LED driver is less than the max. permissible LF current ripple of the LED module (1800 mA).
(4) Max. peak current	2,000 mA	>	980 mA	✓	_ The max. output current peak of the LED driver (700 mA + 40 % = 980 mA) is less than the max. permissible peak current with which the LED module can be operated (2,000 mA).
(5) Power	64.8 W	<	75.0 W	✓	_ The power draw of the LED module (64.8 W) is less than the output power of the LED driver (75.0 W).

Compatibility between LED module and LED driver

Result

All the values meet the requirements. The components are mutually compatible.
With 2 modules a luminous flux of 3,713 lm will be achieved.

Compatibility between LED module and LED driver

2.3.2. Example 2

Comparison data for LED driver

LED driver	
Designation	LC 75W 250-750mA
Manufacturer	TRIDONIC

Data sheet values of LED driver	
Output current	700 mA
Output current tolerance	± 3 %
Min. output voltage	45 V (1)
Max. output voltage	107 V (1)
Output LF current ripple	± 5 %
Max. output current peak	Output current + 40 %
Output power	75.0 W

(1) Values at 700 mA

Compatibility between LED module and LED driver

Comparison data for LED module

LED module	
Designation	Fictitious LED module
Manufacturer	Other manufacturer

Data sheet values of LED module	
Forward current	700 mA
Max. DC forward current	1,050 mA
Typ. forward voltage	39.5 V +/-10 % (1)
Min. forward voltage	35.55 V (1)
Max. forward voltage	43.45 V (1)
Max. permissible LF current ripple	630 mA
Max. permissible peak current	1,500 mA
Power draw	19.75 W

(1) Values at 700 mA

Compatibility between LED module and LED driver

Questions

_ Are the two components mutually compatible?

_ Can the required luminous flux of 1,800 lm be achieved with this combination?

Procedure

Comparison of data sheet values

Comparison of…	Value in LED module		Value in LED driver	Result	Explanation
(1) Current	700 mA	=	700 mA	✓	_ To produce a luminous flux of 1,800 lm the LED module must be operated with a forward current of 700 mA. _ The LED driver can be set so that it delivers precisely this value of 700 mA as the output current.
	1,050 mA	≥	721 mA	✓	_ The output current of the LED driver including tolerances (700 mA + 5 % = 721 mA) is less than or equal to the max. DC forward current of the LED module (1,050 mA).
(2) Voltage	35.55 V	>	45 V	✗	_ The voltage range of the LED module (35.55 V - 43.45 V) is **not** within the voltage range of the LED driver (45 V - 107 V)
	43.45 V	<	107 V	✓	
(3) LF current ripple	630 mA	>	757.05 mA	✗	_ The Output LF current ripple (5 % of output current plus tolerances: [700 mA + 3 %] + 5 % = 757.05 mA) of the LED driver is **not** less than the max. permissible LF current ripple of the LED module (630 mA).
(4) Max. peak current	1,500 mA	>	980 mA	✓	_ The max. output current peak of the LED driver (700 mA + 40 % = 980 mA) is less than the max. permissible peak current with which the LED module can be operated (1,500 mA).

Compatibility between LED module and LED driver

(5) Power	19.75 W	<	75 W	✓	_ The power draw of the LED module (19.75 W) is less than the output power of the LED driver (75.0 W).

Result

The values **do not** meet the requirements. The components are **not** mutually compatible.

Installation notes

3. Installation notes

NOTICE

The cabling, wiring and mounting for a LED driver varies depending on the design and manufacturer of the LED module. The following description should therefore not be viewed as comprehensive installation instructions but merely as important general information.

To obtain further information, proceed as follows:

_ Follow the guidelines and instructions of the lamp manufacturer!

_ Observe all relevant standards!

3.1. Safety information

WARNING!

Comply with the general safety instructions (see General safety instructions, p. 4) !
To avoid failures due to ground faults protect the wiring against mechanical loads from sharp-edged metal parts (e.g. cable penetrations, cable holders, metal frames, etc.

Electronic LED driver from Tridonic are generally protected against overvoltage. Further information can be found in the data sheet.

_ Make sure that the LED driver is not exposed to overvoltages for long periods!

_ The respective IP protection class of the LED driver can be seen in the data sheet. Comply with the requirements for this type of protection!

Installation notes

3.2. Function of the earth terminal

NOTICE

The performance of the prescribed tests and compliance with relevant standards are the responsibility of the luminaire manufacturer.
The following descriptions merely indicate the most important tests and are no substitute for a full research of the relevant standards.

Protective earth	Functional earth	Equipotential earth
		

The LED driver can be earthed using an earth terminal or via the metal housing (if existent). Information about how to earth the LED driver can be found in the data sheet.

Depending on the LED driver, the earth connection can improve the following behavior:

_ Radio interference suppression (EMC - electromagnetic compatibility)

_ LED glowing at standby

_ Transmission of mains transients to the LED output

In the case of modules that are mounted on grounded luminaire parts or heat sinks and therefore have a high capacitance to ground, it can be helpful to also ground the LED driver.

Depending on the application and the type of luminaire, the ground terminal can be designed as protective earth, functional earth or equipotential earth.
This can be seen from the respective symbol on the device and in the data sheet.
The technical explanation can be found in the data sheet.

3.2.1. Avoiding residual LED glow on standby

Residual LED glow on standby may occur as a result of capacitive leakage currents from the LED module onto earthed luminaire parts (such as the heat sink). This mainly affects high-efficiency LED systems with large surface areas installed in luminaires with protection class 1.

The topology has been improved so that residual LED glow can be virtually eliminated by earthing the devices.

Installation notes

NOTICE

If the LED driver cannot be earthed or if earthing is not desired, residual LED glow can be minimized by adequate insulation (for example by using heat-conducting double-sided insulation foil).

3.2.2. Avoiding the transfer of mains transients to the LED output

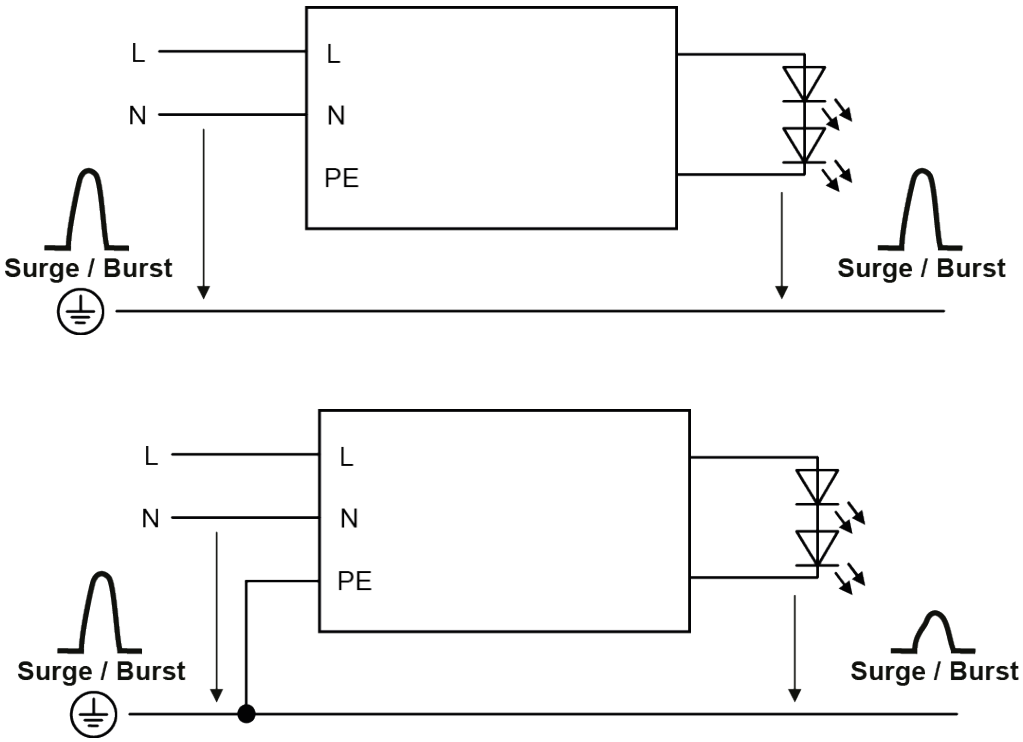
The transfer of mains transients to the LED output presents a problem for many LED driver topologies currently on the market, and TRIDONIC devices may be affected.

Voltage peaks at the input of the LED driver may be transferred to the output of the device where they lead to differences in potential between the LED output and earthed luminaire parts. These differences in potential may result in flashovers if the insulation is inadequate or if the creepage and clearance distances are too small. These flashovers will cause the LED module to fail.

Earthing the LED driver attenuates voltage peaks and reduces the likelihood of flashovers. The precise degree of attenuation depends on the capacitance of the LED module to earth. The exact level of attenuation depends on the capacitance of the LED module to ground

The respective voltage that can be present at the output is specified in the data sheet.

Figure: Voltage peaks for LED driver without earthing (above) and with earthing (below)



Installation notes

NOTICE

Irrespective of whether the LED driver is earthed or not, LED modules must be insulated in accordance with the requirements of the luminaire protection class. Improved insulation of the LED module can also reduce the likelihood of flashovers.

3.2.3. Insulation and dielectric strength testing of luminaires

LED driver for lamps are sensitive to high-voltage transients. This must be taken into consideration when subjecting luminaires to routine testing during manufacture.

According to IEC 60598-1 Annex Q (for information only!) and ENEC 303-Annex A, each luminaire should be subjected to an insulation test for 1 second at 500 V DC. The test voltage is applied between the linked phase/neutral conductor terminal and the protective earth terminal. The insulation resistance must be at least 2 Megaohm.

As an alternative to measuring the insulation resistance, IEC 60598-1 Annex Q describes a dielectric strength test at 1500 V AC (or 1.414 x 1,500 V DC). To avoid damaging electronic LED driver, this dielectric strength test should be performed exclusively for type testing. This test should certainly not be used for routine testing.

NOTICE

Tridonic recommends performing an insulation test because a dielectric strength test may damage the device irreparably.

3.2.4. Type testing

Type testing of the luminaire is performed according to IEC 60598-1 Section 10.
The wiring for protection class 1 luminaires is tested at a voltage of 2xU + 1,000 V. In order not to overload the LED driver all the inputs and outputs of the LED driver are connected to one another.
U_{out} is used for measuring the voltage for luminaires with LED driver with U_{out} > 250 V:
For U_{out} 480 V the voltage for the type test is 2000 V. (Routine testing is always performed at 500 V DC)

3.2.5. Wiring

NOTICE

The wiring procedure is device-specific. Further information about wiring, wire cross sections and the length of stripped off insulation can be found in the data sheet.

Wiring guidelines

_ The cables should be run separately from the mains connections and mains cables to ensure good EMC conditions.

_ The LED wiring should be kept as short as possible to ensure good EMC.

_ Depending on the design of the luminaire it may be possible to improve the radio interference properties by earthing the device at the earth connection.

Installation notes

_ The LED driver has no inverse-polarity protection on the secondary side. Wrong polarity can damage LED modules with no inverse-polarity protection.

3.3. External fuse for DC operation

The internal fuse of an LED driver is not rated for DC operation. Because of this, an additional external fuse must be used if an LED driver is operated on a DC network.

Proceed as follows:

_ Connect the external fuse to the line labeled "+" which is between the DC power supply and the input terminal of the LED driver

_ Only use an external fuse with suitable parameters.

For LED drivers with a power of 25-150 watts the following values are recommended:

_ Rated voltage: 250 V

_ DC Fuse Rating: 1 A - 3.15 A slow

Tridonic recommends the following external fuse:

_ 477 Series, 5 × 20 mm, Fuse Rating 3.15 A slow

3.4. Maximum loading of circuit breakers

3.4.1. Importance of maximum loading

A circuit breaker is an automatically operated electrical switch that protects an electrical circuit from damage caused by overload or short circuit. Unlike a fuse that must be replaced if it triggers, a circuit breaker can be manually or automatically reset and used further. Circuit breakers are available in different sizes and with different technical data.

The inrush current is a short increased peak current that occurs when an LED driver is switched on.

In electrical installations, numerous LED drivers are connected to one circuit breaker. The maximum loading of a circuit breaker indicates how many LED drivers can be connected to the circuit breaker without triggering the circuit breaker because of the summation of the different inrush currents. The value is calculated through simulation programs based on the circuit breakers characteristic.

Information about the maximum loading can be found in Tridonic data sheets. The following table shows the data for 50W LED drivers as an example.

