LED Solutions for Emergency Lighting

Functional Description
PRO DALI Emergency Devices
Manual

TRIDONIC

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Settings for emergency tests

3. Settings for emergency tests

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

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 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	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. The time for the duration test (only time) is determined by the adaptive test mode of the emergency lighting unit (see Adaptive test mode, p. 4). The time between the tests is determined by the INTERVAL time. The time between the individual luminaires is determined by the DELAY time.	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 INTERVAL time is reset to zero, tests are only carried out on request by the DALI control system.
If the DALI bus is interrupted, the EM powerLED PRO DIM does not go back to selftest mode.

NOTICE

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

Settings for emergency tests

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 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, p. 6).

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.

5. 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.

6. 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).

Intelligent multilevel charging system

7. 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, p. 4. 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.

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

7.1. 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).

7.2. 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.

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.

  _ Shorter charge time after only a partial discharge.

When the permanent power supply is switched on for the first time the EM powerLED PRO DIM 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, p. 9).

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.

Intelligent multilevel charging system

_ batteries are charged with a constant charging current in trickle charge mode

After a power outage and subsequent emergency mode the EM powerLED PRO DIM 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.

Prolong time

Prolong time

The command "Store prolong time" (command number 239) allows the EM powerLED PRO DIM 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.

Rest mode and Relight function

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, DC voltage pulses of different lengths are used. The table at Switching between operating modes, p. 11 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.

11. Activate Rest mode

Rest mode is activated as follows:

- Disconnect power supply
- 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).

12. 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:

Rest mode and Relight function

_ 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.

13. Activate Inhibit mode

Inhibit mode is activated as follows:

_ Make sure that the mains supply is switched on
_ 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, p. 12.

NOTICE

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

14. 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

15. 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

Rest mode and Relight function

16. 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:

_ 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

17. 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 the device switches between these operating modes. The following table gives an overview:

Applied pulse length	Charging mode	Emergency mode	Rest mode	Inhibit mode
150 - 1,000 ms	Switches to Inhibit mode	Switches to Rest mode	-	-
1,001 - 2,000 ms (Relight command)	-	-	Switches to Emergency mode	Switches to charging mode

Indicator LED

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	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. 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.
Permanent RED	Lamp failure	Open circuit -or- Short circuit -or- LED failure NOTICE 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.
Fast flashing RED (0,1 s on - 0,1 s off)	Charging failure -or- device failure	Incorrect charging current NOTICE 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.

Indicator LED

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 NOTICE After an exchange of the battery the indicator LED switches to GREEN to indicate satisfactory charging. 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, p. 6).
GREEN and RED off	Battery operation	Emergency mode: Mains disconnected -or- mains failure

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.

Typical Installation

4. A typical installation

Initial startup

After initial connection of the permanent power supply and after connection of the batteries to the EM powerLED PRO DIM 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 powerLED PRO DIM 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 powerLED PRO DIM 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.

Typical Installation

Installation without a control system

If a control system is not connected, the EM powerLED PRO DIM 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, p. 6).

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 , p. 6).

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.

5. Adjustable output current

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.

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.

Typical Installation

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

3. Example

3.1. Given:

_ LED forward voltage: 40 V (chosen as an example)

_ LED forward current (at 40 V): 70 mA (taken from diagram EM converterLED 203)

3.2. Wanted:

_ Emergency output power?

3.3. Result:

_ Emergency output power:
P = U * I = 40 V * 70 mA = 2.8 W

Different battery cell numbers offer flexibility in the available emergency output power - 3, 4 and 5 cells for LED modules with 10-54 V und 48-250 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.

Control gear	Forward voltage range	SELV	Number of battery cells
EM converterLED PRO 203 NiCd/NiMH 50V	10-54 V	SELV < 60 V	3
EM converterLED PRO 204 NiCd/NiMH 50V	10-54 V	SELV < 60 V	4
EM converterLED PRO 203 MH/LiFePO4 50V	10-54 V	SELV < 60 V	3
EM converterLED PRO 204 MH/LiFePO4 50V	10-54 V	SELV < 60 V	4

Control gear	Forward voltage range	SELV	Number of battery cells
EM converterLED PRO 203 NiCd/NiMH 250V	48-250 V	no	3
EM converterLED PRO 204 NiCd/NiMH 250V	48-250 V	no	4

Determining light output in emergency operation

EM converterLED PRO 205 NiCd/NiMH 250V	48-250 V	no	5
EM converterLED PRO 203 MH/LiFePO4 250V	50-250 V	no	3
EM converterLED PRO 204 MH/LiFePO4 250V	50-250 V	no	4
EM converterLED PRO 205 MH/LiFePO4 250V	50-250 V	no	5

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, p. 17).

