

Table of Contents

Scope of documentation	4
Validity	4
Copyright	4
Imprint	4
Safety instructions	5
Intended use	5
Dangers associated with the operation of the system	5
Environment	5
Additional instructions	6
Introduction	7
About the device	7
Testing of emergency systems	7
Portfolio of products	8
Housing	8
Forward voltage	8
DALI functionality	9
DALI standard	9
DALI in Action	9
Commissioning	10
Functions in mains operation	11
Functions in emergency operation	12
Overview	12
Adjustable output current	13
Intelligent multilevel charging system	14
Rest mode, Inhibit mode and Relight command	16
Prolong time	19
Indicator LED	20
Settings for emergency tests	22
Time intervals between emergency tests	22
Type of test system: DALI-controlled or selftest mode	23
Adaptive test mode	23
Functionality of the test switch	24
A typical installation	26
Initial startup	26
Installation without a control system	26

Table of Contents

Determining light output in emergency operation 28

Parameter 1: LED forward voltage	28
Parameter 2: LED current	31
Parameter 3: Light output in emergency operation	36

Compatibility with LED module and the LED Driver 37

Compatibility with LED module	37
Compatibility with LED Driver	37
Practical tests	37

Installation notes 39

Safety information	39
Routing the wires	40

Reference list 42

Related documents	42
Downloads	42
Additional information	42

Scope of documentation

1.1. Validity

This operating instruction is valid for combined LED Drivers for general and emergency lighting from the EM converterLED PRO series.

The series comprises additional versions. However, the other versions EM converterLED ST FX and EM converterLED BASIC are not covered within this documentation.

TRIDONIC GmbH & Co KG is constantly striving to improve all its products. This means that there may be changes in shape, features and technology.

Claims cannot therefore be made on the basis of information, diagrams or descriptions in these instructions.

The latest version of these operating instructions is available on our home page at

<http://www.tridonic.com/com/en/operating-instructions.asp>

1.2. Copyright

This documentation may not be changed, expanded, copied or passed to third parties without the prior written agreement of TRIDONIC GmbH & Co KG.

We are always open to comments, corrections and requests.

Please send them to info@tridonic.com

1.3. Imprint

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Safety instructions

The instructions in this section have been compiled to ensure that operators and users of the emergency lighting LED Drivers of the EM converterLED PRO series 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.

2.1. Intended use

2.1.1. Proper use

Operation of LED modules in single battery supplied emergency lighting. The device may only be used for this intended purpose.

2.1.2. Improper use

Outdoor use. 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.

2.2. 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!

2.3. Environment

DANGER!

Not to be used in corrosive or explosive environments.

CAUTION!

Risk of damage caused by humidity and condensation

- _ Only use the LED Driver in dry rooms and protect it against humidity!
- _ Prior to commissioning the system, wait until the LED Driver is at room temperature and completely dry!

Safety instructions

2.4. 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!

Portfolio of products

4.1. Housing

The EM converterLED PRO is available in a low profile housing (21mm).

Image	Description
	<p>Housing variant low profile</p> <ul style="list-style-type: none">_ Compact shape_ For installations inside the luminaire_ Typical area of application: Spotlights, downlights_ Dimensions: 179 × 30 × 21 mm

4.2. Forward voltage

The EM converterLED PRO is available with three different forward voltages: 10-52 V, 40-97 V, 50-200 V

DALI functionality

5.1. DALI standard

i NOTICE

EM powerLED PRO devices support the new DALI standard V2 EN 62386-101, EN 62386-102, EN 62386-202.

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

The DALI standard was developed by Tridonic together with renowned manufacturers of operating and control equipment. Today, these manufacturers belong to the DALI Activity Group which promotes the use and further development of DALI.

The DALI standard is defined in IEC 62386. A test procedure standardised by the DALI Activity Group 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 Activity Group DALI 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 and the integration of centrally controlled and monitored emergency lighting.

5.2. DALI in Action

DALI offers a lot of possibilities:

- _ Addressability: All control gear are individually addressable
- _ DALI line: 64 control gear can be grouped to a line
- _ DALI groups: Every control gear can be attributed to 16 groups
- _ Grouping: Possible without complicated rewiring
- _ Programmability: Individual programmability makes it possible to use functions which transcend the DALI standard
- _ Monitoring by status feedback on the DALI bus
- _ Wiring: Simple wiring with five pole standard cables and a cable length of max. 300 meters
- _ Wiring: Polarity-free control lines for mains and control lines
- _ Wiring: Multiple wiring possibilities (star, series and mixed wiring)
- _ Unaffected by interruptions: All luminaires receive the same, unaffected digital signal and dimming level

DALI functionality

- _ Similar light level from first to last luminaire

Technical data of a DALI line:

- _ DALI voltage: 9.5 V - 22.5 VDC
- _ DALI current supply: max. 250 mA
- _ Data transfer rate: 1200 Baud
- _ Maximum line length: up to 300 m (for 1,5 mm²)

5.3. Commissioning

Further information can be found in the DALI Handbook (see [Reference list](#), S. 42).

eD ("enhanced DALI") offers extended DALI commands. They can be used to activate specific commands of the control gear. These commands are Tridonic specific. They are not part of the DALI standard and are not publicly available.

Functions in mains operation










Overview of the main functions in mains operation:

Area	Function	
DALI functionality, S. 9	DALI standard	Version 1
	Device type	DT1
	DALI address	Single DALI address for emergency operation
Functions and performance	Standby losses	< 0.2 W
	Rated supply voltage	220 - 240 V

Functions in emergency operation

7.1. Overview

Overview of the main functions in emergency operation:

Area	Function	
DALI emergency functionality	DALI V1 DT1	
Test function, S. 22	Automatic function and duration test	Centralized test activation via DALI
	Function test (interval)	Adjustable via DALI
	Duration test (interval)	Adjustable via DALI
Rated duration	Adjustable to 1, 2 or 3 hours ⁽¹⁾	
	Adjustable on the device via jumper	
Status display	Via two-colour indicator LED, S. 20	
Battery charge system	Intelligent multilevel charging system, S. 14	
	Intermittent charging (pulse charging) for NiMH batteries	
Adjustable output current, S. 13	Automatic adjustment by device	
DALI addressing and identification	Addressing function EZ easy addressing, S.	
Commissioning	Automatic	
Rest mode, Inhibit mode and Relight command, S. 16	Activation	Via DALI
Prolong time, S. 19	Adjustable in 30-second steps to a maximum of 127.5 minutes	Via DALI

⁽¹⁾ Special case: 2-hours rated duration

The first duration test will take 120 minutes, following duration tests are rated with 90 minutes. If the battery is disconnected or replaced, the next duration test will again be rated with 120 minutes.

Functions in emergency operation

7.2. Adjustable output current

7.2.1. Description

If the EM converterLED PRO switches to emergency operation in case of a power failure, the device will detect the forward voltage of the connected LED modules and set the correct LED current. Setting a constant output power ensures maximum light output in emergency mode for the specified operating time.