Automatic circuit breaker type	C10	C13	C16	C20	B10	B13	B16	B20	Inrush current	
Installation Ø	1.5 mm^2	1.5 mm^2	2.5 mm^2	2.5 mm^2	1.5 mm^2	1.5 mm^2	2.5 mm^2	2.5 mm^2	I_{max}	time

Installation notes

50W 100-400mA LED driver	18	26	28	34	9	13	14	17	22.4 A	176 µs

3.4.2. Calculation of maximum loading

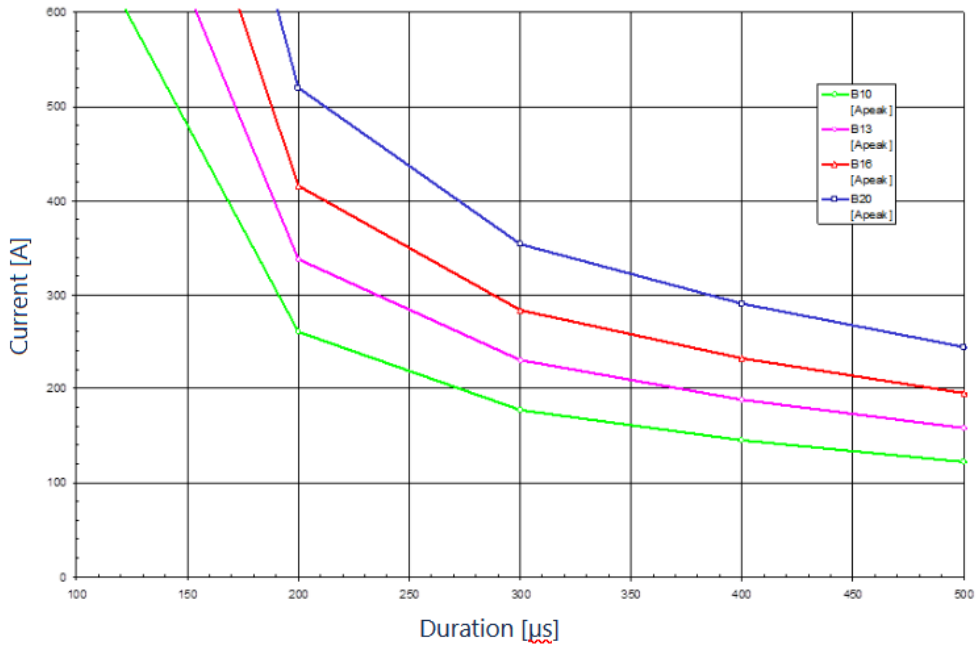
Tripping characteristics of circuit breakers

The load at which a circuit breaker triggers is defined by the height and the duration of the applied current.
The following table shows exemplary values for different circuit breakers (B10, B13, B16, B20).

Duration [µs]	Current B10 [A_{peak}]	Current B13 [A_{peak}]	Current B16 [A_{peak}]	Current B20 [A_{peak}]
100	700	910	1,120	1,400
200	260	338	416	520
300	177	230.1	283	354
400	145	188.5	232	290
500	122	158.6	195	244
600	110	143	176	220
700	102	132.6	163	204
800	97	126.1	155	194
900	93	120.9	149	186
1000	90	117	144	180

The combination of both parameters can also be displayed graphically. This results in the tripping characteristic for a certain circuit breaker.

Installation notes



NOTICE

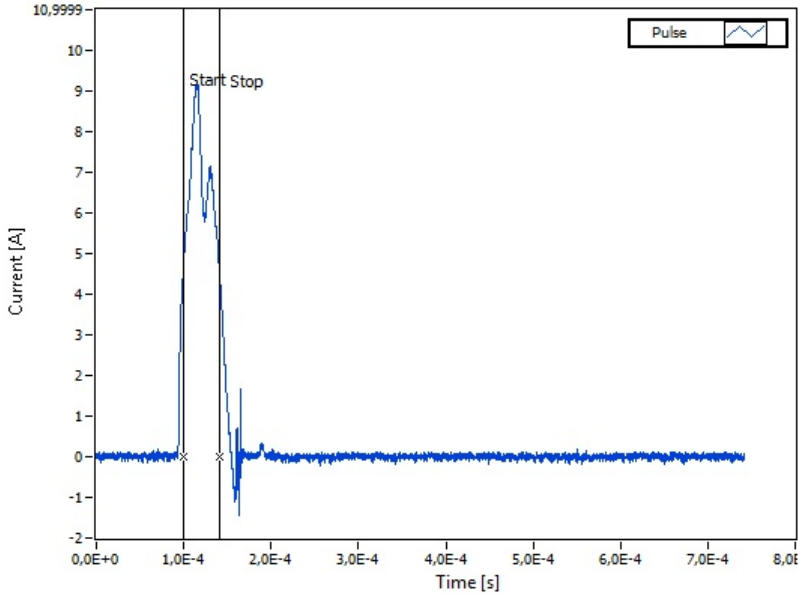
Information about the specific tripping characteristics of a circuit breaker must be requested from the respective manufacturer!

Calculation of the inrush current

The inrush current of an LED driver is also defined by its duration and its height. The duration is typically measured as the time between 10 % of maximum current (ascending) and 50 % of maximum current (descending).

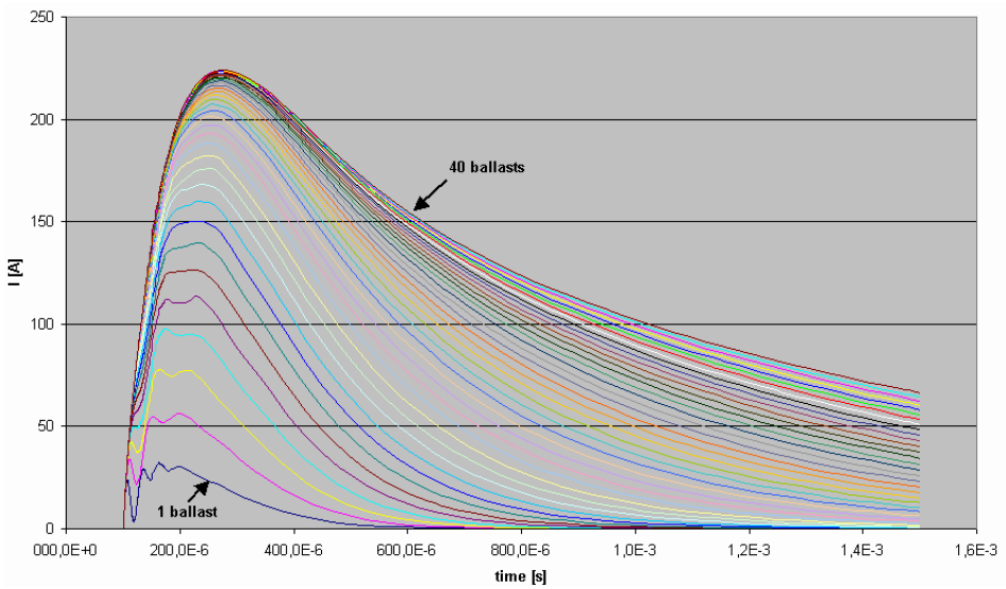
The following illustration shows an example of the inrush current of a single LED driver:

Installation notes



If several LED drivers are connected to one circuit breaker, the inrush current increases.

Die Erhöhung ist nicht nicht-linear. Durch Simulation lässt sich die Erhöhung ermitteln.
The increase is non-linear. It can be determined by simulation.

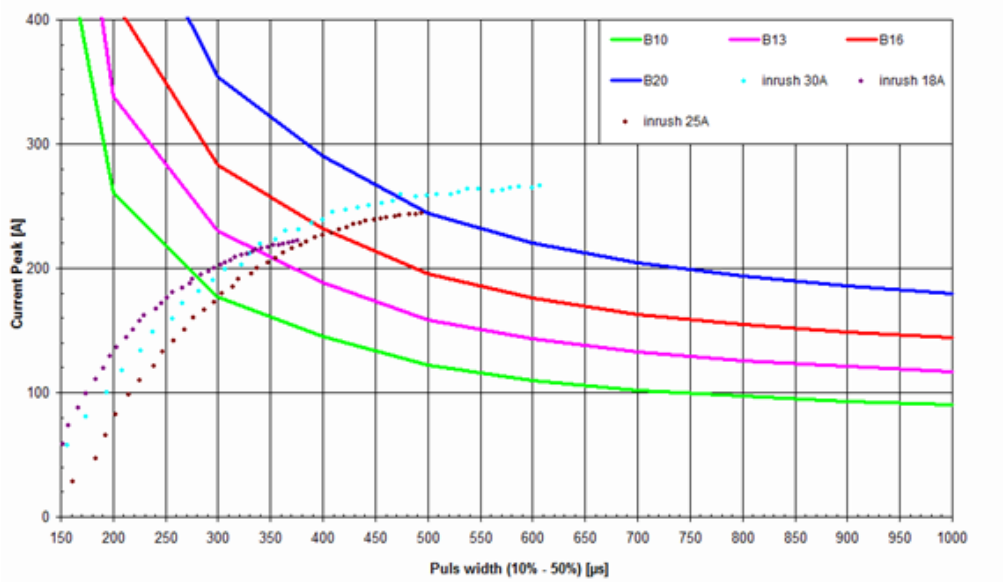


Implementation of the simulation

The above-mentioned parameters, height and duration of the current pulse in both the circuit breaker and the LED driver, are entered into the simulation program.

The result of the simulation is presented in graphical form.

Installation notes



The different elements have the following meaning:

_ Circuit breaker:
B10, B13, B16, B20 (solid line) represent the tripping characteristics of different circuit breakers.

_ Inrush current:
The dotted lines represent different inrush currents.
The index of a point signifies the number of LED driver, that is, point 1 represents the result for 1 LED driver, point 2 the result for 2 LED driver, etc.

The simulation results can be read as follows:

_ The crossing of the two lines shows the maximum value for the selected combination of circuit breaker and inrush current.

_ The index of the point at this maximum value shows the max. number of LED drivers.

The following example shows the maximum number of LED drivers at four different circuit breakers:

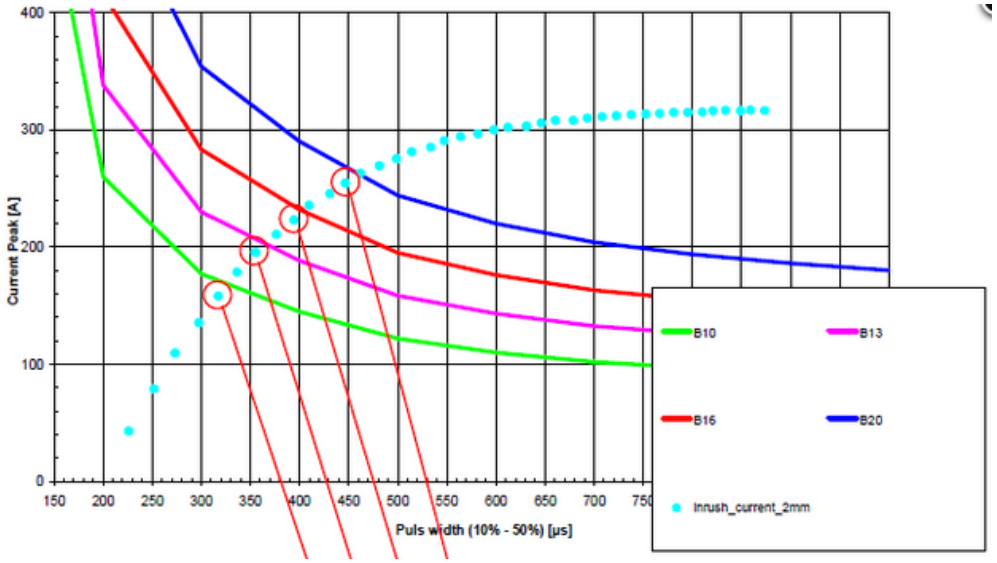
_ max. 5 LED drivers at circuit breaker B10 (green tripping characteristic)

_ max. 7 LED drivers at circuit breaker B13 (pink tripping characteristic)

_ max. 9 LED drivers at circuit breaker B16 (red tripping characteristic)

_ max. 12 LED drivers at circuit breaker B20 (blue tripping characteristic)

Installation notes



NOTICE

The results of different simulations can only be compared if all of the relevant factors are the same. The following points can influence the results:

_ Tripping characteristic used for the circuit breakers

_ Definition used for the duration of the inrush current (Tridonic: 50-50 %)

_ Gear used for the measurement of the inrush current

_ Considering a safety buffer (Tridonic: +20 % for the electrolytic capacitor)

_ Considering different system impedances

_ Switch-on point used: should always be at max. input voltage

_ Adopted cable lengths and cable data (Tridonic: Cable length 40 cm; Resistivity: 0.0172 Ω * mm^2 / m; inductance: 5 nH / cm; terminal resistance: 2 mΩ)

_ The modeling of the LED driver is performed from the input to the bus voltage electrolytic capacitor. For inductance the saturation values must be used.

_ Bei Verwendung unterschiedlicher Leistungen an einem Leistungsschutzautomaten kontaktieren Sie bitte den Technischen Kundendienst.

Functions

4. Functions

NOTICE

The following chapters provide a general description of different LED drivers. Due to the variety of devices, it is sometimes necessary to look up details on parameters and similar values in the corresponding documentation.