6. 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

Parameter 1: LED forward voltage

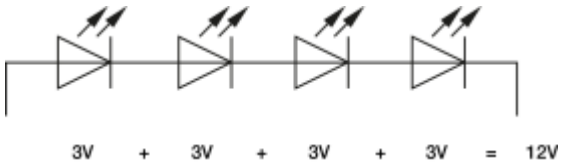
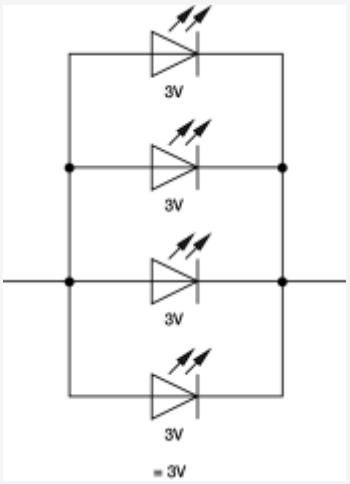
_ The total forward voltage of all connected LED modules must be within the forward voltage range of the EM converterLED PRO.

2. 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:

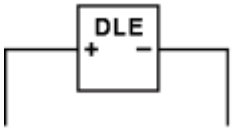
Series circuit	Parallel circuit

Determining light output in emergency operation

	
The values of the individual LED modules are summed up.	The total value is the same as the value of a single LED module

Determining light output in emergency operation

3. Example 1: 1 LED module DLE



3.1. Given:

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

3.2. Wanted:

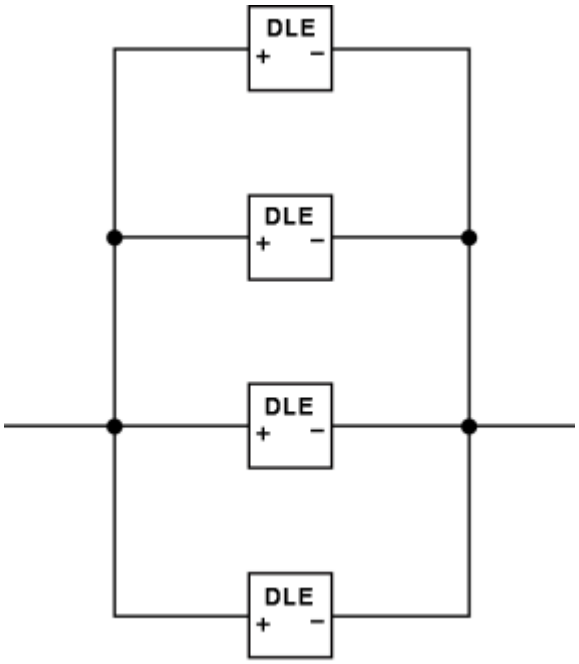
_ Total forward voltage of all LED modules in emergency operation

3.3. 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

4. Example 2: 4 LED module DLE in parallel



4.4. Given:

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

4.5. Wanted:

_ Total forward voltage of all LED modules?

4.6. Result:

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

NOTICE

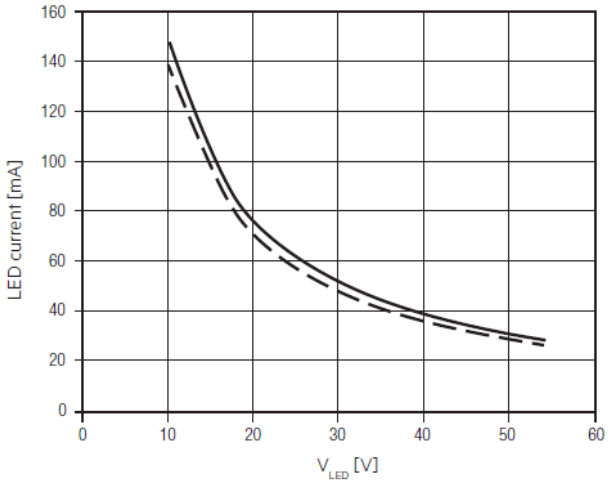
As Example 2 shows, parallel circuits make it possible to use multiple LED modules where the forward voltage does not add up.