An EM converterLED PRO with 3 or 4 watts output power operates the connected LED modules with said output power. For this purpose, the device detects the connected LED forward voltage, and adjusts the LED forward current to the appropriate value, resulting in an output power of 3 or 4 watts.

i NOTICE

At the lowest range of permissible forward voltage, the efficiency may be slightly lower. In this case the output power is also slightly lower.

7.2.2. Calculation

Formel: $P = U * I$

P	=	U	*	I
Emergency output power: Given by the EM converterLED PRO type		LED forward voltage: Detected by the EM converterLED PRO		LED forward current: Automatically adjusted by the EM converterLED PRO

Example

Given:

- _ LED forward voltage: 45 V (chosen as an example)
- _ LED forward current (at 45 V): 60 mA (taken from diagram EM converterLED PRO 103)

Wanted:

- _ Emergency output power?

Result:

- _ Emergency output power:
 $P = U * I = 45 \text{ V} * 60 \text{ mA} = 2.7 \text{ W}$

Different battery cell numbers offer flexibility in the available emergency output power - 3, 4 and 5 cells for LED modules from 10 V to 200 V forward voltage.

The LED current in emergency mode is automatically adjusted by the EM converterLED PRO based on the total forward voltage of the LED modules connected and the associated battery.

Functions in emergency operation

Control gear	Forward voltage range	SELV	Number of battery cells
EM converterLED PRO 103 50V	10-52 V	SELV < 60 V	3 cells for light output in emergency operation
EM converterLED PRO 103 NiMH 50V	10-52 V	SELV < 60 V	3 cells for light output in emergency operation
EM converterLED PRO 104 50V	10-52 V	SELV < 60 V	4 cells for light output in emergency operation
EM converterLED PRO 104 NiMH 50V	10-52 V	SELV < 60 V	4 cells for light output in emergency operation
EM converterLED PRO 134 NiCd 50V	10-52 V	SELV < 60 V	4 cells for light output in emergency operation
EM converterLED PRO 104 90V	40-97 V	SELV < 120 V	4 cells for light output in emergency operation
EM converterLED PRO 104 NiMH 90V	40-97 V	SELV < 120 V	4 cells for light output in emergency operation
EM converterLED PRO 105 90V	40-97 V	SELV < 120 V	5 cells for light output in emergency operation
EM converterLED PRO 105 NiMH 90V	40-97 V	SELV < 120 V	5 cells for light output in emergency operation
EM converterLED PRO 135 NiCd 90V	40-97 V	SELV < 120 V	5 cells for light output in emergency operation
EM converterLED PRO 104 50V	50-200 V	no	4 cells for light output in emergency operation
EM converterLED PRO 104 NiMH 50V	50-200 V	no	4 cells for light output in emergency operation
EM converterLED PRO 105 50V	50-200 V	no	5 cells for light output in emergency operation
EM converterLED PRO 105 NiMH 50V	50-200 V	no	5 cells for light output in emergency operation

i NOTICE

There is a separate chapter that describes how the light output in emergency operation can be determined (see chapter [Determining light output in emergency operation](#), S. 28).

7.3. Intelligent multilevel charging system

The multilevel charging system is used for minimising charging times while maximising battery life. During normal functional mains operation the module charges the batteries using a specially developed charging algorithm.

- _ Initial charge mode:
20 hours of high charging current at the start to prepare the new battery cells and fully charge them.
- _ Trickle charge mode:
Continuous low charge to maintain battery output and reduce battery temperature.
- _ Fast charge mode:
Automatic adjustment of the charge time ensures minimal overcharging:
 - _ 10 or 15 hours of rapid charge after a full discharge.

Functions in emergency operation

- _ Shorter charge time after only a partial discharge.

When the permanent power supply is switched on for the first time the EM converterLED PRO starts to charge the batteries for 20 hours in fast charge mode. This 20-hour preparatory charge ensures that the new batteries are completely charged before being used. The 20-hour recharge is also used if a new battery is connected or if the device leaves the Rest mode (see [Rest mode](#), [Inhibit mode](#) and [Relight command](#), S. 16).

At the end of the 20-hour charge the module automatically switches to trickle charge mode. This ensures that the batteries remain at optimum charge levels and avoids any overheating due to overcharging.

- _ NiCd batteries are charged with a constant charging current in trickle charge mode
- _ Special NiMH devices charge with a pulsed charging current in trickle charge mode

After a power outage and subsequent emergency mode the EM converterLED PRO recharges the batteries in fast charge mode. However, the charge time is set so that only the power consumed during emergency mode is replaced. If emergency mode did not last as long as the prescribed operating time the charging time will be reduced. If emergency mode extended for the full operating time the charging time will be 10 hours for modules with an operating time of 1 hour, and 15 hours for modules with an operating time of 2 and 3 hours. Once the batteries are fully charged again the module automatically switches to trickle charge mode.

In trickle charge mode the battery status is continually monitored to ensure that the charging currents and battery voltages remain within the specified limits. If these limits are exceeded error status flags are set for monitoring with the aid of a suitable control system. The status LED also shows such faults locally.

If a duration test is required while the battery is not yet fully charged the test will be postponed until charging is complete. This prevents a duration test from being carried out with a battery that is not fully charged.

NOTICE

A partially charged battery is defined as one for which the charger is operating in fast charge mode.

A fully charged battery is defined as one for which the charger is operating in trickle charge mode. The appropriate bit in the internal memory (command number 253 Bit 3) is set.

If the power supply fails during rapid charging the module will power the lamp immediately in emergency mode for as long as the charge in the batteries will allow.

Functions in emergency operation

7.4. Rest mode, Inhibit mode and Relight command

Emergency operation is automatically started when the mains supply is switched off. If the Rest mode is activated, the discharging of the battery will be minimized by switching off the LED output.

Rest mode can be used during short periods of time when a building is completely unoccupied and the mains supply is to be switched off intentionally, for example during a holiday period. Using Rest mode prevents a full discharge and possible damages to the batteries during these times.

Rest mode has to be activated by a competent person. Activation is only possible after the mains supply has been switched off. Contrary to this, if the Inhibit mode has been activated in advance, Rest mode will be automatically switched on if the mains supply is switched off.

By sending the Relight command both modes, Rest mode and Inhibit mode, will be deactivated. The emergency unit will switch back to the previous operating mode. If it has been in Rest mode, it will switch back to emergency mode, if it has been in Inhibit mode, it will switch back to charging mode

For all the different changes, activating Rest mode and Inhibit mode and sending the Relight command, DALI-commands or DC voltage pulses of different lengths are used. The table at [Switching between operating modes](#), S. 18 gives an overview of all the operating modes.

CAUTION!

Even in Rest mode there is self discharge current and an extremely small level of discharge current flowing from the batteries. If the batteries remain in Rest mode for prolonged periods of time this can lead to deep discharge and potential damage. Further information can be found in the data sheet of the batteries (see [Reference list](#), S. 42).