Device operating mode

4.1. Device operating mode

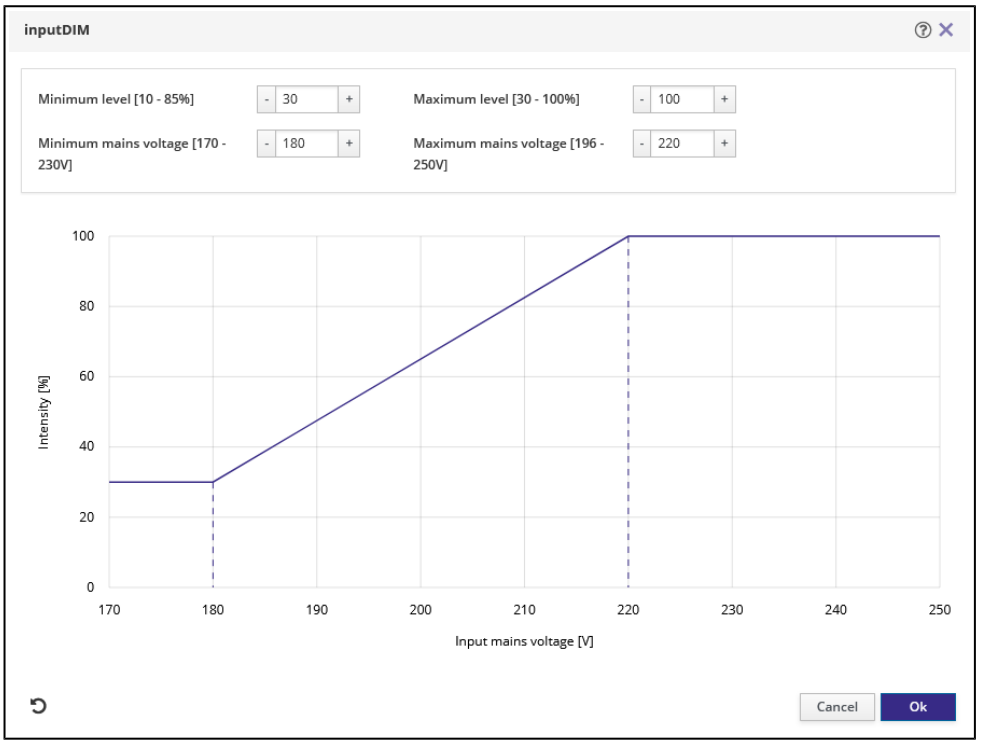
4.1.1. Description

An LED driver supports several control signals. These control signals are automatically detected and the mode is adapted.
If only one special device mode is required, this mode can be fixed here.
"Automatic detection" is the default setting.

4.1.2. Parameter Description

Device operating mode	Description
Automatic detection	The LED driver detects the incoming signal and switches automatically to the corresponding device operating mode.
DSI	The LED driver detects only DSI commands.
switchDIM	The luminaires connected to the LED driver can only be smoothly adjusted using commercially available momentary-action switches. The mains voltage is used as a control signal. The LED driver interprets the signal as either a smooth adjustment or switch command depending on how long the manual momentary-action switch is pressed.
corridorFUNCTION	With the corridorFUNCTION and a commercially available motion detector, it is easy to adapt the lighting in one area to its use. That is, when the area is entered by a person, the lighting dims instantly to a desired brightness and is available in full strength. After the area is left by the person, the brightness dims slowly to a smaller value or switches off completely. The individual parameters of the desired profile, such as brightness values or delay times, can be adjusted flexibly and individually.
1-10 V	The LED driver adjusts the brightness according to the applied voltage at the 1-10 V terminal.
ready2mains	The LED driver detects only ready2mains commands.

Device operating mode

chronoSTEP	In the outdoor lighting and street lighting sector, it often makes sense to dim the lighting level during night hours in order to save energy. The device automatically measures the switch-on and switch-off times of the lighting installation over the past three days. The switch-on and switch-off times are typically the times at which the sun sets and rises. The midpoint of these two reference points is the time referred to as Virtual Midnight. Overall there are 8 profiles, 5 are predefined by factory and 3 can be programmed by the customer.
inputDIM	The intensity of the LED can be set depending on the level of the input voltage via two adjustable values. Linear interpolation takes place between the two values. 
DALI	The LED driver detects only DALI commands.
sensorMODE	The sensorMODE combines the features chronoSTEP and corridorFUNCTION and adds the possibility to control them with a DALI input device directly connected to the LED driver.

NOTICE

Automatic detection (one4all interface)

These device operating modes are automatically detected: DALI, DSI, switchDIM, corridorFUNCTION.

4.2. deviceKEY

4.2.1. Description

With this function, individual device functions can be protected from unauthorized changes by a password.

Name	Function
Set	With this option the write protection for desired functions can be set or changed.
Remove	This option allows you to remove the write protection from all functions.
Current deviceKEY	If the device is already protected by a deviceKEY, the current devicekEY needs to be entered in this field.
New deviceKEY	Enter your desired deviceKEY which shall be applied after configuring your device.
Select functions which shall be protected	The selected functions will be locked by the entered deviceKEY after the configuration of the device.

NOTICE

List of functions
The list of read-only functions is device dependent.

4.3. corridorFUNCTION

4.3.1. Description

The corridorFUNCTION enables the illuminance to be linked to the presence or absence of people. A conventional relay motion sensor is connected. The luminous intensity is increased when a person enters the room. When the person leaves the room the motion sensor switches off after a defined delay and the luminous intensity is automatically reduced or switched off.

The corridorFUNCTION is particularly beneficial in applications in which light is needed around the clock for safety reasons, as in for example in public buildings, large apartment complexes, car parks, pedestrian underpasses and underground railway stations. Since the luminous intensity only has to be increased when there is a demand for light the corridorFUNCTION offers effective lighting management and helps saving energy and costs. Another benefit of the corridorFUNCTION is the enhanced convenience of automatic lighting control.

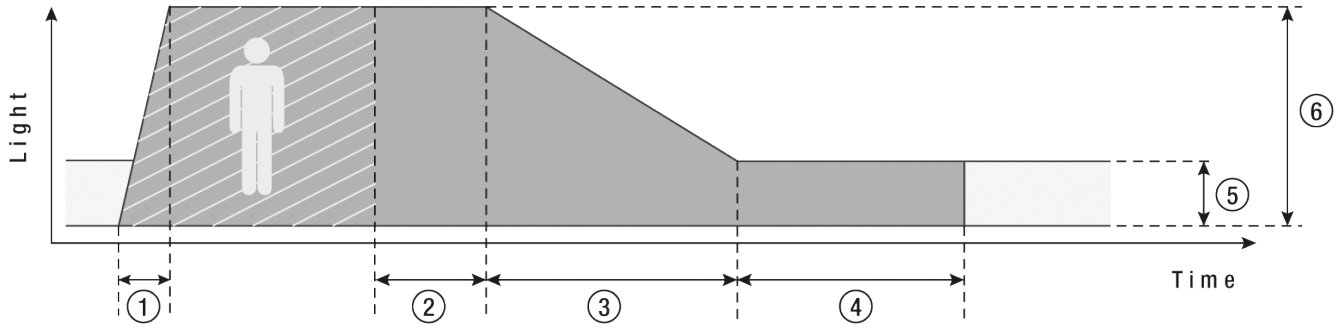
⚠ CAUTION!

To ensure correct operation a sinusoidal mains voltage with a frequency of 50 Hz or 60 Hz is required at the control input.
Operation is only ensured with clear zero crossings
Serious mains faults may impair the operation of switchDIM and corridorFUNCTION.

Profile settings:

Standard profile for activating via 230 V on the interface terminal DA/N - DA/L for 5 minutes is **"Never off"**

The LED drivers have different profiles so they can provide the best possible performance in a range of conditions. The profiles are defined by a series of values:



1. Fade-in time: the time that starts as soon as the presence of a person is detected. During the fade-in time the luminous intensity is faded up to the presence value (default: 0s).
2. Run-on time: the time that starts as soon as the presence of a person is no longer detected. If the presence of a person is detected again during the run-on time the run-on time is restarted from zero. If no presence is detected during the run-on time the fade time is started as soon as the run-on time expires.

3. Fade time: the time during which the luminous intensity is faded from the presence value to the absence value (default: 30 s).
4. Switch off delay: the time during which the absence value is held before the lighting is switched off. Depending on the profile selected the switch-off delay may have different values or may not be defined (default: "Never Off").
5. Absence value: the luminous intensity when there is no person present (default: 10 %).
6. Presence value: the luminous intensity when persons are present (default: 100 %).

Variable switch-off times

The profiles and their values can be freely adjusted.

4.3.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

If the device is in the delivery state (Automatic mode), activation/deactivation is also possible via mains voltage:

Activating the corridorFUNCTION

If an a.c. voltage of 230 V is applied to the digital interface of the LED driver for a period of at least 5 minutes the LED driver detects the corridorFUNCTION and automatically activates it. Activation is required only once per device.
There are different procedures for activating by means of the mains voltage. The requirements are the same in each case.

Requirements:

_ The LED driver is correctly installed in the luminaire

_ Mains power is connected

_ A motion sensor is connected to information DA/N or DA/L

Procedure Version 1:

_ Remain in the activation range of the motion sensor for more than 5 minutes
→ The motion sensor detects movement and switches on
→ The corridorFUNCTION is activated automatically after 5 minutes
→ The light value switches to presence level (default: 100 %)

Procedure Version 2:

_ Set the run-on time on the motion sensor to a value greater than 5 minutes

_ Remain in the activation range of the motion sensor for a short time
→ The motion sensor detects movement and switches on
→ The corridorFUNCTION is activated automatically after 5 minutes
→ The light value switches to presence value (default: 100 %)

_ Reset the run-on time of the motion sensor to the required value

corridorFUNCTION

Procedure Version 3: Only possible if the motion sensor offers a manual override option

_ Set the slide switch on the motion sensor to the "Never-Off" function

_ Wait 5 minutes
→ The corridorFUNCTION is activated automatically after 5 minutes
→ The light value switches to presence value (default: 100 %)

_ Reset the slide switch on the motion sensor to the "automatic" function

Deactivating the corridorFUNCTION

If the corridorFUNCTION is activated the LED driver is controlled only by motion. To operate the LED driver via DALI, DSI or switchDIM the corridorFUNCTION must be deactivated.

In order to be able to operate the LED driver via DALI, DSI or switchDIM, the corridorFUNCTION must be deactivated again.

_ Connect the phase over push button to the terminal marked DA/L

_ Connect neutral conductor to the terminal marked DA/N

_ Press the push button 5 times within 3 seconds

4.3.3. Installation

Requirements:

_ LED driver is correctly installed in a luminaire

_ Mains wiring is connected

_ Motion detector is connected to interface connection DA/N or DA/L

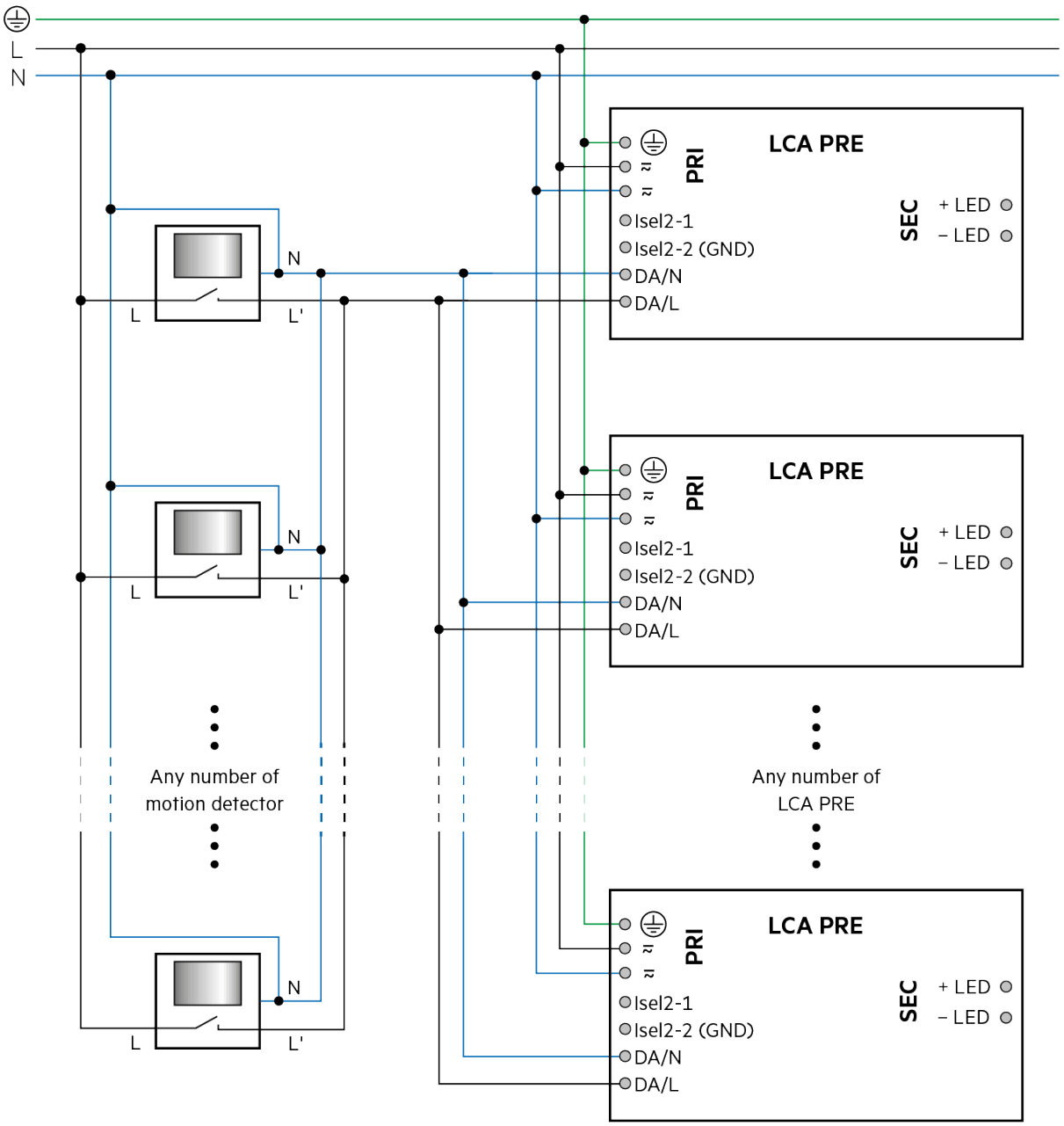
NOTICE

_ Connect the neutral conductor (N) to terminal DA/N on the LED driver

_ Connect the output of the motion sensor (switched phase) to terminal DA/L on the LED driver

corridorFUNCTION

Wiring versions:



Benefits:

Control can be changed at any time to a digital control signal (DSI or DALI) without having to change the luminaire or provide an additional control line

⚠ CAUTION!

