EM powerLED SELFTEST 4 W

Combined emergency lighting LED driver 1 – 4 W

Product description

- Emergency lighting LED driver with self-test function
- For self-contained emergency lighting
- SELV for output voltage < 60 V DC
- Low profile casing (21 x 30 mm cross-section)
- 5 years guarantee

Properties

- Non maintained operation
- Self-test as per IEC 62034
- Constant current mode
- With screw fastening
- 1, 2 or 3 h rated duration
- Selectable operating time (jumper)
- Output power limitation
- Two-colour status display LED
- „Rest mode“ function
- Simple set-up
- Automatic restart after LED replacement
- Electronic multi-level charge system
- SELV (outputs powerLED, battery, status LED, test switch)
- Polarity reversal protection for battery
- Deep discharge protection
- Very low energy consumption from the battery after activation of the deep discharge protection
- Short-circuit-proof battery connection
- Emergency lighting LEDs available

Self-test:

- Status of the battery
- Status of the LED
- Charge condition
- Function test
- Duration test

Batteries

- High-temperature cells
- NiCd or NiMH batteries
- 4-year design life
- 2 years guarantee (conditions at www.tridonic.com)
- For battery compatibility refer to table „Battery selection“

Standards, page 5

For wiring diagrams and installation examples, page 8

SELV EL-T RoHS

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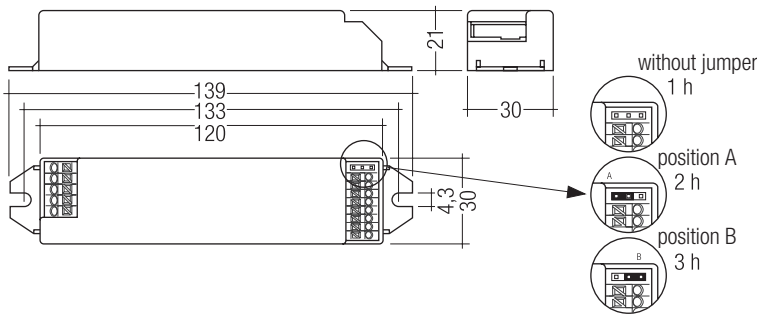
Combined emergency lighting LED driver 1 – 4 W

Technical data

Rated supply voltage	220 – 240 V
Mains frequency	50 / 60 Hz
Typ. λ (at 230 V, 50 Hz)	0.34
Max. open circuit voltage	10 V
Time to light	0.23 s from detection of emergency event
Overvoltage protection	320 V (for 1 h)
Battery discharge current	See page 4
Max. casing temperature tc	70 °C
Ambient temperature ta	-25 … +45 °C
Mains voltage changeover threshold	according to EN 60598-2-22
Type of protection	IP20
Rest mode max. number of emergency units	100
Rest mode max. wiring distance	1,000 m
Functional test	Weekly 5s test
Duration test	Yearly 1 h / 2 h / 3 h test
Lifetime	up to 50,000 h
Guarantee	5 years



Ordering data

Type[2]	Article number	Max. number of LED	Packaging, carton	Packaging, pallet	Weight per pc.
Screw fastening version					
EM powerLED 4 W ST	**89800124**	2	25 pc(s).	1,200 pc(s).	0.068 kg
EM powerLED 4 W ST NiMH	**89800445**	2	25 pc(s).	1,200 pc(s).	0.068 kg

Specific technical data

Type[2]	Rated duration	Forward voltage range LED module	Typ. output power	Mains current in charging operation			Mains power in charging operation		
				Initial charge	Fast recharge	Trickle charge[1]	Initial charge	Fast recharge	Trickle charge[1]
Emergency operation 1000 mA for 1 x LED									
EM powerLED 4 W ST	1 h	2.8 – 3.4 V	3.4 W	21.0 mA	27.5 mA	15.2 mA	2.0 W	3.0 W	1.2 W
EM powerLED 4 W ST	2 h	2.8 – 3.4 V	3.4 W	27.5 mA	32.4 mA	21.0 mA	3.0 W	3.7 W	2.0 W
EM powerLED 4 W ST	3 h	2.8 – 3.4 V	3.4 W	27.5 mA	32.4 mA	21.0 mA	3.0 W	3.7 W	2.0 W
EM powerLED 4 W ST NiMH	1 h	2.8 – 3.4 V	3.4 W	19.0 mA	24.0 mA	13.0 mA	1.7 W	2.4 W	1.0 W
EM powerLED 4 W ST NiMH	2 h	2.8 – 3.4 V	3.4 W	30.0 mA	32.0 mA	13.0 mA	3.1 W	3.3 W	1.1 W
EM powerLED 4 W ST NiMH	3 h	2.8 – 3.4 V	3.4 W	30.0 mA	32.0 mA	13.0 mA	3.1 W	3.3 W	1.1 W
Emergency operation 700 mA for 2 x LED									
EM powerLED 4 W ST	1 h	5.6 – 6.8 V	4.5 W	21.0 mA	27.5 mA	15.2 mA	2.0 W	3.0 W	1.2 W
EM powerLED 4 W ST	2 h	5.6 – 6.8 V	4.5 W	27.5 mA	32.4 mA	21.0 mA	3.0 W	3.7 W	2.0 W
EM powerLED 4 W ST	3 h	5.6 – 6.8 V	4.5 W	27.5 mA	32.4 mA	21.0 mA	3.0 W	3.7 W	2.0 W
EM powerLED 4 W ST NiMH	1 h	5.6 – 6.8 V	4.5 W	19.0 mA	24.0 mA	13.0 mA	1.7 W	2.4 W	1.0 W
EM powerLED 4 W ST NiMH	2 h	5.6 – 6.8 V	4.5 W	30.0 mA	32.0 mA	13.0 mA	3.1 W	3.3 W	1.1 W
EM powerLED 4 W ST NiMH	3 h	5.6 – 6.8 V	4.5 W	30.0 mA	32.0 mA	13.0 mA	3.1 W	3.3 W	1.1 W

