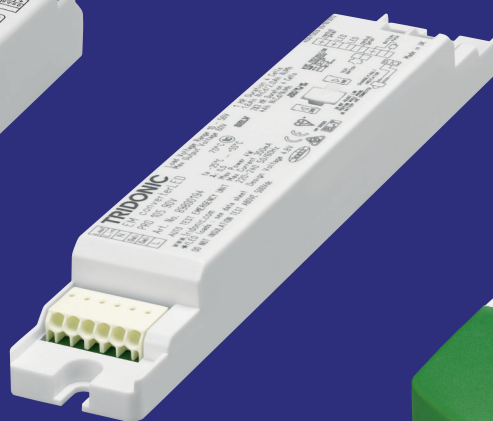


LED Solutions for Emergency Lighting

Functional Description

PRO DALI Emergency Devices

Manual



TRIDONIC

Table of Contents

1. Settings for emergency tests 3

1.1. Time intervals between emergency tests	3
1.2. Type of test system: DALI-controlled or selftest mode	4
1.3. Adaptive test mode	4
1.4. Functionality of the test switch	5
1.5. Intelligent multilevel charging system	6
1.6. Prolong time	8
1.7. Rest mode, Inhibit mode and Relight command	9
1.8. Indicator LED	12

2. A typical installation 14

2.1. Initial startup	14
2.2. Installation without a control system	15

Settings for emergency tests

1.1. 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

1.2. 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, p. 4).</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 powerLED PRO DIM does not go back to selftest mode.

NOTICE

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

1.3. 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](#), p. 5).

1.4. 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.

1.4.1. 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.

1.4.2. 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).

1.4.3. 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](#), 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.

Intelligent multilevel charging system

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.

1.5. 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.

- _ 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.

Intelligent multilevel charging system

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

1.6. 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

1.7. 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.

1.7.1. 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).

1.7.2. 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:

- _ 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

Rest mode and Relight function

- _ 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.

1.7.3. 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.

1.7.4. 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

1.7.5. 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

1.7.6. 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:

- _ 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

Rest mode and Relight function

- _ The polarity of the voltage pulse does not matter

1.7.7. 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 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

1.8. 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 1176 1476 1406" style="border: 1px solid #0070C0; padding: 5px;"> <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 -or- device failure	<p>Incorrect charging current</p> <div data-bbox="550 1550 1476 1713" style="border: 1px solid #0070C0; padding: 5px;"> <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>

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
		<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, p. 6).</p>
GREEN and RED off	Battery operation	Emergency mode: Mains disconnected -or- mains failure

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.

Typical Installation

2.1. 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

2.2. 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.