Use conventional relay motion sensors!
Electronic motion sensors (Triac) are not suitable because of their technical design.

corridorFUNCTION

CAUTION!

Do not use push buttons with glow lamp!
Push buttons with glow lamp may affect the control.

CAUTION!

Make sure that the control line (L') of the motion sensor is connected to terminal DA/L and the neutral conductor (N) to terminal DA/N.

CAUTION!

For five-pole wiring the neutral conductor must be connected to DA/N.
This prevents 400 V being applied between adjacent terminals if a different phase is used for the control input.

NOTICE

For large installations, supply to the LED driver may be split among several phases (L1, L2, L3).
Any phase can be used for the control input .
Any number of motion sensors can be connected in parallel.

4.4. DSI

4.4.1. Description

DSI (Digital Serial Interface) enables DSI LED driver to be controlled. The DSI line can be wired separately via a two-core cable or together with the mains cable in a five-core cable. Communication is not impaired by the mains cable. In contrast to DALI, there is no individual addressing of the LED drivers with DSI.

DSI offers a number of advantages over analog control methods:

_ Expansion options via submodules, for example in combination with daylight control or additional switch modules

_ Wiring: Simple wiring with five pole standard cables and line length of up to 250 meters

_ Wiring: Polarity-free control lines can be used for mains and control lines

_ Wiring: Multiple wiring possibilities (star, series and mixed wiring)

_ Unaffected by electrical interference: Uniform light level from the first to the last light source

_ Reverse polarity protected connection: can be connected with any polarity

4.5. switchDIM

4.5.1. Description

With the switchDIM function it is possible to use the mains voltage as a control signal.
The phase of a simple standard mains voltage push button is connected to the terminal marked DA/L and the neutral conductor is connected to the terminal marked DA/N.

Using the function is easy and convenient:

_ A short press (50-600 ms) switches the LED driver on or off

_ A long press (> 600 ms) fades the connected LED driver alternately up and down (between 1 and 100 %).

switchDIM is therefore a very simple form of lighting management. It also has a positive effect on material and labour costs.

The LED driver has a switchDIM memory function. This is used, among other things, for storing the last dimming value in the event of interruptions in the power supply.
When power returns, the LED is automatically restored to its previous operating state and dimmed to the last value.

⚠ CAUTION!

Push button with glow lamp are not approved for controlling switchDIM.
Push button with glow lamp may cause the LED driver to spontaneously switch on or off or make sudden changes in the dimming value.

⚠ CAUTION!

To ensure correct operation a sinusoidal mains voltage with a frequency of 50 Hz or 60 Hz is required at the terminal.
Operation is only ensured with clear zero crossings.
Serious mains faults may impair the operation of switchDIM and corridorFUNCTION.

⚠ CAUTIONS!

A maximum number of 25 LED drivers per switchDIM system should not be exceeded.
If you have more LED drivers please use DALI or DSI.

4.5.2. switchDIM fading

Here you can set the fade time of the LED driver when using switchDIM.

This function is only available for LED drivers that have it mentioned in the data sheet.

switchDIM

Parameter	Default value	Description	Min value	Max value
fade-in time	0 s	The fade-in time is used to set the fade time if the light is turned on by a short press	0 s	9,600 s
fade-out time	0 s	The fade-out time is used to set the fade time if the light is turned off by a short press	0 s	9,600 s

⚠ CAUTION!

Some LED drivers have a potential-free switchDIM input that is not protected against 230 V.
This input is then marked as "pushBUTTON".

4.5.3. Commissioning

ⓘ NOTICE

If the corridorFUNCTION is activated the LED driver is controlled only by motion. To operate the LED driver via DALI, DSI or switchDIM the corridorFUNCTION must be deactivated.

Using the switchDIM function

switchDIM is operated by the mains voltage push button.

Procedure:

_ Switch the LED driver on/off by briefly actuating the push button or

_ Dim the LED driver by holding down the push button

Synchronizing LED drivers

If the LED drivers in a system do not operate synchronously the LED drivers must be synchronized, i.e. put in the same status (on/off).

Procedure:

_ Hold down the push button for 10 seconds
→ All LED drivers will be synchronized to the same status
→ LEDs will will be set to a uniform light value (approx. 50 %)
→ The fading time will be set to it default value (approx. 3 seconds)

Changing the fading time

The default value for the fading time is approx. 3 seconds. It can be changed to approx. 6 seconds.

Procedure:

_

Hold down the push button for 20 seconds
→ After 10 seconds: all LED drivers will be synchronized to the same status
→ After 20 seconds: a fading time of approx. 6 seconds will be set
→ LEDs will be set to a uniform light value (approx. 100 %)

Switching the LED driver to automatic mode

In automatic mode the LED driver detects which control signal (DALI, DSI, switchDIM, etc.) is connected and automatically switches to the corresponding operating mode.

Procedure:

_ Press the push button 5 times within 3 seconds

Setting via software

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted.
Further information can be found at https://www.tridonic.com/en/int/services/software/software.

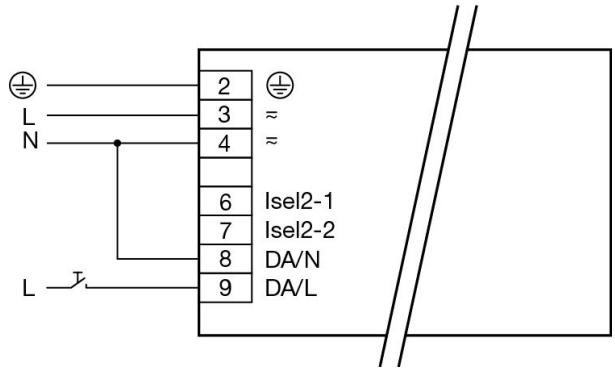
4.5.4. Installation

Wiring variants

There are two options for installing switchDIM:
Four-pole and five-pole wiring

Four-pole wiring

Configuration:



Phase (L), neutral (N), earth (PE), control line (L')

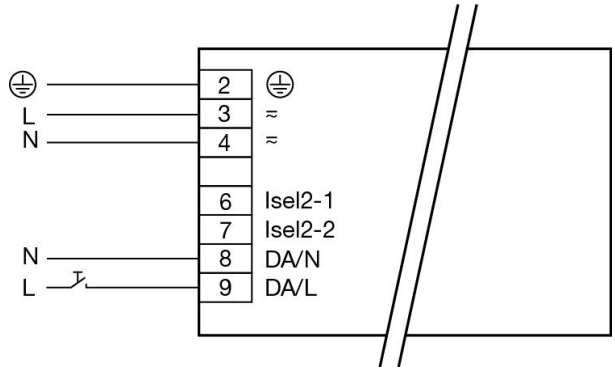
Benefits:

No need for a control line thanks to bridging terminal 8 and the N-connection of the luminaire

switchDIM

Five-pole wiring

Configuration:



Phase (L), neutral (N), earth (PE), control line (L), neutral (N)

Benefits:

Control can be changed at any time to a digital control signal (DSI or DALI) without having to change the luminaire or provide an additional control line

CAUTION!

For five-pole wiring the neutral conductor must be connected to DA/N.
This prevents 400 V being applied between adjacent terminals if a different phase is used for the control input.

HINWEIS

If the LED driver is in the delivery state (Automatic mode), activation/deactivation is also possible via mains voltage.

HINWEIS

It is allowed to use alternative phases to control the driver and to operate the switchDIM input.

Power-up Fading

4.6. Power-up Fading

4.6.1. Description

The power-up fading function offers the opportunity to realise a soft start. The soft start will be applied at turning on the mains and at starts by switchDIM. The function is programmed as a DALI fade time in the range from 0.7 to 16 seconds and dims in the selected time from 0 % to the power-on level.

By factory default power-up fading is not active (0 seconds).

4.6.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.7. DALI

4.7.1. Description

DALI standard

NOTICE

A lot of Tridonic devices support the DALI Standard V2 to a great extent. Detailed information can be found in the respective data sheet.

DALI (Digital Addressable Lighting Interface) is an interface protocol for digital communication between lighting components.

The DALI standard was developed by Tridonic together with renowned manufacturers of operating and control equipment. Today, these manufacturers belong to the Digital Illumination Interface Alliance (DiiA) which promotes the use and further development of DALI.

The DALI standard is defined in IEC 62386. A test procedure standardized by the DiiA ensures compatibility between products from different manufacturers. Tridonic products have undergone this test and meet all the requirements. This is indicated by the logo of the DALI-2™ Alliance on the device.

The agreement by the lighting industry to adopt a common protocol has opened up a virtually unlimited number of options. With the right choice of individual DALI components an extremely wide range of requirements can be met, from operating a simple light switch to lighting management systems for entire office complexes with thousands of light sources.

DALI in Action

DALI offers a lot of possible uses:

_ DALI line: 64 LED driver can be grouped to a line
_ DALI groups: Every LED driver can be attributed to 16 groups
_ Addressability: All LED driver are individually addressable
_ Grouping: Possible without complicated rewiring
_ Programmability: Functions that go beyond the DALI standard can be programmed individually
_ Monitoring: Easily possible thanks to status feedback
_ Wiring: Simple wiring with five pole standard cables and a cable length of max. 300 metres
_ Wiring: Polarity-free control lines can be used for mains and control lines
_ Wiring: Multiple wiring possibilities (star, series and mixed wiring)
_ Unaffected by interruptions: All luminaires receive the exact same, unaffected digital signal and dimming level
_ Similar light level from first to last luminaire

Technical data of a DALI line:

DALI

_ DALI voltage: 9.5 V - 22.4 DC

_ Maximum DALI system current: max. 250 mA

_ Data transfer rate: 1200 bit/s

_ Maximum line length: up to 300 m (for 1,5 mm^2)

4.7.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.8. ready2mains

4.8.1. Description

ready2mains uses the mains cable to transmit information: easily, reliably and professionally.

ready2mains can be used to configure both LED drivers with a separate communication interface as well as fixed output LED drivers. The configuration saves time and is very flexibel. ready2mains reduces production costs and installation costs and also reduces possible sources of error.

4.8.2. Configuration

Using ready2mains-capable configuration software or directly via the ready2mains programmer, LED drivers are configured via power line.

These parameters can be adjusted either via ready2mains-capable configuration software or directly via the ready2mains programmer.

- Easy configuration of luminaires
- Simple integration in existing luminaire production test systems
- Optionally, the ready2mains programmer can also be used standalone for programming the current and setting up the lock byte

Constant Light Output

4.9. Constant Light Output

4.9.1. Description

The light output of an LED module reduces over the course of its lifetime. The Constant Light Output function compensates for this natural decline. In order to achieve an almost constant light output over the entire service life, the output power of the LED driver is continuously increased.

For configuration purposes the expected module-specific values for lifetime and residual luminous flux must be specified. The output power is then controlled automatically on the basis of these values.
The LED driver typically starts with an output power ("Required Intensity") that corresponds to the expected residual luminous flux and calculates the increase in the value on the basis of the anticipated lifetime.

In order to provide a visual indication that the expected service life of the LED module has been exceeded, the "Visual feedback" function must be activated. After switching on, the light flashes for two seconds.

4.9.2. Parameter

Parameter	Default value	Description	Min value	Max value
Expected LED life	0	Indicates the duration for which the LED can be operated before it becomes unusable or no longer meets the criteria given in applicable standards.	0 h	127,500 h
Required intensity	100 %	Indicates the intensity which should remain constant over the entirety of the LED lamp life.	70 %	100 %
LED burning hours	0 h	Makes it possible to adjust the burning hours of an LED. With this, LEDs with different burning hours can be matched to each other when LEDs are replaced.	0 h	131,070 h
Visual feedback	Off	If the Visual feedback is enabled, visual feedback is given as soon as the LED exceeds the expected LED lamp life. If the expected LED lamp life is exceeded, the luminaire flashes for 2 seconds after being switched on.	Off	On

4.9.3. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted.
Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.10. eCLO

4.10.1. Description

The light output of an LED module reduces over the course of its lifetime.

The enhanced constant light output function compensates for this natural decline by constantly increasing the output current of the LED driver throughout its lifetime.

As a results, a virtually uniform light output is achieved at all times.

Up to 8 steps, each with a timer value and an intensity value, can be used for the configuration.
Starting from these steps, the control of the output current then takes place automatically.

If the function "visual feedback" is enabled, visual feedback is given as soon as the LED exceeds the expected LED lamp lifetime. If the expected LED lamp lifetime is exceeded, the luminaire flashes for 2 seconds after being switched on.