Determining light output in emergency operation

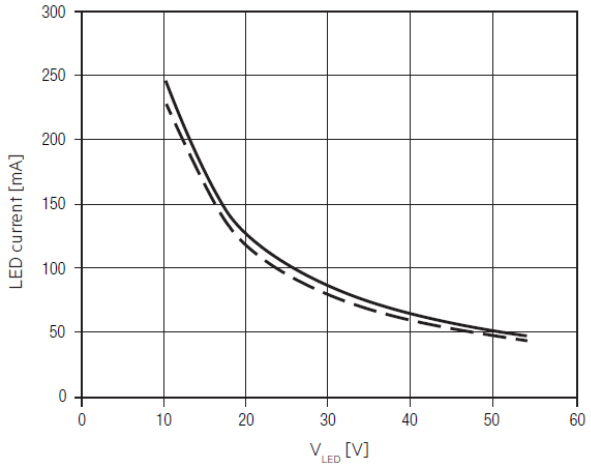
Parameter 2: LED current

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

EM converterLED PRO 202 NiCd/NiMH 50V

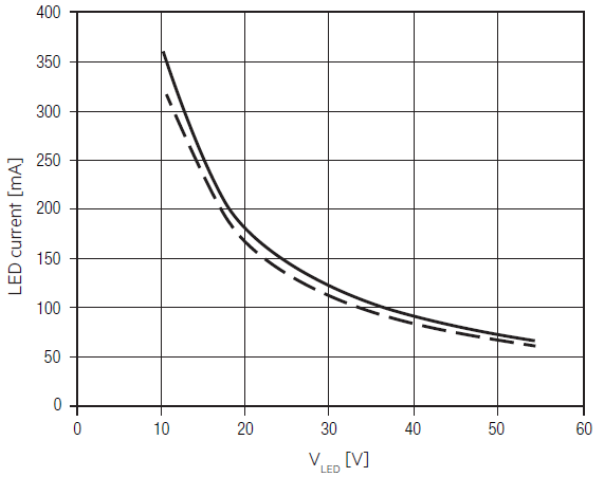


EM converterLED PRO 203 NiCd/NiMH 50V

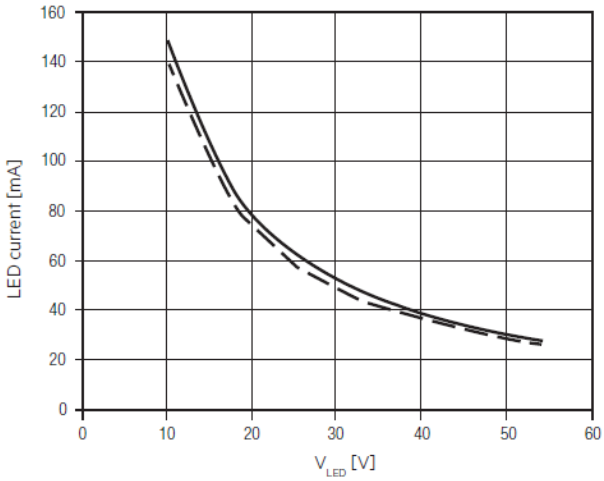


Determining light output in emergency operation

EM converterLED PRO 204 NiCd/NiMH 50V

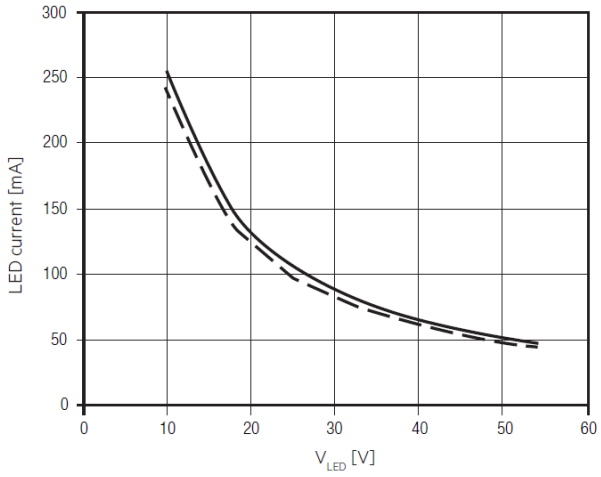


EM converterLED PRO 202 MH/LiFePO4 50V

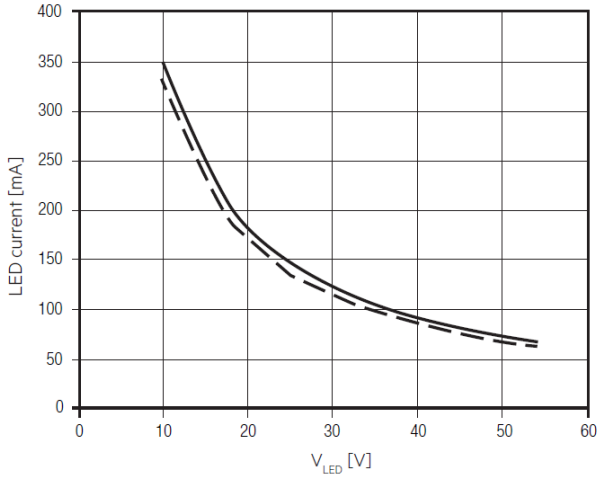


Determining light output in emergency operation

EM converterLED PRO 203 MH/LiFePO4 50V

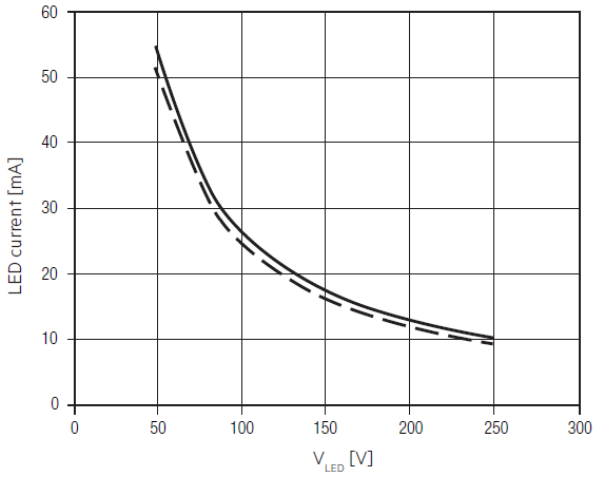


EM converterLED PRO 204 MH/LiFePO4 50V

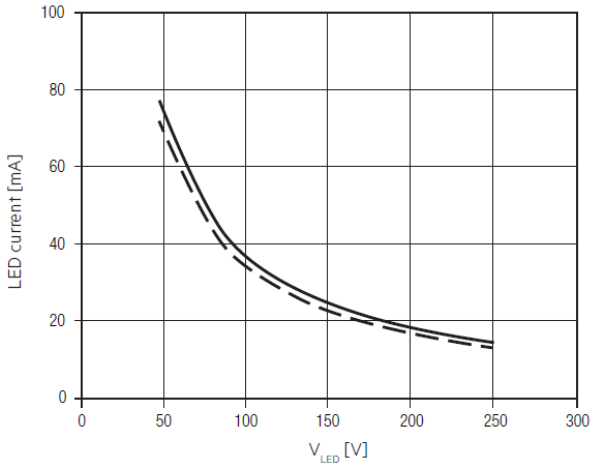


Determining light output in emergency operation

EM converterLED PRO 203 NiCd/NiMH 250V

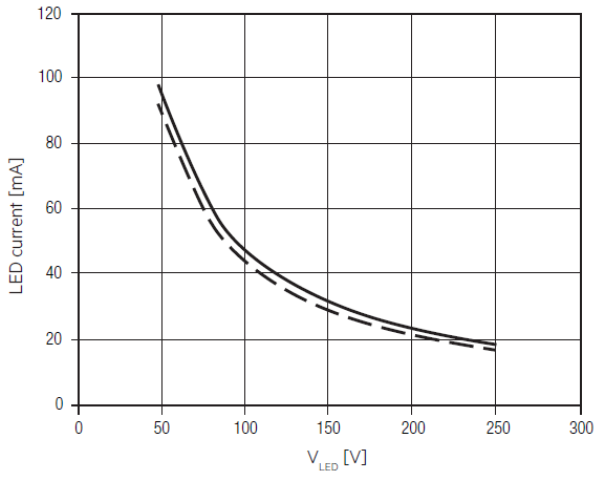


M converterLED PRO 204 NiCd/NiMH 250V

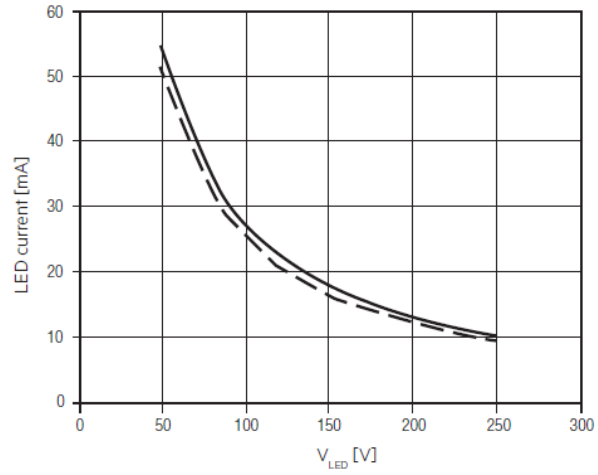


Determining light output in emergency operation

EM converterLED PRO 205 NiCd/NiMH 250V

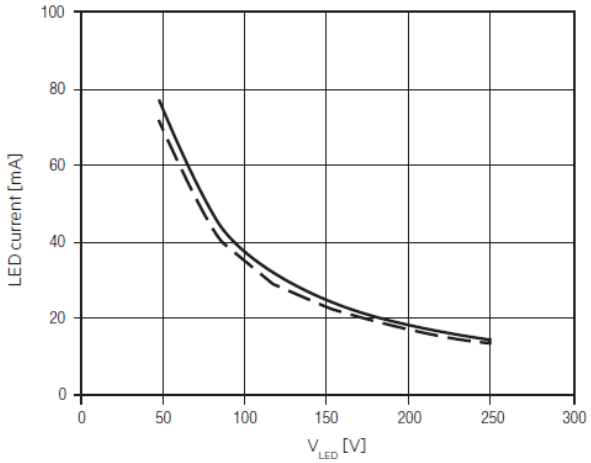