7.4.1. Activate Rest mode

Rest mode is activated as follows:

- _ Disconnect power supply
- _ Send the REST command -or-
- _ Apply DC voltage pulse at the two terminal points "REST/L" and "REST/N"
 - _ The signal must have an amplitude of 9.5 - 22.5 V with a pulse length of 150 - 1,000 ms
 - _ The polarity of the voltage pulse does not matter

NOTICE

Rest mode cannot be activated as long as the power supply hasn't been disconnected.
The maximum number of emergency units on one bus is 100 pieces with a maximum recommended cable length of 1000 metres.
Rest mode voltage can be applied across all emergency modules (parallel connection).

7.4.2. Deactivate Rest mode via Relight command

By sending the Relight command the Rest mode is deactivated. The emergency unit will switch back to emergency mode. To deactivate Rest mode via Relight command, proceed as follows:

Functions in emergency operation

- _ Send the RELIGHT command -or-
- _ Apply DC voltage pulse at the two terminal points "REST/L" and "REST/N"
 - _ The signal must have an amplitude of 9.5 - 22.5 V with a pulse length of 1,001 - 2,000 ms
 - _ The polarity of the voltage pulse does not matter

NOTICE

Reapply the power supply does also deactivate Rest mode. In this case, the device switches from Rest mode to charge mode.

7.4.3. Activate Inhibit mode

Inhibit mode is activated as follows:

- _ Make sure that the mains supply is switched on
 - _ Send the INHIBIT command -or-
 - _ Apply DC voltage pulse at the two terminal points "REST/L" and "REST/N"
 - _ The signal must have an amplitude of 9.5 - 22.5 V with a pulse length of 150 - 1,000 ms
 - _ The polarity of the voltage pulse does not matter
- > Emergency unit switches to Inhibit mode
-> Inhibit mode is active for a duration of 15 minutes
-> Inhibit mode is indicated by indicator LED (double pulsing GREEN)

For further information see [Indicator LED](#), S. 20.

NOTICE

The inhibit mode must be activated before the mains supply is switched off.

7.4.4. Automatically switch from Inhibit mode to Rest mode

The emergency unit automatically switches from Inhibit mode to Rest mode if the following conditions are met:

- _ Inhibit mode has been activated -and-
- _ Within 15 minutes after activation, the mains supply is switched off

7.4.5. Automatically deactivate Inhibit mode

Inhibit mode is automatically deactivated and the emergency unit switches back to charging mode if the following conditions are met:

- _ Within 15 minutes after activation, the mains supply is **not** switched off

Functions in emergency operation

7.4.6. Deactivate Inhibit mode via Relight command

By sending the Relight command the Inhibit mode is deactivated. The emergency unit will switch back to charging mode.

To deactivate Inhibit mode via Relight command, proceed as follows:

- _ Send the RELIGHT command -or-
- _ Apply DC voltage pulse at the two terminal points "REST/L" and "REST/N"
 - _ The signal must have an amplitude of 9.5 - 22.5 V with a pulse length of 1,001 - 2,000 ms
 - _ The polarity of the voltage pulse does not matter

7.4.7. Switching between operating modes

The device has four different operating modes (Standby/Charge mode, Emergency mode, Rest mode and Inhibit mode). Depending on the initial mode and the length of the applied DC voltage pulse or the DALI commands sent, the device switches between these operating modes.

The following table gives an overview:

Applied pulse length / DALI command	Charging mode	Emergency mode	Rest mode	Inhibit mode
150 - 1,000 ms INHIBIT	Switches to Inhibit mode	-	-	-
150 - 1,000 ms REST	-	Switches to Rest mode	-	-
1,001 - 2,000 ms RELIGHT	-	-	Switches to Emergency mode	Switches to charging mode

Functions in emergency operation

7.5. Prolong time

The command "Store prolong time" (command number 239) allows the EM converterLED PRO to continue emergency operation after restoration of the power supply. This time can be set in 30 second steps. The maximum value is 127.5 minutes. The device leaves this continued emergency operation after the set time has expired or as soon as the low voltage battery cut off level has been reached (discharge protection), that is, when the total operating time has been exceeded.

The prolong time can be set by the DALI controller.

Functions in emergency operation

7.6. Indicator LED

System status is locally indicated by a bi-colour indicator LED.

LED indication	Status	Description
Permanent GREEN	Standby/Charge mode, System OK	Mains operation, battery is charged
Fast flashing GREEN (0,1 s on - 0,1 s off)	Function test underway	
Slow flashing GREEN (1 s on - 1 s off)	Duration test underway	
Double pulsing GREEN	Inhibit mode is activated	<p>The Inhibit mode makes it possible to set the emergency mode to "inhibited"; in this mode, the power can be turned off without switching to emergency mode.</p> <p>The Inhibit mode is activated by sending the inhibit command (command number: 225), while the modules are still connected to mains. Just as in Rest mode, the device does not support the Relight command (command number: 226). After a break of 15 minutes, the inhibit mode is automatically reset.</p>
Permanent RED	Lamp failure	<p>Open circuit -or- Short circuit -or- LED failure</p> <div data-bbox="550 1151 1474 1384" style="border: 1px solid #00a0e3; padding: 10px; margin-top: 10px;"> <p>i NOTICE</p> <p>After an exchange of the LED module, the RED light of the indicator LED remains on and the lamp failure flag remains set until a scheduled function test or a "maintenance" function test requested by the control system has been successfully completed. The LED module's mains operation does reset the lamp failure flag.</p> </div>
Fast flashing RED (0,1 s on - 0,1 s off)	Charging failure	<p>Incorrect charging current</p> <div data-bbox="550 1525 1474 1688" style="border: 1px solid #00a0e3; padding: 10px; margin-top: 10px;"> <p>i NOTICE</p> <p>After an exchange of the device in a DALI-controlled system it is necessary to address the LED Driver and reset the DELAY time and INTERVAL time.</p> </div>

Functions in emergency operation

Slow flashing RED (1 s on - 1 s off)	Battery failure	Battery failed duration test or function test -or- Battery is defect -or- Incorrect battery voltage
		<p>i NOTICE</p> <p>After an exchange of the battery the indicator LED switches to GREEN to indicate satisfactory charging.</p> <p>The battery failure flags will only be reset after a successful completion of a "maintenance" duration test, though. This "maintenance" duration test can only be performed if the batteries are fully charged. For this, new batteries must have completed the 20-hour initial charge mode (see Intelligent Multilevel battery system, S. 14).</p>
GREEN and RED off	Battery operation	Emergency mode: Mains disconnected -or- mains failure
RED and GREEN flashing alternating	Addressing function EZ easy addressing	The addresses of the devices can be calculated by the sequence of flashing signals that the devices emit (see Addressing function EZ easy addressing, S. .).

i NOTICE

If a lamp error was detected at an emergency test and then corrected (by changing the lamp for example), the error indication can only be corrected by a renewed emergency test. Switching to mains operation does not reset the error indication.