4.10.2. Parameter description

Parameter	Default value	Description	Min value	Max value
Initial timer value	0 h	The initial timer value is always 0. The function will be started from this step.	0 h	0 h
Initial intensity	100 %	Specifies the intensity, with which the function is started.	70 %	100 %
Step 1 - 7 timer value	0 h	For each of the 7 further steps (1 - 7) a separate timer value can be specified. After the period specified here, the respective intensity of the level (1 - 7) is taken. The 7 timer values are to be entered as absolute values.	0 h	127,500 h
Step 1 - 7 intensity	100 %	For each of the 7 further steps (1 - 7) an intensity can be specified. If one of the levels is defined as 100 %, the function is ended at this step.	70 %	100 %
LED burning hours	0 h	Makes it possible to adjust the burning hours of an LED. With this, LEDs with different burning hours can be matched to each other when LEDs are replaced.	0 h	131,070 h
Visual feedback	Off	If visual feedback is enabled, visual feedback is given as soon as the LED exceeds the expected LED lamp life. If the expected LED lamp life is exceeded, the luminaire flashes for 2 seconds after being switched on.	Off	On

4.10.3. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted.
Further information can be found at https://www.tridonic.com/en/int/services/software/software.

DC recognition

4.11. DC recognition

4.11.1. Description

In emergency light systems with central battery supply the DC recognition function uses the input voltage to detect that emergency mode is in place. The LED driver then automatically switches to DC mode and dims the light to the defined DC level. Without DC recognition different and more complex solutions need to be applied in order to detect emergency mode.

_ Information about the standard value for the DC level and the range in which this can be changed can be found in the data sheet.

_ By default, the light level is fixed during DC operation. By activating "Dimming on DC", the device reacts to dimming commands as in AC operation.

_ Via Tridonic-specific software individual values can be adjusted using Tridonic-specific software. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

NOTICE

Most LED drivers are designed to operate on DC voltage and pulsing DC voltage.
In DC recognition connected sensors are ignored.
Detailed information can be found in the respective data sheet.

4.11.2. Commissioning

The function is integrated in the device as standard. No additional commissioning is necessary for activation.

DC recognition

4.11.3. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted.
Further information can be found at https://www.tridonic.com/en/int/services/software/software.

Dimming on DC

4.12. Dimming on DC

4.12.1. Description

If Dimming on DC is activated the requirements of the DC recognition function are ignored. Even if DC is detected the LED driver continues to behave as in AC mode:

_ The present dimming level is retained

_ An emergency light level defined for the DC recognition function (DC level) is ignored

_ Control signals via DALI und DSI continue to be executed

4.12.2. Commissioning

⚠ WARNING!

If Dimming on DC is activated then emergency mode is not recognized. The device no longer automatically switches to the emergency light level.
Make sure that if Dimming on DC is activated an appropriate dimming level is selected for the emergency lighting mode.

Please also note the following:

_ Dimming on DC may only be activated by trained personnel

_ Dimming on DC must not be used in emergency lighting systems to EN 50172

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

Intelligent Temperature Guard

4.13. Intelligent Temperature Guard

WARNING!

The maximum t_c temperature is the maximum permitted in terms of life time. Operating the LED drivers above the permitted t_c temperature is not allowed.
The Intelligent Temperature Guard function does not replace the proper thermal design of the luminaire and does not enable the lighting to operate for lengthy periods of time in impermissible ambient temperatures.

4.13.1. Description

The Intelligent Temperature Guard function provides protection against temporary thermal overloads. Thermal overload protection is triggered if the t_c temperature is exceeded. This way, instant failure of the LED driver can be prevented.

The performance is reduced in small steps that are usually imperceptible to the user.

4.13.2. Behaviour

NOTICE

The temperature at which the power reduction starts is device-specific and depends on the load and the installation situation.

Depending on the installation situation and the load of the device, the temperatures at different measuring points of the device may differ. As a result, it may happen that the actual measured temperature is not identical to the temperature at the t_c point.

In any case, the starting point of the power reduction is higher than the predetermined maximum t_c temperature.

For the functioning of the protective function these deviations are not decisive. The starting point of the power reduction is selected by the device in a way that the protective function starts when the rated life time would otherwise be significantly affected.

4.13.3. Adjusting the Offset

Via Tridonic-specific software the offset value of specific devices can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.14. colourSWITCH

4.14.1. Description

A conventional push button can be used to control the system via colourSWITCH.
Using a push button with glow lamp is not permitted.

NOTICE

If the device is controlled via DALI/DSI, colourSWITCH is not available.

4.14.2. colourSWITCH use cases

_ The tunable white driver and LED modules from Tridonic as a calibrated bundle

_ The tunable white driver and LED modules from Tridonic separately

For control via a push button different settings can be made:

_ Short press:
Setting the colour temperature via colourSWITCH mode with 9 predefined scenes between 2,700 and 6,500 K.

_ Long press (> 1 s):
Stepless setting of colour temperature. After reaching the maximum or minimum color temperature, the direction of the color temperature will be inverted.
Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted.
Further information can be found at https://www.tridonic.com/en/int/services/software/software.

_ Sync press:
Dim up/down to the Sync Level (50 %) and remain there, set the dim direction for the next press to "Down" and set the switchDIM Fade Rate to "default".

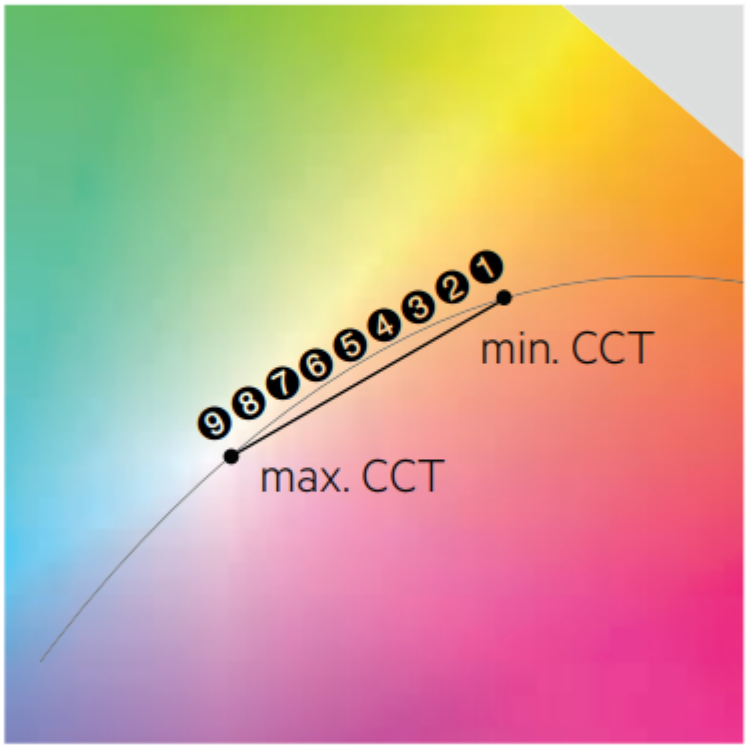
_ Fade press:
Set the switchDIM Fade Rate to "slow" and dimm up to 100 %; dim direction is not changed.

Synchronization

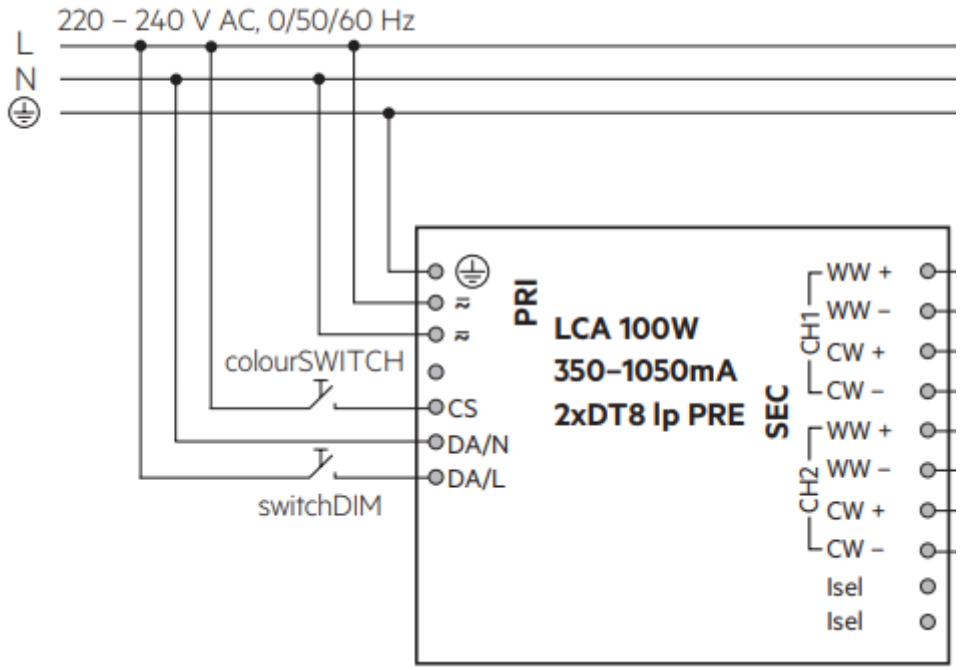
In installations with LED drivers with different colour temperatures or opposite colour temperature directions (e.g. after a system extension), all LED drivers can be synchronized to 4,000 K by pressing the button for 10 seconds.

colourSWITCH

Predefined Scenes



Wiring diagram



colourSWITCH

Short press behaviour

A short press provides the user the possibility to switch between different CCT (correlated color temperature) values, which are stored as special scenes.

_ At each short press the next CCT value (= next scene) shall be set without fading.
_ If the last CCT value (= last scene) is reached the next short press shall continue with the first CCT value (= first scene)
_ CCT value = If there is a MASK in the last scene, it continues with the first scene.

NOTICE

The default starting CCT value shall be the 4th CCT value (= scene 4) in the list (per default 4,000 K).

If at least one long press is in between two short presses, the next short press shall recall the current CCT value instead of continuing with the next CCT value.

There shall be no reaction on short press if the gear is in standby mode (lamp is off).

Long press behaviour

At a long press, the gear shall fade the CCT using the actual colourSWITCH fade rate.
The intensity shall not be changed due to a long press.

_ default direction is from warm (default = 2,700 K) to cool (default = 6,500 K)
_ each long press the direction of colour fading shall toggles
_ after sync press the fade direction shall be always the default direction
_ no reaction on long press if the gear is in standby mode (lamp is off)f

Sync press behaviour

At any sync press of switchDIM or colourSWITCH, the gear will be set to default again on both functions!

_ The CCT value shall be set according to the 4th CCT value (= scene 4)
_ The direction of CCT fading for the next long press is set from warm to cool
_ The colourSWITCH fade rate shall be reset to default
_ switchDIM is set to default (according sync press specification of switchDIM)
_ The colourSWITCH fading time will be set to default (2.5 s)
_ switchDIM is set to default (according to sync press specification of switchDIM)

Fade press behaviour

At any fade press (longer than 20 seconds) of switchDIM or colourSWITCH the colourSWITCH fading time will be set to 5 seconds.
If a fade press or a sync press is executed, these automatically apply to both switchDIM and colourSWITCH.

colourSWITCH

Memory Colour Value

Once the device is in colourSWITCH mode the current CCT value and the currently selected scene number shall be stored at power-down. These settings shall be recalled at the next power-on. For the very first power-on (no Memory CCT) the default settings shall be applied.

Configuration and default settings

colourSWITCH fade rate	Definition
default	ca. 2,5s from 2700K to 6500K and vice versa, longer if CCT range is bigger
slow	ca. 5s from 2700K to 6500K and vice versa, longer if CCT range is bigger

Scene no.	CCT value	Scene no.	CCT value
1	0x0A8C (= 2,700 K)	6	0x1388 (= 5,000 K)
2	0x0BB8 (= 3,000 K)	7	0x157C (= 5,500 K)
3	0x0DAC (= 3,500 K)	8	0x1770 (= 6,000 K)
4 (default)	0x0FA0 (= 4,000 K)	9	0x1964 (= 6,500 K)
5	0x1194 (= 4,500 K)	10	0xFFFF (MASK)

colourSWITCH

4.14.3. colourSWITCH mode

colourSWITCH is not a separate one4all mode but a functional extension to switchDIM mode.

This means:

_ colourSWITCH is only available if switchDIM mode is active (so colourSWITCH is not available in cF mode)

_ A colourSWITCH press may activate switchDIM mode in automatic one4all mode (if one4all conditions are met)

_ colourSWITCH and switchDIM can be used in parallel

_ In corridorFUNCTION mode the default colour of colourSWITCH shall be applied (= scene 4, 4,000 K).

Miscellaneous

_ At start-up always the default CCT direction (from warm to cool) is applied

4.15. proportionSWITCH

4.15.1. Description

proportionSWITCH is an extension of switchDIM. You can call up to 10 predefined intensity levels.

With a short press via a push button on terminal PS, the 10 predefined levels can be called up in succession.
With a long press via a push button on terminal PS, the level is continuously adjusted.
For multi-channel devices, both channels dim in the opposite direction.

A conventional push button can be used to control the system via proportionSWITCH.
Use of push button with indicator lamp is not permitted.

In installations with LED drivers with different dimming level or opposite dimming direction (e.g. after a system extension), all LED drivers can be synchronized to a standard value by a 10 s push.

NOTICE

If the device is controlled via DALI/DSI, proportionSWITCH is not available.