EM converterLED PRO 203 MH/LiFePO4 250V

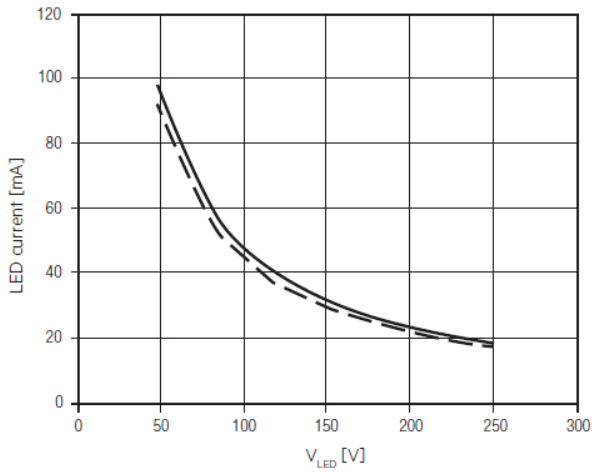


Determining light output in emergency operation

M converterLED PRO 204 MH/LiFePO4 250V



EM converterLED PRO 205 MH/LiFePO4 250V



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

6. Example 1: 1 LED module DLE

6.1. Given:

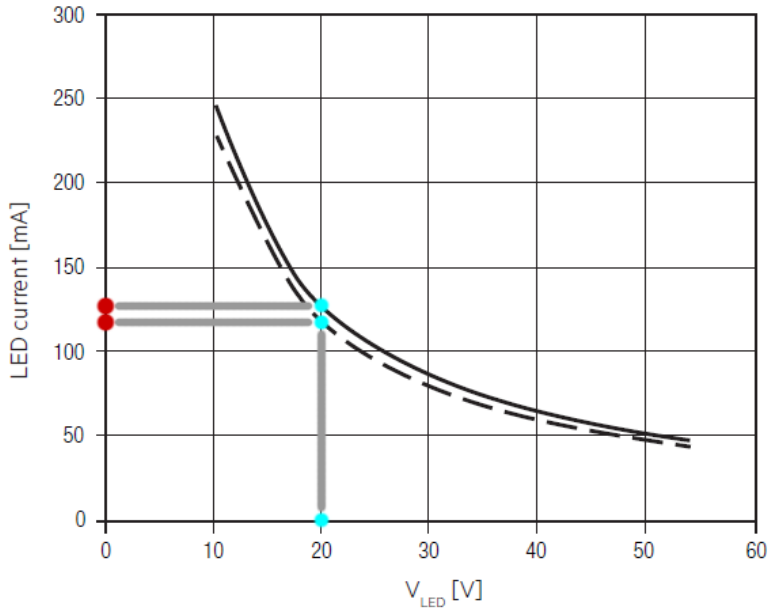
_ Total forward voltage of all LED modules: 20 V (calculated before)

6.2. Wanted:

_ LED current?

6.3. Result:

Figure: Determining LED current for EM converterLED PRO 203 NiCd/NiMH 50V



_ The two crossing points are at around 120 mA (minimum value) and 130 mA (maximum value).

_ The effective value of the LED current is between these two values.

Determining light output in emergency operation

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).

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

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

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

8. Example 1: 1 LED module DLE

8.1. Given:

_ LED current in emergency operation: approx. 60 mA (minimum value) and approx. 70 mA (maximum value) (taken from the previous example, see Example 1: 1 LED module DLE, p. 26)

_ LED current in mains operation 400 mA (taken from data sheet TW DLE G2 60mm 3000lm 927-965 Artikelnr.: 89603439)

_ Light output in mains operation: 2,080 lm (taken from data sheet TW DLE G2 60mm 3000lm 927-965 Artikelnr.: 89603439)

8.2. Wanted:

_ Light output in emergency operation?

8.3. Result:

_ Minimum light output in emergency operation = 60 mA / 400 mA * 2,080 lm = 312 lm

_ Maximum light output in emergency operation = 70 mA / 400 mA * 2,080 = 364 lm

NOTICE

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

EM converterLED with LLE FLEX constant voltage LED loads

⚠ CAUTION!

Please note:

The following description and calculation is only valid for the EXC and ADV layers of LLE FLEX but **not** for the SNC layer.

This is because the layers differ in how the current is limited:

_ EXC and ADV use an integrated circuit

_ SNC uses an ohmic resistor.

This leads to compatibility problems with the EM converterLED (open circuit shutdown responds).

7. EM converterLED with LLE FLEX constant voltage LED loads - Calculating the minimum length of LLE FLEX

Background

The EM converterLED is a constant current emergency LED Driver.
Within certain limitations, it can also be used to operate constant voltage LED loads of the Tridonic LLE FLEX product range.

To ensure a correct operation, the LLE FLEX must have a certain minimum length.
The following guide explains how the minimum length can be calculated for the following devices as an example:

_ Emergency LED Driver: https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_BASIC_MH_LiFePO4_50V_en.pdf -and-

_ LLE FLEX tape: https://www.tridonic.com/com/en/download/data_sheets/Module_LLE_FLEX_8mm_EXC3_en.pdf

The calculation contains numerous steps.

Maximum emergency output current of EM converterLED at 24V

The chosen LLE FLEX 8mm EXC3 tape is a "dimmable 24 V constant voltage LED flextape (SELV)".
This information can be found in the data sheet https://www.tridonic.com/com/en/download/data_sheets/Module_LLE_FLEX_8mm_EXC3_en.pdf at chapter "product description".