Settings for emergency tests

8.1. Time intervals between emergency tests

The timing for the individual tests is defined by the DALI parameters INTERVAL time and DELAY time.

_ INTERVAL time:

This determines the time interval in which function and duration tests are carried out. The factory presets specify that the function test is performed every 7 days and the duration test every 52 weeks. Typically the same INTERVAL time is assigned to all the connected luminaires.

If the INTERVAL time is reset to zero this means that the test is no longer automatically initiated by the device but only via the connected control system.

_ DELAY time:

This determines the delay for initiating the tests between the individual luminaires. The factory default is DELAY time = 0.

This means that there is no delay and all the luminaires are tested at the same time. By assigning a DELAY time to an individual luminaire the test for that luminaire will be delayed by the appropriate value. The delay is based on the point in time when the device was first connected to the power supply.

Both values are stored in the device's internal memory. The values can be changed by connecting a DALI bus and by sending appropriate DALI commands or can also be deactivated, i.e. reset to zero. This provides different setting options which are crucial for implementing different test systems.

Settings for emergency tests

8.2. Type of test system: DALI-controlled or selftest mode

There are two types of test system:

- _ Centrally controlled and monitored (DALI-controlled)
- _ Decentrally controlled and monitored (selftest mode)

The following table gives an overview of the test systems and setting options:

Test system	Trigger	Test times	Requirements	Comments
DALI-controlled	Test triggered by the DALI control system	Test time and interval are stored in the DALI control system	Selftest mode was deactivated by resetting the DELAY time and INTERVAL time in the emergency lighting unit to zero	Tests are only performed if an appropriate command is received by the emergency lighting unit.
Selftest mode	Test triggered by emergency lighting unit	<p>The time for the function test (time and day) corresponds to the time when the emergency lighting unit was first connected to the power supply.</p> <p>The time for the duration test (only time) is determined by the adaptive test mode of the emergency lighting unit (see Adaptive test mode, S. 23).</p> <p>The time between the tests is determined by the INTERVAL time.</p> <p>The time between the individual luminaires is determined by the DELAY time.</p>	The DELAY time and INTERVAL time are programmed to appropriate values and are NOT reset to zero.	The DELAY time and INTERVAL time can be changed by appropriate commands via the DALI bus.

NOTICE

As soon as the preset parameters are reset to zero, tests are only carried out on request by the DALI control system. If the DALI bus is interrupted, the EM converterLED PRO does not go back to selftest mode.

NOTICE

DALI communication with a connected battery is only possible after a mains reset.

8.3. Adaptive test mode

Adaptive test mode sets the time for the duration test to a time of minimum risk and minimum presence.

This is achieved by monitoring the switched phase of the lighting. This tells the emergency lighting unit which times the lighting is

Settings for emergency tests

switched off (i.e. no one is in the room) and the unit stores these times. If non-presence of more than five hours is detected the start time for the duration test is set to one hour after the start of the non-presence time.

Example:

A room is not used between 8 pm and 6 am. The lights are therefore switched off. The duration test will therefore begin at 9 pm. This provides a certain buffer before the start and after the end of the duration test, and the batteries can be recharged after the duration test before the room is in use again.

Room usage is monitored on a monthly basis and the time for the duration test is constantly adjusted. This allows for seasonality in room usage to be taken into account.

If a suitable time cannot be found (perhaps because the room is in use round the clock) the duration test is performed at the time set during startup (this is the time when the emergency lighting unit was first connected to the power supply). If subsequently a suitable period is found the time for the duration life test will be suitably adapted.

If none of this is successful because the startup time is unsuitable and no other suitable period can be found, the time for the duration test can be set manually (see [Setting the test time](#), S. 24).

8.4. Functionality of the test switch

The optional test switch enables you to make a series of settings manually.

NOTICE

The test switch can remain permanently connected and used as a startup tool.

8.4.1. Starting the function tests

- _ A short press on the button (0.15 - 1 s) starts a function test lasting 5 seconds.
 - > The indicator LED flashes GREEN.
 - > The result of the function test is displayed on the two-colour indicator LED.

8.4.2. Starting the test mode

- _ A longer press on the button (1 - 10 s) switches the light sources to emergency mode but does not perform a function test.
 - > The indicator LED goes off for 1 second and then on for the rest of the time (maximum of 9 seconds).

8.4.3. Setting the test time

The time and day for the function and duration test is stored in the internal timer. To change the test time the timer needs to be reset. All the test times previously stored will be deleted and replaced by the time of resetting.

NOTICE

Resetting the timer deactivates the [adaptive test mode](#), S. 23. Because of this the test time is no longer adapted to the room usage of the building. The function test and duration test is always carried out at the time of resetting.

Settings for emergency tests

Depending on whether the timer is to be reset for one luminaire or for multiple luminaires, there are two different methods:

Setting the test time for one luminaire

- _ Holding down the button (> 10 s) resets the timer.
 - > The indicator LED goes off for 1 second and then shows GREEN and goes off again after 10 seconds.
 - > The indicator LED going off after 10 seconds confirms that the timer has been successfully reset (to the current time).

Setting the test time for all the light sources in an emergency lighting circuit

- _ Switching the unswitched power supply for an emergency lighting circuit on and off 5 times within 60 seconds resets the timers for all the light sources in the emergency lighting circuit.

Typical Installation

9.1. Initial startup

After initial connection of the permanent power supply and after connection of the batteries to the EM converterLED PRO the module starts to charge the batteries with the initial high charging current for 20 hours (initial charge mode).

Since the DELAY time is preset to zero at the factory, the EM converterLED PRO tries to perform an initial function and duration test (commissioning test) as soon as connection to the power supply is made. Since at this time the batteries are not yet adequately charged the EM converterLED PRO postpones the commissioning test.

Generally, the batteries will be fully charged within 24 hours and the commissioning test can then be carried out. The operation time corresponds to the preset value.

If the power supply is interrupted before the end of the 20 hours of continuous initial charging the initial charging process will be completely restarted and the commissioning test postponed accordingly.

NOTICE

If the INTERVAL time was reset to zero by the control system during the addressing, the commissioning test is performed only after the initial commissioning. If mains supply and batteries are disconnected and then reconnected at a later time, this does not trigger a renewed commissioning test. If the battery is replaced, it is expected that the control system requests the test.

9.2. Installation without a control system

If a control system is not connected, the EM converterLED PRO will carry out all further tests in accordance with the parameters preprogrammed in the internal memory (INTERVAL time and DELAY time), i.e. a function test every seven days and a duration test every 52 weeks.

Function tests are performed irrespective of the charge status of the battery, duration tests are only performed if the battery is fully charged.

If a duration test is required while the battery is not yet fully charged the test will be postponed until charging is complete. This prevents a duration test from being carried out with a battery that is not fully charged (see [Intelligent multilevel charging system](#), S. 14).

NOTICE

If the INTERVAL time has not been reset to zero, the procedure after a battery replacement is the same as during initial commissioning:
The batteries are charged for 20 hours, after that a commissioning test is performed (see [Intelligent multilevel charging system](#), S. 14).