4.15.2. proportionSWITCH use cases

_ For proportionSWITCH use cases a tunable white device and the use of colourSWITCH is proposed.
Theoretically it is also possible with static white LED driver and proportionSWITCH as well but the color and dim performance is very limited

_ Static LED driver with DT6 and possibility to individually dim direct and indirect light

For control via push button, different settings can be made:

_ Short press:
Setting of 5 pre-defined light levels (variable for each channel for direct and indirect applications).
A maximum of 10 scenes can be programmed.

_ Long press (> 1 s):
Stepless setting of dimming level. Both channels running in opposite direction
After completion, the dimming direction of both channels will be inverted.
Values can be changed via masterCONFIGURATOR.

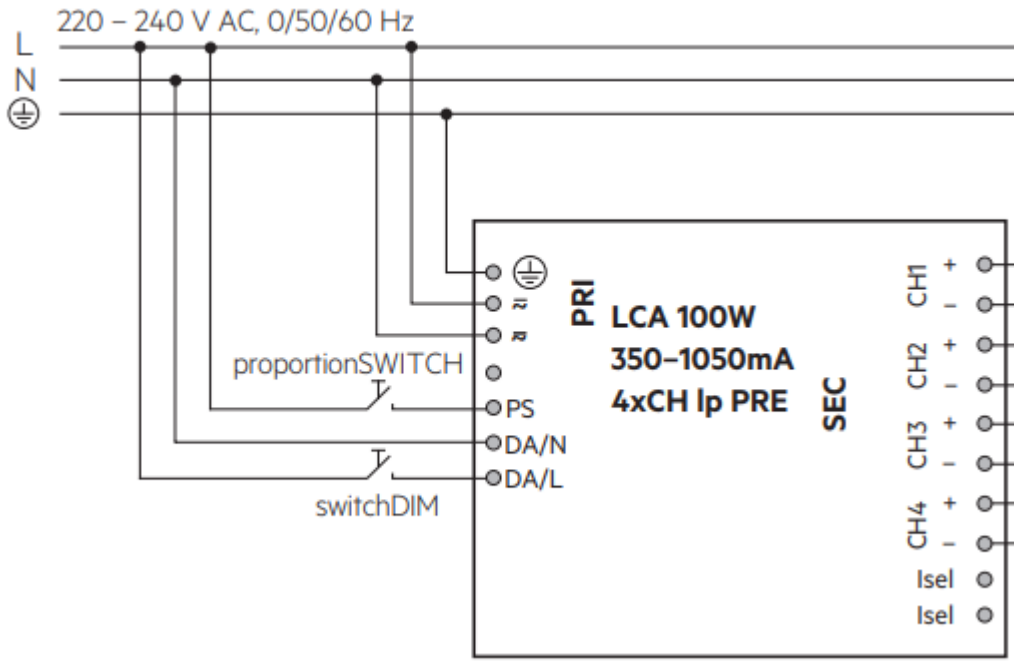
_ Sync press:
Dim up/down to the Sync Level (50 %) and remain there, set the dim direction for the next press to "Down" and set the switchDIM Fade Rate to "default".

_ Fade press:
Set the switchDIM Fade Rate to "slow" and dimm up to 100 %; dim direction is not changed.

proportionSWITCH

In installations with LED drivers with different dimming level or opposite dimming direction (e.g. after a system extension), all LED drivers can be synchronized to a standard value by a 10 seconds push.

Wiring diagram



Short press behaviour

A short press provides the user the possibility to switch between different dim levels per channel (= ratio per pair).

_ With each short press the next level shall be set without fading

_ If the last level is reached, the next short press shall continue with the first level

_ The default starting level shall be the third level in the row (per default 50 % / 50 %)

Since the two channels of a pair shall not be independent, the following applies for dim level = MASK:

_ One channel: “no change” (e.g. 50 % / MASK)

_ Both channels: MASK means “skip” (e.g. MASK / MASK).

_ If there is a MASK in the last scene, it continues with the first scene.

If at least one long press is in between two short presses, the next short press shall recall the current CCT value instead of continuing with the next CCT value.

NOTICE

Short press works similar to a DALI Goto Scene command for each channel.

proportionSWITCH

If the gear is in standby mode, lamps might be switched on with a short press.

Long press behaviour

_ With a long press, the gear shall fade both channels up or down

_ Both directions use the switchDIM fade rate

_ The fading direction of each channel will toggle

_ The default direction shall be upwards for 4 channel device channel 1 + 3 (= logical unit 1) and downwards for channel 2 + 4 (= logical unit 2)

_ With a sync press the fade direction shall be always the default direction

If the gear is in standby mode, lamps shall be switched on with a long press using the default direction; this means: Channel 1 and 3 (on 4 channel devices) dims up to 100% and channel 2 and 4 (on 4 channel devices) stays at Physical Minimum Level (PHM)

_ Once one channel reaches its physical minimum or maximum level at a long press the corresponding channel stops dimming.

_ The other channel will continue dimming if the minimum or maximum isn't reached at the same time

Sync press behaviour:

_ With a sync press of switchDIM or proportionSWITCH, the gear shall be set to default again

_ The dim level (ratio) setting shall be set to the third level for the next short press

_ The dimming fade rate is set to default (2.5 seconds)

_ The direction of dim level fading for the next long press shall be upwards for channel 1 + 3 (on 4 channel devices) and downwards for channel 2 + 4 (on 4 channel devices)

_ switchDIM fade rate shall be set to default

_ The dim level after a sync press is 50 % for both channels, according to the switchDIM specification

_ A sync press of proportionSWITCH shall synchronize switchDIM as well switchDIM.

Fade press behaviour

At any fade press of switchDIM or proportionSWITCH the switchDIM fading time shall be set to fast (5 seconds).
Likewise the fade press and also a sync press shall be applied to both switchDIM and proportionSWITCH.

Memory level

Once the device is in proportionSWITCH mode, the current dim level and the currently selected ratio shall be stored at power-down. These settings shall be recalled at the next power-on.

For the very first power-on (no memory dim level), the default settings shall be applied.

Configuration and default settings

switchDIM fade rate	Definition
default	2 DSI steps per mains period (= ca. 2.5 s from 1 % to 100 % and vice versa)

proportionSWITCH

slow	1 DSI steps per mains period (= ca. 5 s from 1 % to 100 % and vice versa)

Level no.	Level CH1	Level CH2	Level no.	Level CH1	Level CH2
1	254 (100 %)	PHM*	6	255 (MASK)	255 (MASK)
2	241 (70 %)	210 (30 %)	7	255 (MASK)	255 (MASK)
3 (default)	229 (50 %)	229 (50 %)	8	255 (MASK)	255 (MASK)
4	210 (30 %)	241 (70 %)	9	255 (MASK)	255 (MASK)
5	PHM*	254 (100 %)	10	255 (MASK)	255 (MASK)

* PHM (physical minimum level)

4.15.3. proportionSWITCH Mode

proportionSWITCH is not a separate one4all mode, but a functional extension to switchDIM mode.
This means:

- proportionSWITCH is only functional if switchDIM mode is active (so proportionSWITCH is not functional in corridor mode)
- A proportionSWITCH press may activate switchDIM mode in automatic one4all mode (if one4all conditions are met)
- If proportionSWITCH and switchDIM are pressed in parallel switchDIM has priority (proportionSWITCH not functional)

4.15.4. proportionSWITCH programming

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

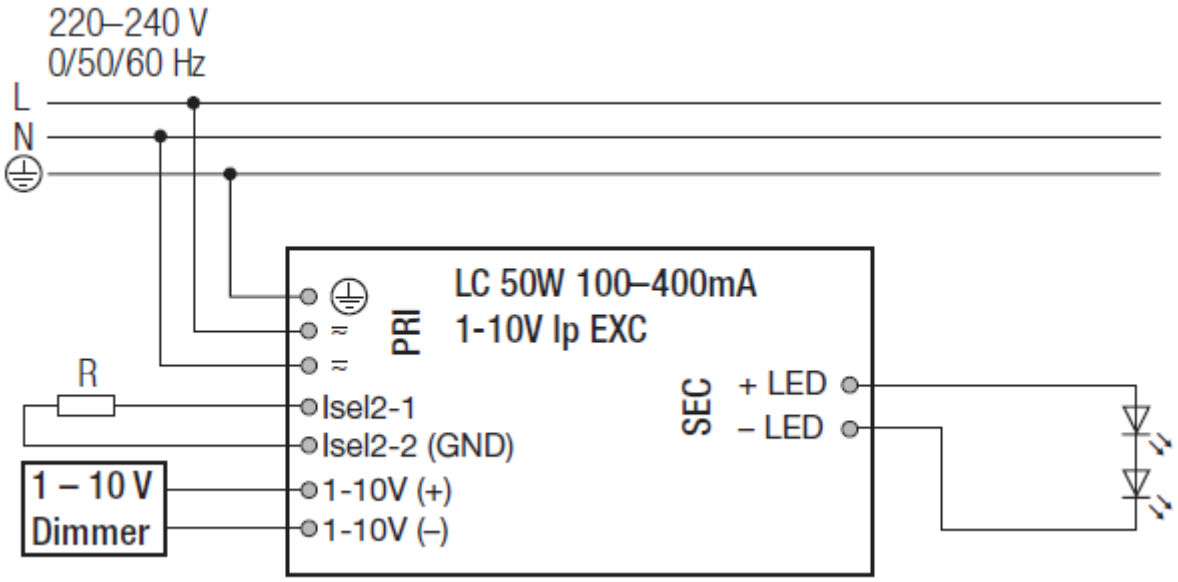
0-10 V and 1-10 V interface

4.16. 0-10 V and 1-10 V interface

4.16.1. Description

A corresponding analogue dimmer can be connected via the control input of the device. This allows the output current to be reduced, which reduces the light level.
The minimum achievable dimming level and a possible standby depends on the respective device

4.16.2. Wiring diagram



fade2zero

4.17. fade2zero

With fade2zero you can set whether or not the LED driver uses a fade time when switching off from the minimum value.

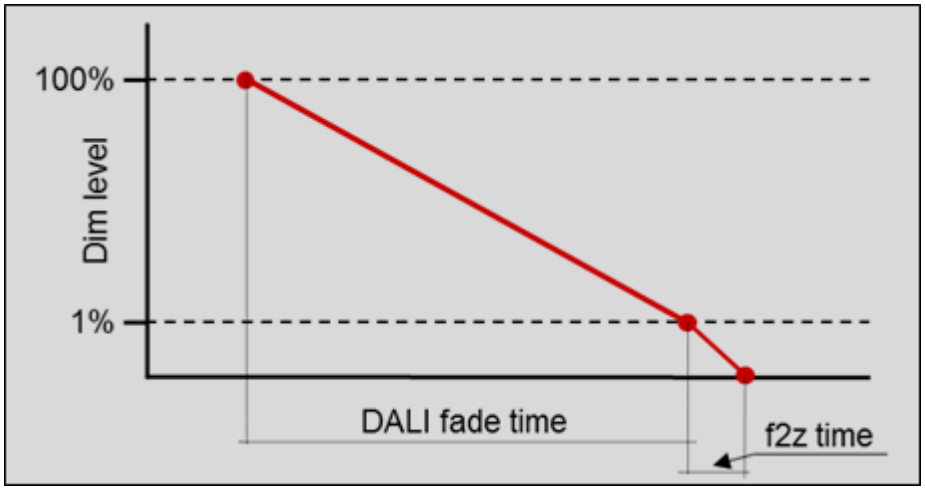
fade2zero allows a smooth fading down to almost zero when switching off the LED driver (with DALI command)

_ The LED driver fades down far below the lower limits of its operating window and dimming range

_ fade2zero will only work when the minimum dimming level of the LED driver is the default value

_ to enable this functionality the fade2zero feature has to be activated during LED driver programming and a DALI fade time has to be set

fade2zero duration = 0.5 x DALI fade time (maximum value: 3 seconds)



IVG+ (Intelligent Voltage Guard Plus)

4.18. IVG+ (Intelligent Voltage Guard Plus)

4.18.1. Description

In some cases mains voltage is not stabilized and has some voltage peaks which are lower or higher than the nominal voltage range.
Between 192 V and 80 V input voltage, the LED driver operates in undervoltage mode and dims the secondary side linearly down to 10 %.
Below 80 V input voltage, the LED driver shuts down, restarts at 90 V (without a reset) and dims linearly up back to 100 %.
Above 280 V input voltage, the LED driver shuts down. If input voltage drops below 270 V, the LED driver restarts (without a reset).

WARNING!