This value of 24 V defines the maximum output voltage of the used EM converterLED https://www.tridonic.com/com/en/download/data_sheets/EM_converterLED_BASIC_MH_LiFePO4_50V_en.pdf

To find the corresponding maximum current of the EM converterLED, proceed as follows:

_ go to graph at "Typ. LED current/voltage characteristics"

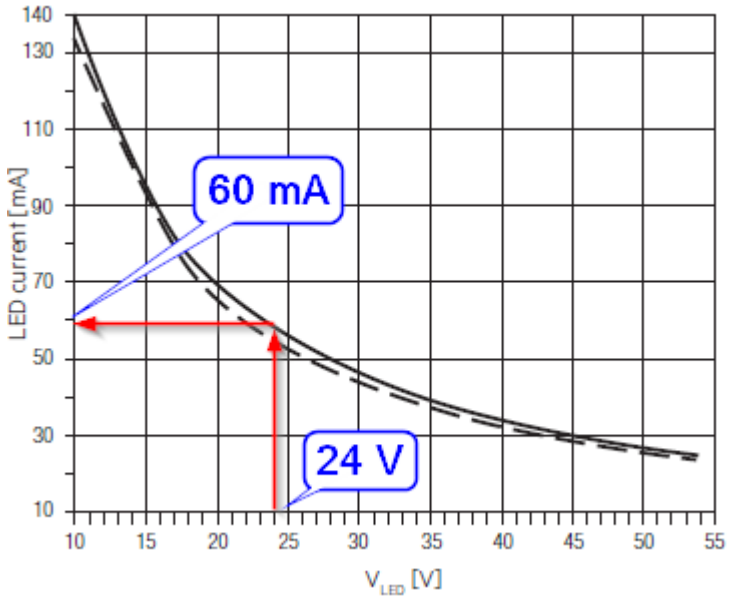
EM converterLED with LLE FLEX constant voltage LED loads

_ mark 24 V forward voltage on the x axis

_ move upwards to reach intersection with the upper current curve (with the higher current value)

_ move to the left until you reach intersection point with current axis

→ Result: approx. 60 mA



Current per meter

_ current per meter can be taken from data sheet https://www.tridonic.com/com/en/download/data_sheets/Module_LLE_FLEX_8mm_EXC3_en.pdf at table "Specific technical data"

→ Result: 222 mA/m

Specific technical data

Type	Photometric code	Typ. luminous flux at tp = 25 °C①	Typ. luminous flux at tp = 65 °C①	Typ. current consumption at tp = 65 °C②	Typ. power consumption at tp = 65 °C②	Efficacy of the module at tp = 25 °C	Efficacy of the module at tp = 65 °C
5,000 mm reel							
LLE FLEX 8x5000 5W-600lm/m 927 EXC3	927/359	690 lm/m	615 lm/m	222 mA/m	5.3 W/m	124 lm/W	115 lm/W
LLE FLEX 8x5000 5W-600lm/m 930 EXC3	930/359	705 lm/m	630 lm/m	222 mA/m	5.3 W/m	127 lm/W	118 lm/W
LLE FLEX 8x5000 5W-600lm/m 940 EXC3	940/359	670 lm/m	595 lm/m	202 mA/m	4.9 W/m	132 lm/W	122 lm/W

Current per one LLE FLEX segment

_ length of one LLE FLEX segment is given as: 5 cm

_ number of parallel LLE FLEX segments per meter can be calculated as:
1 m / 0.05 m = 20

→ 20 segments per meter

EM converterLED with LLE FLEX constant voltage LED loads

_ current per one LLE FLEX segment can be calculated as:
222 mA per meter / 20 pieces per meter = 11.1 mA
→ 11.1 mA is the current per one segment

Minimum number of needed LLE FLEX segments

_ number of segments can be calculated as:
60 mA / 11.1 mA = 5.41 segments

_ Requirement:
"Current drawn from CV load needs to exceed current from EM converterLED @ 24V"
→ A minimum of 6 segments (more than 5.41 segments) is needed

There is no maximum length of the LLE FLEX defined as constant voltage LED load for EM converterLED. Since the provided LED current is split over all connected LED the light output will decrease with the length of the LLE FLEX.
The max. allowed output current rating of the associated constant voltage LED Driver is 2 A eff (current rating of the terminals of EM converterLED) and 2.4 A peak (current rating of switching relays of EM converterLED).

Please refer to the respective EM converterLED product data sheet on www.tridonic.com especially to check the maximum allowed rating of the used constant voltage LED Driver.