Typical Installation

NOTICE

A partially charged battery is defined as one for which the charger is operating in fast charge mode.

A fully charged battery is defined as one for which the charger is operating in trickle charge mode. The appropriate bit in the internal memory (command number 253 Bit 3) is set.

Determining light output in emergency operation

To determine the light output in emergency operation the following parameters are crucial:

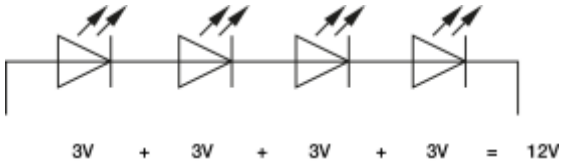
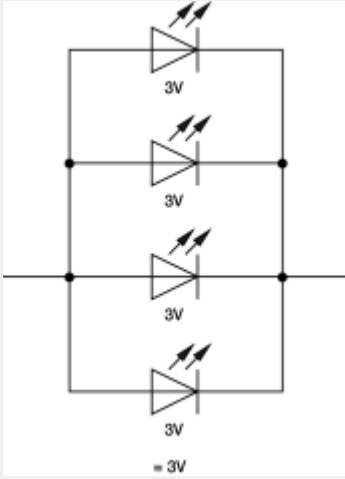
1. LED forward voltage (total forward voltage of all connected LED modules)
2. LED current in emergency operation
3. Light output in emergency operation

10.1. Parameter 1: LED forward voltage

- _ The total forward voltage of all connected LED modules must be within the forward voltage range of the EM converterLED PRO.

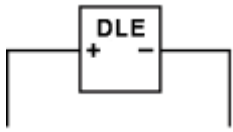
10.1.1. Total forward voltage of all LED modules

The forward voltage of a single LED module can be found in the data sheet. When calculating the total forward voltage of all LED modules, series and parallel circuits must be handled differently:

Series circuit	Parallel circuit
 <p style="text-align: center;">3V + 3V + 3V + 3V = 12V</p>	 <p style="text-align: center;">= 3V</p>
<p>The values of the individual LED modules are summed up.</p>	<p>The total value is the same as the value of a single LED module</p>

Determining light output in emergency operation

10.1.2. Example 1: 1 LED module DLE



Given:

- _ Forward voltage DLE: 24.2 V (taken from data sheet)

Wanted:

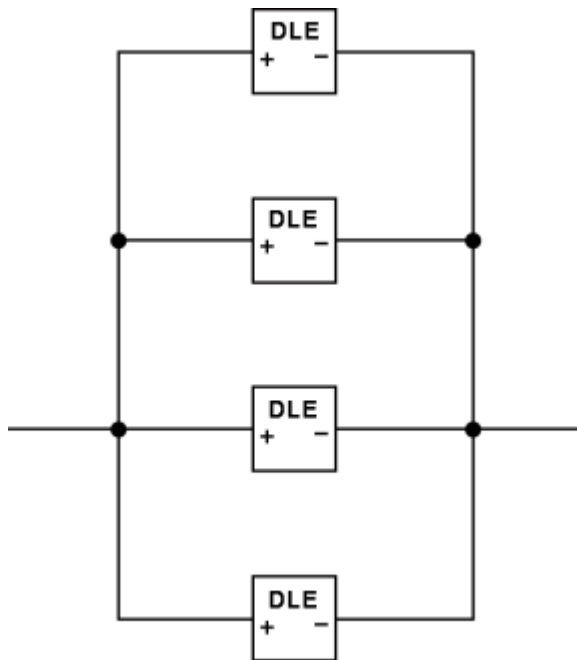
- _ Total forward voltage of all LED modules in emergency operation

Result:

- _ The total forward voltage of all LED modules is 24.2 V because there is only 1 LED module.

Determining light output in emergency operation

10.1.3. Example 2: 4 LED module DLE in parallel



Given:

- _ Forward voltage DLE: 24.2 V (taken from data sheet)

Wanted:

- _ Total forward voltage of all LED modules?

Result:

- _ The total forward voltage of all LED modules is 24.2 V (no addition of the values in a parallel circuit).

i NOTICE

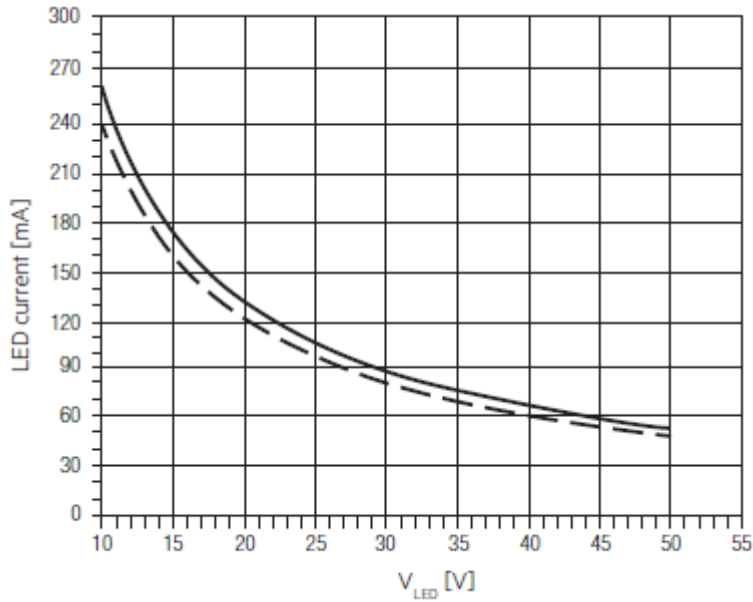
As Example 2 shows, parallel circuits make it possible to use multiple LED modules where the forward voltage does not add up.

Determining light output in emergency operation

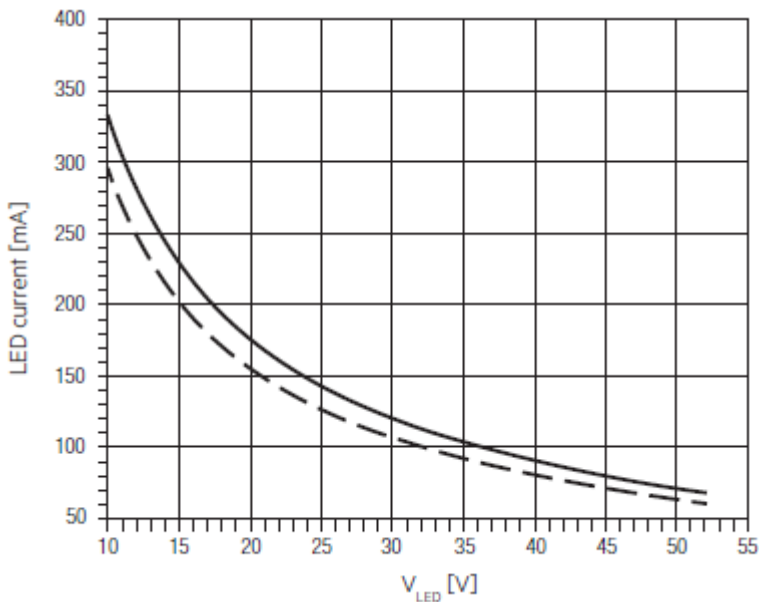
10.2. Parameter 2: LED current

Each EM converterLED PRO has a specific current/voltage characteristic. The corresponding current/voltage curve can be found in the datasheet:

EM converterLED PRO 103 50V / EM converterLED PRO 103 NiMH 50V

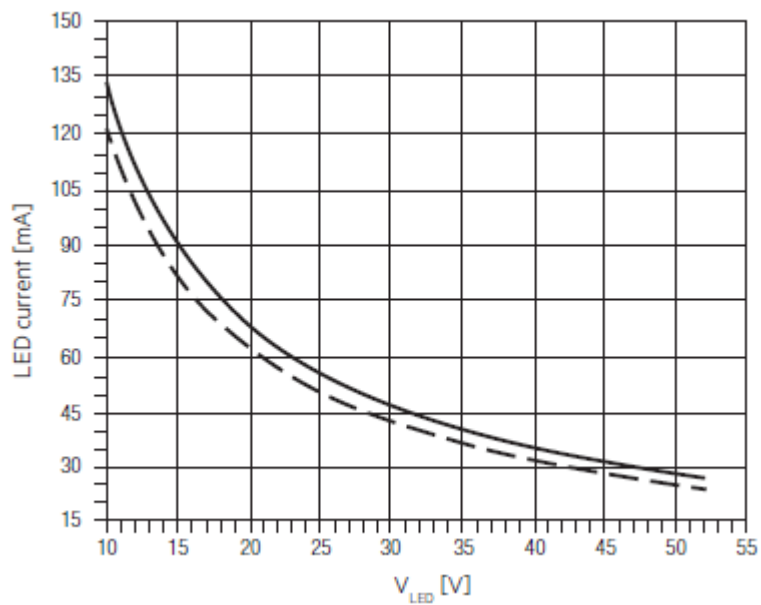


EM converterLED PRO 104 50V / EM converterLED PRO 104 NiMH 50V

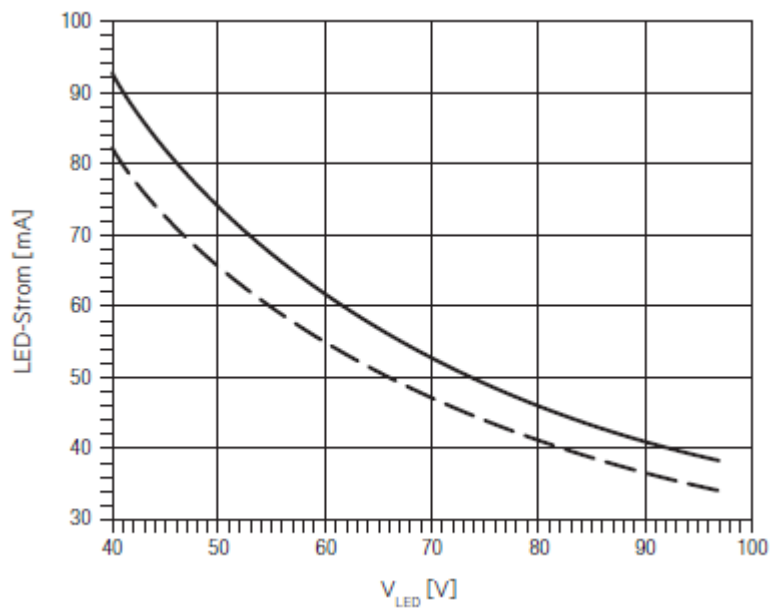


Determining light output in emergency operation

EM converterLED PRO 134 NiCd 50V

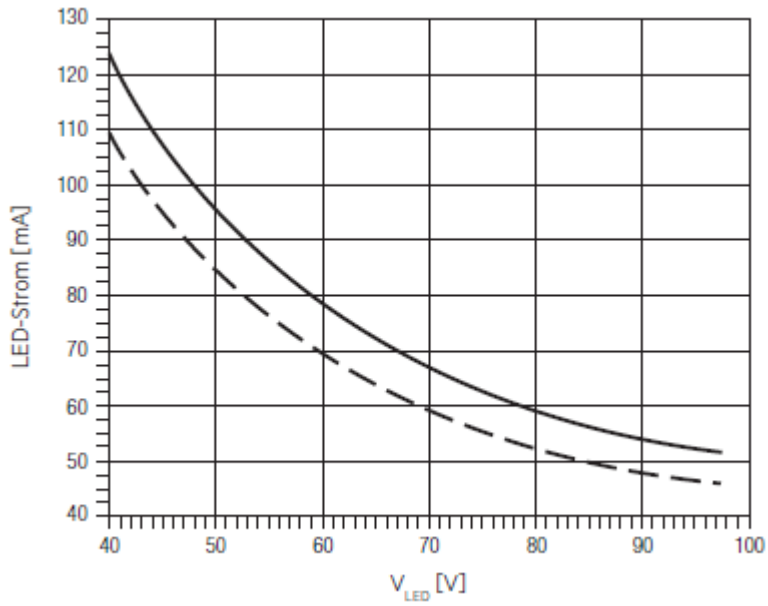


EM converterLED PRO 104 90V / EM converterLED PRO 104 NiMH 90V

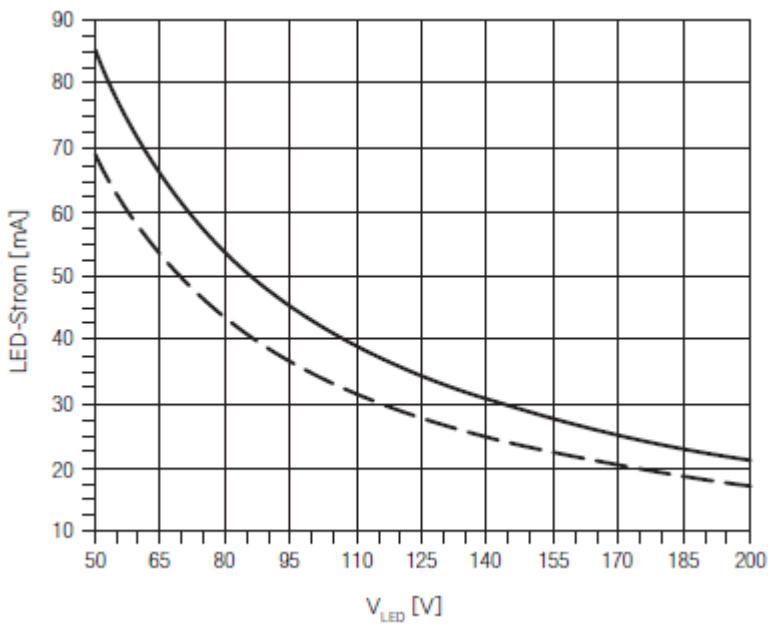


Determining light output in emergency operation

EM converterLED PRO 105 90V / EM converterLED PRO 105 NiMH 90V

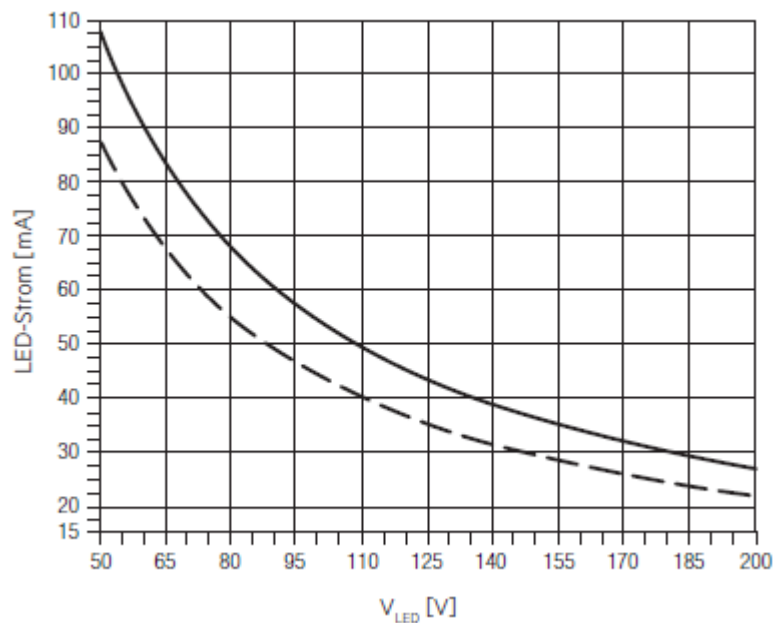


EM converterLED PRO 104 200V / EM converterLED PRO 104 NiMH 200V



Determining light output in emergency operation

EM converterLED PRO 105 200V / EM converterLED PRO 105 NiMH 200V



— — — LED current at nominal battery voltage and min. battery discharge current

———— LED current at nominal battery voltage and max. battery discharge current

Knowing the total forward voltage of all LED modules, the value for the LED current can be read from the current/voltage curve:

- _ Mark the value of the total forward voltage of all LED modules on the x-axis of the graph
- _ From that point move up vertically
- > The crossing points with the two curves define a range of values.

The value of the LED current lies within this range. The effective value depends on tolerances.

Determining light output in emergency operation

10.2.1. Example 1: 1 LED module DLE

Given:

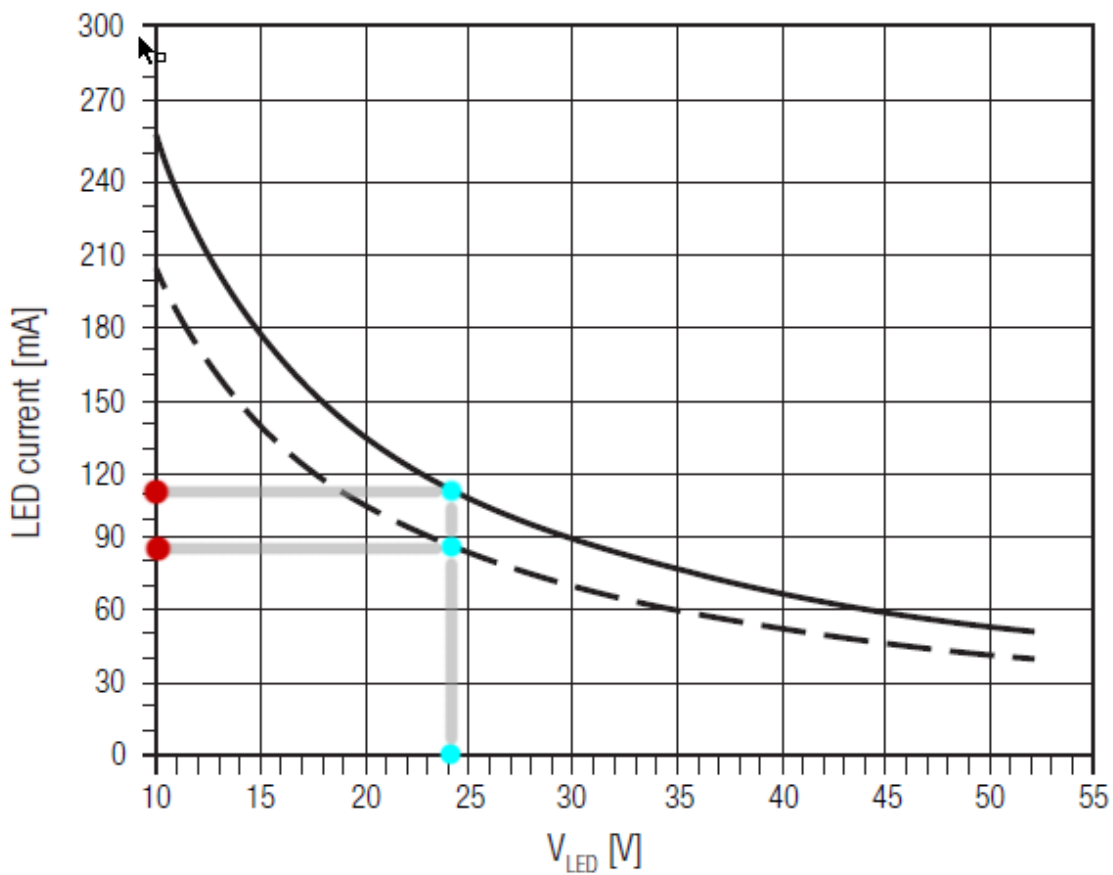
- _ Total forward voltage of all LED modules: 24.2 V (calculated before)

Wanted:

- _ LED current?

Result:

Figure: Determining LED current for EM converterLED PRO 103 50V



- _ The two crossing points are at around 85 mA (minimum value) and 111 mA (maximum value).
- _ The effective value of the LED current is between these two values.

Determining light output in emergency operation

10.3. Parameter 3: Light output in emergency operation

The ratio between emergency operation and normal operation is the same for light output and LED current. The values for normal operation can be found in the LED module data sheet, the value for the LED current in emergency operation can be found in the data sheet (see example above).

$$\frac{\text{light output in emergency operation}}{\text{light output in mains operation}} = \frac{\text{LED current in emergency operation}}{\text{LED current in mains operation}}$$

With this equation the light output in emergency operation can be isolated and calculated:

$$\text{light output in emergency operation} = \frac{\text{LED current in emergency operation}}{\text{LED current in mains operation}} \times \text{light output in mains operation}$$

10.3.1. Example 1: 1 LED module DLE

Given:

- _ LED current in emergency operation: approx. 85 mA (minimum value) and approx. 111 mA (maximum value) (taken from the previous example, see [Example 1: 1 LED module DLE](#), S. 35)
- _ LED current in mains operation 750 mA (taken from data sheet DLE G3 2000 lm, Article number: 89600574)
- _ Light output in mains operation: 2,100 lm (taken from data sheet DLE G3 2000 lm, Article number: 89600574)

Wanted:

- _ Light output in emergency operation?