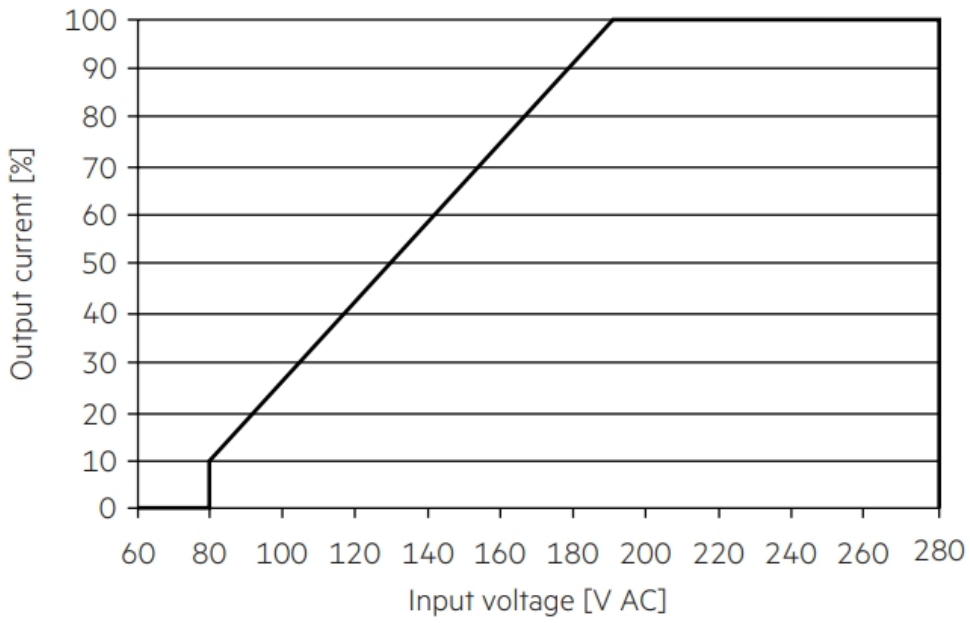
If the LED driver is operated on voltages higher >280 V it will turn off automatically. This is a safety feature only in streetlight applications.

NOTICE

IVG+ has a higher priority than inputDIM.

NOTICE

If overvoltage is detected, the connected sensors are ignored.



IVG+ (Intelligent Voltage Guard Plus)

4.18.2. Commissioning

Activating the IVG+ function

The IVG+ function is activated by default.

Deactivating the IVG+ function

Via Tridonic-specific software this function can be deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.19. inputDIM

4.19.1. Description

inputDIM enables dimming with the variation of mains voltage between 170 and 250 V AC. The max. / min. dimming level can be set via appropriate software.
The associated voltage for the max. / min. dimming level can be set individually within the voltage range stated above.

The input voltage regulation IVG Plus has higher priority than inputDIM. If the min. dimming level set by the inputDIM function is higher than the max. allowed dimming level of IVG Plus, the value of IVG Plus has priority.

The intensity of the LED can be set depending on the level of the input voltage via two adjustable values. Linear interpolation takes place between the two values.

inputDIM

4.19.2. Parameter

Parameter	Default value	Description	Min value	Max value
Minimum level	30 %	Defines the minimum dimming value of the LED.	10 %	85 %
Minimum voltage	180 V	Defines the input voltage for the minimum dimming value of the LED.	170 V	Maximum voltage - 20 V
Maximum level	100 %	Defines the maximum dimming value of the LED.	30 %	100 %
Maximum voltage	220 V	Defines the input voltage for the maximum dimming value of the LED.	196 V ≤ Maximum voltage + 20 V	250 V

4.19.3. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

ETM (External temperature management)

4.20. ETM (External temperature management)

4.20.1. Description

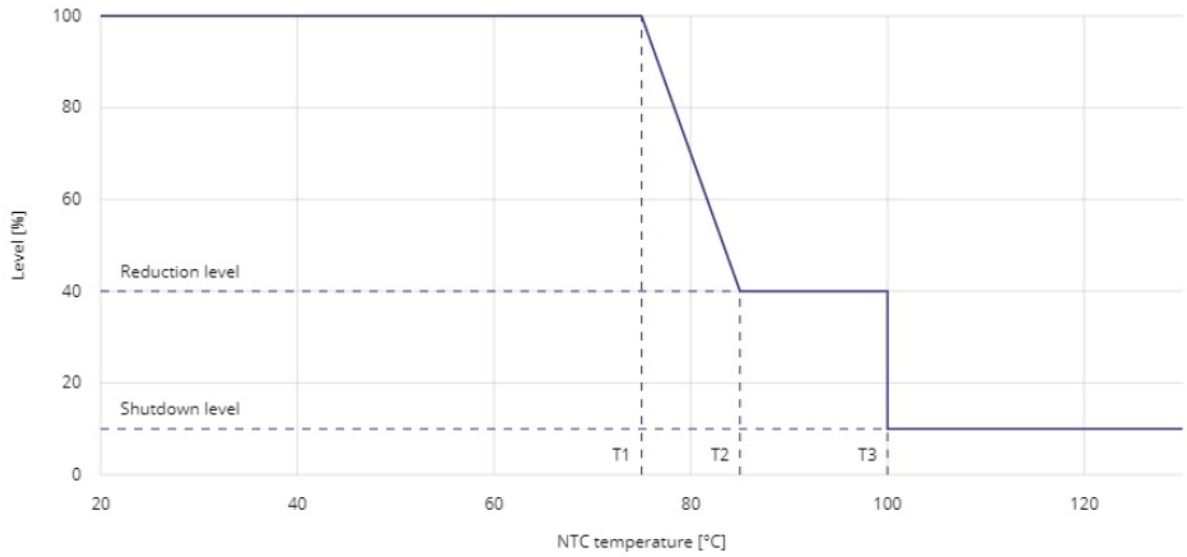
ETM protects the LED module against thermal overstress.
An external temperature sensor (NTC) detects the LED module temperature and the LED driver will limit the output current according to this temperature:

If the temperature is between the limits T1 (normal condition) and T2 (overload), the LED output current will be decreased.
If the temperature exceeds the limit T3 (critical temperature), the device will switch to the shutdown level.
The shutdown level will be active until the module temperature decreases below T1 or until the LED driver is restarted (switch off or mains reset).

> **NOTICE**
>
> The LED module's temperature is only measured if the output is active (lamp is on).

The allowed NTC resistor value is between 0 to 2 Megaohm. By default there are three predefined values that can be set via programming software.

The temperature sensor (NTC) is defined by two parameters, the resistance value at 25 °C (R25) and the sensor constant (BETA).



ETM (External temperature management)

4.20.2. Parameter

Parameter	Default value	Description	Min value	Max value
External temperature management	OFF	Via this checkbox the function can be activated or deactivated	OFF	ON
Lower temperature limit T1	75 °C	Temperature at which the power reduction starts	50 °C	T2 - 10 °C
Upper temperature limit T2	85 °C	Temperature where the power reduction stops at the reduction level	T1 + 10 °C	T3 - 10 °C
Critical temperature T3	100 °C	Critical temperature at which the device switches to the shutdown level	T2 + 10 °C	Device dependent (maximum 127 °C)
Reduction level	40 %	Level up to which the power is reduced	10 %	100 %
Shutdown level	10 %	Level to be switched to, when reaching the critical temperature T3	Physical minimum	Reduction level (maximum 30 %)
Select NTC sensor	–	Here, predefined NTC types can be selected or user defined values can be entered. The sensor constant (BETA) and the resistance at 25 °C (R25) can be precisely defined.	-	NCP 18XH103J NCP 18XW153J NCP 18XW223J User defined
Sensor constant (BETA)	0 K	This constant is needed to convert the NTC resistance value to a temperature value, displayed in Kelvin.	0 K	4,890 K
Resistance at 25 °C (R25)	0 ohm	Resistance value of the NTC sensor at 25 °C	0 ohm	470,000 ohm

4.20.3. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.21. chronoSTEP

4.21.1. Description

In the outdoor lighting and street lighting sector, it often makes sense to dim the lighting level during night hours in order to save energy. chronoSTEP is a feature that makes this easy to do.

The device automatically measures the power-on time of the lighting installation over the past three days. The switch-on time is typically the time between sunset and sunrise. The midpoint of the on-time is taken as Virtual Midnight. To allow immediate operation it is possible to set the Virtual Midnight time via the programming Interfaces (NFC, DALI, U6Me2).

Nights with an on-time of less than 4 hours are ignored and not included in the calculation.

Calculation example with 3 nights

With measured values for night 1: <4 hours, night 2: 4 hours, night 3: 5 hours, the following calculation results:

- Night 1 is ignored because the on-time is less than 4 hours
- An average duty cycle of 4.5 hours is calculated from night 2 and night 3: 4 hours + 5 hours / 2
- From this, the virtual midnight is calculated as 4.5 hours / 2 = 2.25 hours

⚠ CAUTION!

The device measures the on-time as the time during which mains voltage is present.
In case of a power failures, the result is falsified. The device cannot distinguish whether a power failure is only temporary or lasting several hours and wrongly interprets a power failure as the beginning of a new night.

Example:

- If there is a power failure after 3 hours of a 6-hour night, this is interpreted as two nights of 3 hours each and therefore the whole night is completely ignored
- If there is a power failure after 4 hours during a 6-hour night, this is interpreted as two nights with 4 hours and 2 hours. The "first" night is evaluated with a value that is too short, the "second" night is incorrectly ignored

ⓘ NOTICE

If the night is actually shorter than 4 hours, for example during the summer in very northern regions, no virtual midnight can be calculated from this.

Overall there are 7 sequences, 4 are defined by the factory, and 3 can be programmed by the customer using DALI Memory Bank 6 or NFC or U6Me2 or R2M. A sequence consists of 8 times and 8 levels and allows various profiles to be realized.

4.21.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.22. U6Me2

4.22.1. Description

U6Me2 is the communication type to activate and adapt the chronoSTEP function in the device using mains voltage switch-on and switch-off commands.

A detailed U6Me2 programming instruction is available on request. Contact Tridonic technical support!

Surge Burst protection

4.23. Surge Burst protection

4.23.1. Description

In the case of protection against overvoltage, it is decisive between which connections the overvoltage occurs. Lightning strikes cause an overvoltage between the live power lines and the ground. LED drivers from Tridonic offer a protection of 10 kV and meet protection classes I and II according to standard IEC 61000-4-5.

Depending on the application, LED drivers require different levels of overvoltage protection. The highest requirements apply to outdoor applications, lower ones to industrial applications and indoor applications.

This better protection has clear advantages:

_ Fewer luminaires must be serviced or replaced

_ Therefore, maintenance costs are lower

In indoor applications such high overvoltages do normally not occur. A lower overvoltage resistance is therefore sufficient.

Depending on the device topology, LED drivers protect the connected LED modules by not fully transferring mains overvoltages to the output.

Bursts

According to Standard IEC 61547 Ed. 2.0 (2009) tests are conducted according to IEC 61000-4-4.
Fast transients with positive and negative polarity are applied to the device for a minimum of 2 minutes each.

Surges

Tests are conducted according to IEC 61000-4-5. Pulses shall be applied to the a.c. voltage wave as follows:

_ five positive polarity pulses at the 90° phase angle

_ five negative polarity pulses at the 270° phase angle

Two test levels are given for different types of lighting equipment.

Surge Burst protection

Further information about Surge Burst protection can be found in the data sheet.

D4i / lumDATA / DiiA DALI parts

4.24. D4i / lumDATA / DiiA DALI parts

4.24.1. Description

D4i

D4i is the DALI standard for intelligent, IoT-ready luminaires.

D4i is an extension of the DALI-2 certification program. D4i LED drivers have a mandatory set of features related to power-supply requirements and smart-data capabilities.

Details can be found at https://www.dali-alliance.org/d4i/

lumDATA

lumDATA supplements the DALI-2 and D4i standards with a pragmatic intermediate solution for smart buildings and IoT concepts.

lumDATA includes at least the mandatory DALI specifications of Parts 251, 252 and 253 that enable essential lighting, energy and diagnostic data to be stored and shared.

DiiA DALI parts

DALI Part 150 – AUX Power Supply

An AUX supply as specified in this standard provides 24 V DC to power e.g. a controller, an occupancy sensor, a photo sensor or other device. An AUX supply can eliminate the need for an AC/DC supply and the associated need for surge suppression and an EMI filter in such applications.

DALI Part 250 – Integrated Bus Power Supply (Device Type 49)

This standard specifies the characteristics of a DALI bus power supply integrated in an LED driver. This standard builds on the Digital Addressable Lighting Interface as specified in the IEC62386 series of standards, by adding specific requirements to enable powering of an external device and addressing data exchange.

DALI Part 251 – Memory Bank 1 Extension (Device Type 50)

This standard specifies an extension to memory bank 1 to enable asset management functionality. This standard builds on the Digital Addressable Lighting Interface as specified in the IEC62386 series of standards.

DALI Part 252 – Energy Reporting (Device Type 51)

This standard specifies the information related to energy reporting accessible through memory banks in LED drivers. This standard builds on the Digital Addressable Lighting Interface as specified in the IEC62386 series of standards, by adding specific requirements to address data exchange.

DALI Part 253 – Diagnostics & Maintenance (Device Type 52)

This standard specifies the information related to diagnostics and maintenance information accessible through memory banks. This standard builds on the Digital Addressable Lighting Interface as specified in the IEC62386 series of standards, by adding specific requirements to address data exchange. The information given for light source in this standard is LED light source specific.

4.24.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

4.25. NFC

4.25.1. Description

The NFC Interface allows wireless communication with the LED driver. This interface offers the option to write configuration and to read configuration, errors and events with Tridonic-specific software.
A correct communication between the LED driver and the NFC antenna can only be guaranteed if the antenna is placed directly on the LED driver.
Any material placed between the LED driver and the NFC antenna can cause a deterioration of the communication quality.
Programming via NFC should only be performed with mains off.

Depending on the NFC tag used, after programming the device with NFC switch on the device once for one second so that the parameters are written to the internal memory and can be read out correctly.

We recommend the use of following NFC antenna: www.tridonic.com/nfc-readers.

NFC is complied with ISO/IEC 15963 standard.

4.25.2. Commissioning

Via Tridonic-specific software this function can be activated/deactivated and the individual values can be adjusted. Further information can be found at https://www.tridonic.com/en/int/services/software/software.

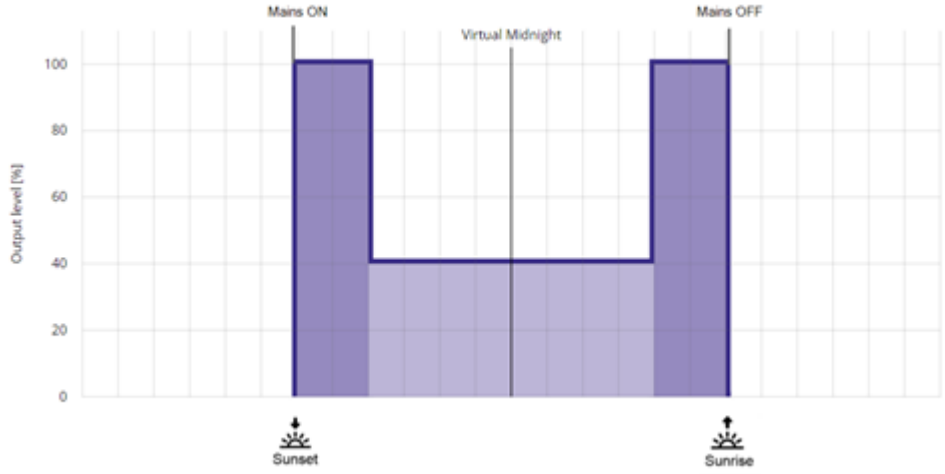
4.26. sensorMODE

4.26.1. Description

The sensorMODE combines the chronoSTEP and corridorFUNCTION functions and expands it with the option of controlling the LED driver via a DALI input device instead of via the mains.
There are 5 different control modes supported by the sensorMODE function.

Mode 0: Disabled (Operating Mode chronoSTEP)

In this mode the LED driver uses the standard chronoSTEP function which is started by switching the mains on/off.
Please find more information here on how to program the chronoSTEP function.

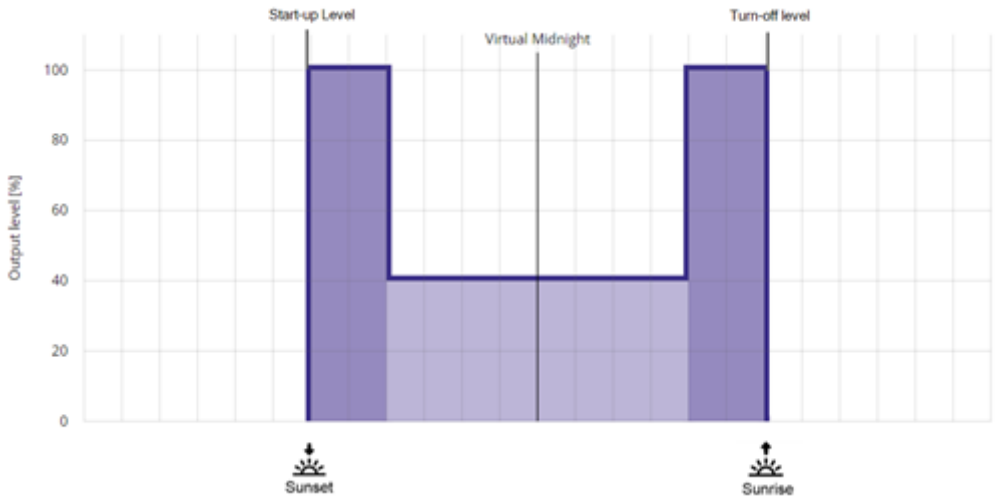


sensorMODE

Mode 1: Ambient light control

In this mode the light sensor of a connected DALI sensor is used to start/stop the chronoSTEP function.
The chronoSTEP function is started when the measured light value falls below the defined start-up level and turned off as soon as the measured value exceeds the defined turn-off level.

Parameter	Default value	Description	Min value	Max value
Switch-on level	50 lx	Defines at which light level the chronoSTEP function should be started.	0 lx	1,000 lx
Switch-off level	200 lx	Defines at which level the chronoSTEP function should be stopped.	0 lx	5,000 lx
Fade-out time	30 s	Time needed to reach the absence value.	0 s	160 min
Midnight shift	0	To shift the virtual midnight, a location with longitude and latitude can be entered as an alternative to manual input.	-2 h 7 min	+2 h 7min

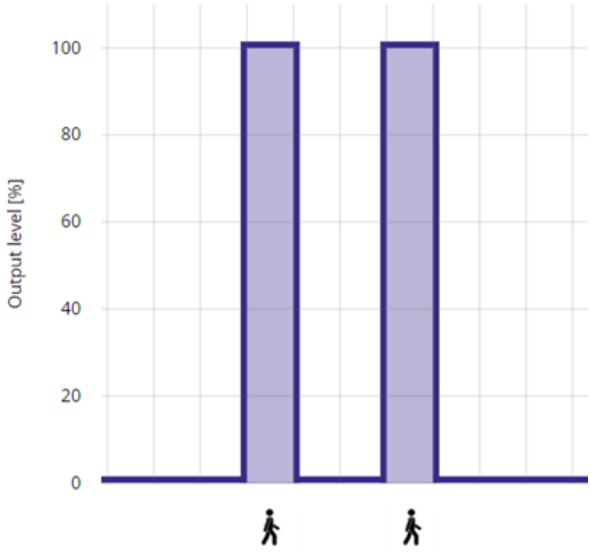


sensorMODE

Mode 2: Motion control

This mode triggers the well known corridorFUNCTION by a connected DALI motion sensor instead of a mains switch.

Parameter	Default value	Description	Min value	Max value
Presence level	100 %	Brightness value the luminaire occupies as soon as a movement /presence has been detected.	0 %	100 %
Absence level	10 %	Brightness value that the luminaire occupies while the switch-off delay is running.	0 %	100 %
Fade-in time	0 s	Time required to reach the presence level.	0 s	160 min
Run-on time	0 s	Time that begins to run from the last moment that presence was detected in the room. After the run-on time the fade-out transition is started. If another presence is detected in the room during run-on time, the run-on time is started again.	0 s	42 min 30 s
Fade-out time	30 s	Time needed to reach the absence value.	0 s	160 min
Switch-off delay	Never off	Time in which the absence value is held. After expiration, it is either switched off or the absence value is held (Never off).	0 s	42 min 20 s Never off

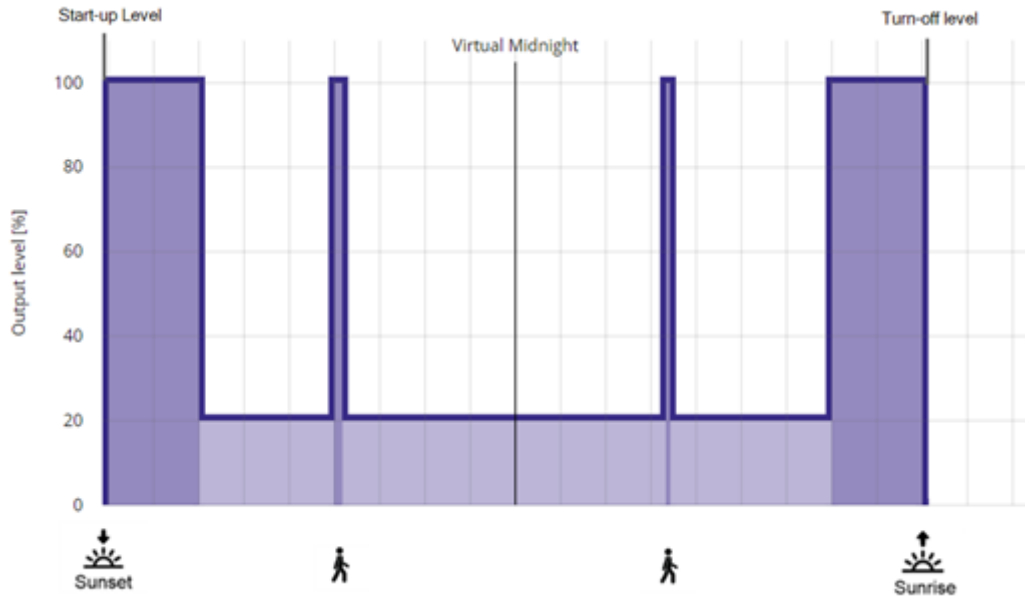


Mode 3: Ambient light with motion control

This mode combines the function ambient light control and motion control.
The chronoSTEP function is activated by the ambient light level but it can be temporarily overwritten by the motion sensor if motion is detected.

Parameter	Default value	Description	Min value	Max value
Switch-on level	50 lx	Defines at which light level the chronoSTEP function should be started.	0 lx	1,000 lx
Switch-off level	200 lx	Defines at which level the chronoSTEP function should be stopped.	0 lx	5,000 lx
Presence level	100 %	Brightness value the luminaire occupies as soon as a movement/presence has been detected.	0 %	100 %
Fade-in time	0 s	Time required to reach the presence value.	0 s	160 min
Run-on time	0 s	Time that begins to run from the last moment that presence was detected in the room. After the run-on time the transition is started. If another presence is detected in the room during run-on time, the run-on time is started again. ⚠ CAUTION! Please note that the LED driver has an internal 1 minute time out before the chronoSTEP function takes over again. That means if you want to have a run-on time of 5 min you have to program 4 min run-on time (4 min run-on time + 1 min time out).	0 s	42 min 30 s
Fade-out time	30 s	Time needed to reach the absence value.	0 s	160 min
Midnight shift	0	To shift the virtual midnight, a location with longitude and latitude can be entered as an alternative to manual input.	-2 h 7 min	+2 h 7min

sensorMODE


Start-up Level
Turn-off level
Virtual Midnight
100
80
60
40
20
0
Output level [%]
Sunset
Sunrise

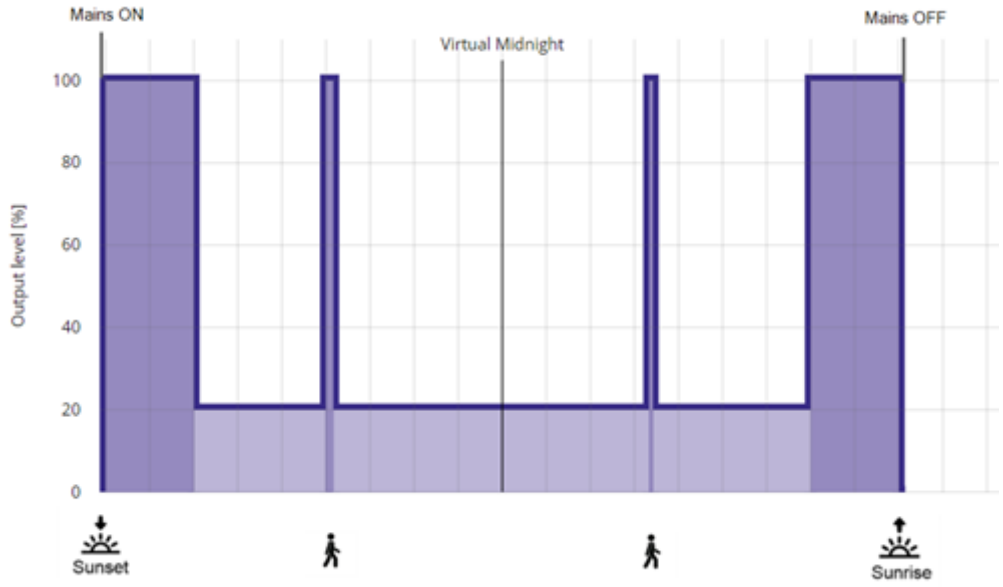
sensorMODE

Mode 4: Mains with motion control

In this mode the chronoSTEP function is controlled by switching the mains, but it can be temporarily overwritten by the motion sensor if motion is detected.

Parameter	Default value	Description	Min value	Max value
Presence level	100 %	Brightness value the luminaire occupies as soon as a movement/presence has been detected.	0 %	100 %
Fade-in time	0 s	Time required to reach the presence value.	0 s	160 min
Run-on time	0 s	Time that begins to run from the last moment that presence was detected in the room. After the run-on time the transition is started. If another presence is detected in the room during run-on time, the run-on time is started again. ⚠ CAUTION! Please note that the LED driver has an internal 1 minute time out before the chronoSTEP function takes over again. That means if you want to have a run-on time of 5 min you have to program 4 min run-on time (4 min run-on time + 1 min time out).	0 s	42 min 30 s
Fade-out time	30 s	Time needed to reach the absence value.	0 s	160 min
Midnight shift	0	To shift the virtual midnight, a location with longitude and latitude can be entered as an alternative to manual input.	-2 h 7 min	+2 h 7min

sensorMODE



Failure handling

In case the LED driver does not receive any events from DALI inputs for at least 5 minutes, the DALI system failure level will be set.

In configuration mode 0 (mains only), the gear will not react to DALI input devices and therefore no failure level will be activated, whereas in configuration mode 3 (light and occupancy control) a periodical event is expected from both input devices.

NOTICE

Possible reasons for missing DALI events from connected sensors:

_ Invalid configuration of DALI sensor or gear

_ Defect of a DALI sensor

_ Problems in wiring

_ Disabled / no DALI power supply