Result:

- _ Minimum light output in emergency operation = 85 mA / 750 mA * 2,100 lm = 238 lm
- _ Maximum light output in emergency operation = 111 mA / 750 mA * 2,100 lm = 310.8 lm

NOTICE

The Webtool "EM converterLED current calculator" automatically calculates the current and luminous flux and helps with choosing the correct EM converterLED for individual applications. The tool is accessible on: <http://www.tridonic.com/download/emergency/>

Compatibility with LED module and the LED Driver

Both, the LED module and the LED Driver used in combination with the EM converterLED PRO have to be checked for compatibility.

11.1. Compatibility with LED module

The total forward voltage of all LED modules connected to the EM converterLED PRO have to be in its LED module forward voltage range.

- _ EM converterLED PRO 50V: 10-52 V
- _ EM converterLED PRO 90V: 40-97 V
- _ EM converterLED PRO 200V: 50-200 V

11.2. Compatibility with LED Driver

The EM converterLED emergency unit use 3 pole technology and is compatible with most LED Drivers on the market, however it is important to check that the rating of the LED Driver does not exceed the values specified below:

- _ Max. allowed output current: 2.4 A peak
- _ Max. allowed inrush current rating: 60 A peak for 1 ms, 84 A for 255 μ s
- _ Max. allowed output voltage: 450 V
- _ max. allowed LED load: 150 W

11.3. Practical tests

Practical tests are used to ensure fault-free operation of the LED module and LED Driver. The following aspects must be checked.

11.3.1. Technical aspects

- _ Transient behaviour
- _ Colour shift
- _ Connection during operation
- _ Parasitic capacitance

Compatibility with LED module and the LED Driver

11.3.2. Visual aspects

- _ Flickering
- _ Stroboscopic effect (video applications)
- _ Dimming behaviour
- _ Colour change/stability
- _ Luminous flux

11.3.3. Conditions

When conducting the tests the following conditions must be considered:

- _ All tolerances
- _ Entire temperature range
- _ Different output voltage ranges (incl. no load)
- _ Entire dimming range
- _ Short circuit

NOTICE

If the values are slightly over or under the specified threshold values or if there are any other concerns or questions please contact Technical Support: techservice@tridonic.com

Installation notes

NOTICE

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

To obtain further information, proceed as follows:

- _ Read the documentation provided by the lamp manufacturer. Follow the guidelines and instructions of the lamp manufacturer!
- _ Observe all relevant standards. Follow the instructions given in the standards!

12.1. Safety information

WARNING!

- _ Comply with the general safety instructions (see [Safety instructions](#), S. 5)!
- _ 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 protected for a maximum of 48 hour against overvoltage of up to 320 V. Make sure that the LED Driver is not exposed to overvoltage for long periods!
- _ Electronic LED Driver of the EM converterLED series from Tridonic have type of protection IP 20. Comply with the requirements for this type of protection!

Installation notes

12.2. Routing the wires

12.2.1. Tests

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.

12.2.2. 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.

CAUTION!

As an alternative to measuring the insulation resistance, IEC 60598-1 Annex Q describes a dielectric strength test at 1,500 V AC (or 1.414 x 1,500 V DC). To avoid damaging electronic LED Driver, it is strongly disadvised to perform this dielectric strength test.

12.2.3. 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.

12.2.4. 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.
- _ Maximum lead length for the test switch and indicator LED connection is 1 m.
- _ The test switch and indicator LED wiring should be separated from the LED leads to prevent noise coupling.
- _ The battery wires are specified with a cross section of 0.5 mm and a max. length of 1.3 m.

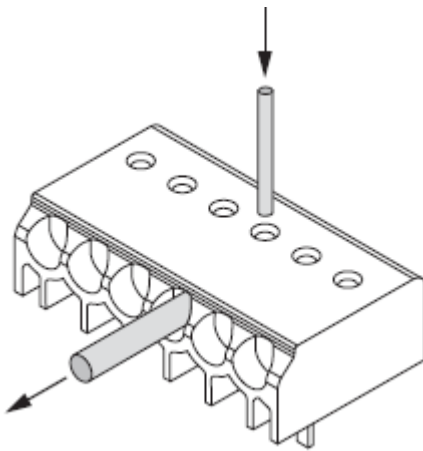
Installation notes

Wiring the plug-in terminal

- _ Use solid wire with the correct cross-section
- _ Strip off correct length of insulation; you may need to twist the tool slightly
- _ Insert the bare end into the terminal

Detaching the plug-in terminal

- _ Loosen wire through twisting and pulling or using a \varnothing 1 mm release tool



Reference list

13.1. Related documents

- _ Data sheet EM converterLED SELFTEST 50V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_ST_50V_en.pdf
- _ Data sheet EM converterLED SELFTEST 90V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_ST_90V_en.pdf
- _ Data sheet EM converterLED SELFTEST 200V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_ST_200V_en.pdf
- _ Data sheet EM converterLED PRO 50V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_PRO_50V_en.pdf
- _ Data sheet EM converterLED PRO 90V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_PRO_90V_en.pdf
- _ Data sheet EM converterLED PRO 200V:
https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_PRO_200V_en.pdf
- _ Brochure Emergency Lighting: http://www.tridonic.com/com/en/download/Emergency_Lighting_Overview_EN.pdf
- _ DALI manual: http://www.tridonic.com/com/en/download/technical/DALI-manual_en.pdf
- _ Documentation masterCONFIGURATOR: http://www.tridonic.com/com/en/download/Manual_masterConfigurator_en.pdf

13.2. Downloads

- _ Tridonic software: <http://www.tridonic.com/com/en/software.asp>
- _ Download masterCONFIGURATOR: <http://www.tridonic.com/com/de/software-masterconfigurator.asp>
- _ Download Android-App Emergency ADDRESSING Decoder:
https://play.google.com/store/apps/details?id=net.gmx.royder.knight.EZ_easyADDRESSING

13.3. Additional information

- _ EM converterLED current calculator: <https://www.tridonic.com/com/en/products/converterled>
- _ Declarations of conformity: <http://www.tridonic.com/com/en/news-declarations-of-conformity.asp>
- _ Company certificates: <http://www.tridonic.com/com/en/company-certificates.asp>
- _ Guarantee conditions: <http://www.tridonic.com/com/en/guarantee.asp>
- _ Data sheets: <http://www.tridonic.com/com/en/data-sheets.asp>
- _ Environmental declarations: <http://www.tridonic.com/com/en/environmental-declarations.asp>
- _ Tender text: <http://www.tridonic.com/com/en/tender.asp>
- _ Other technical documents: <http://www.tridonic.com/com/en/technical-docs.asp>
- _ Product catalogue: <http://www.tridonic.com/com/en/catalogue.asp>