[1] For EM powerLED 4 W ST NiMH: average over 20 min. (4 min. charge / 16 min. off)

[2] EM = Emergency

ACCES-SORIES

Test switch EM2

Product description

- For connection to the emergency lighting unit
- For checking the device function

Ordering data

Type	Article number	Packaging, bag	Packaging, carton	Weight per pc.
Test switch EM 2	**89805277**	25 pc(s).	600 pc(s).	0.011 kg

ACCES-SORIES

Status indication system OK/fault

Product description

- Two-colour status display LED
- Green: system OK, red: fault

Ordering data

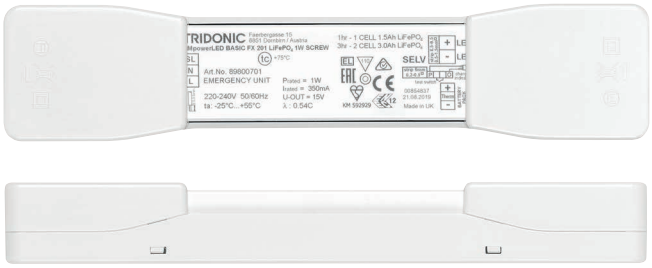
Type	Article number	Packaging, bag	Packaging, carton	Weight per pc.
LED EM bi-colour	**89899720**	25 pc(s).	200 pc(s).	0.017 kg
LED EM bi-colour, high brightness	**89899753**	25 pc(s).	800 pc(s).	0.013 kg

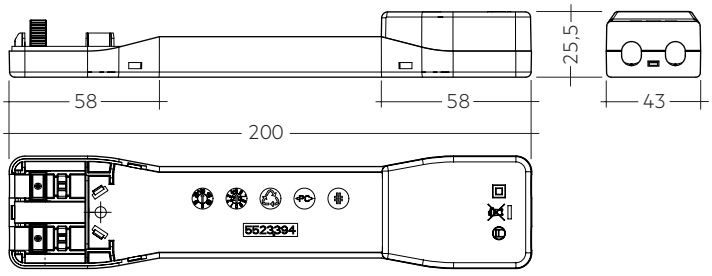
ACCES-SORIES

EMpLED Strain-relief set 200x43x25.5mm

Product description

- Optional strain-relief set for independent applications
- Transforms the EM powerLED into a fully class II compatible LED driver (e.g. ceiling installation)
- Easy and tool-free mounting to the EM powerLED, screwless cable-clamp channels with strain-relief (200 x 43 x 25,5 mm)





Permissible cable jacket diameter 2.2 – 9 mm

Ordering data

Type	Article number	Packaging, carton	Packaging, pallet	Weight per pc.
EMpLED SR	**28004033**	10 pc(s).	1,260 pc(s).	0.06 kg

Battery selection

EM powerLED 4W BASIC, 1 / 2 / 3 h

				Type	EM powerLED 4W ST		EM powerLED 4W ST NiMH	
				Article no.	89800124		89800445	
				Cells	5 cells		5 cells	
				Duration	1 h	2 / 3 h	1 h	2 / 3 h
Technology and capacity	Design	Number of cells	**Type**	**Article no.**	**Assignable batteries**			
NiCd 4 Ah D cells[1]	stick	1 x 5	**Accu-NiCd 5A 55**	**28002774**		•		
	stick + stick	3 + 2	**Accu-NiCd 5C 55**	**89800090**		•		
NiMH 2.2 Ah Cs cells	stick	1 x 5	**Accu-NiMH 5A**	**28002090**	•		•	
	side by side	5 x 1	**Accu-NiMH 5B**	**28002093**	•		•	
NiMH 4 Ah LA cells	stick + stick	2 + 3	**Accu-NiMH 4Ah 5C CON**	**89800439**				•

Battery charge / discharge data

EM powerLED 4W BASIC, 1 / 2 / 3 h

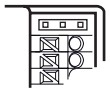
	Type	EM powerLED 4W ST		EM powerLED 4W ST NiMH	
	Article no.	**89800124**		**89800445**	
	Cells	**5 cells**		**5 cells**	
	Duration	**1 h**	**2 / 3 h**	**1 h**	**2 / 3 h**
Battery charge time	Initial charge	20 h			
	Fast recharge	10 h	15 h	10 h	15 h
	Trickle charge	continuously			
Charge current	Initial charge	130 mA	250 mA	130 mA	300 mA
	Fast recharge	250 mA	330 mA	210 mA	330 mA
	Trickle charge	60 mA	130 mA	127 mA / 4 min. 0 mA / 16 min.	201 mA / 4 min. 0 mA / 16 min.
Discharge current		1,100 mA	1,100 mA	1,100 mA	1,100 mA
Charge voltage range[1]		1.07 – 1.6 V per cell			
Discharge voltage range		1.6 – 1.07 V per cell			

[1] The battery will be charged below 1.07 V. The EM powerLED will indicate a battery fault.
The emergency lighting LED driver will recharge the battery normally after running the test of 61347-2-7 CL 22.3 (abnormal operating conditions).

Standards

- EN 61347-2-7
- EN 61347-2-13
- EN 62384
- EN 55015
- EN 61000-3-2
- EN 61000-3-3
- EN 61547
- EN 60068-2-64
- EN 60068-2-29
- EN 60068-2-30
- according to EN 50172
- according to EN 60598-2-22
- according to EN 62034

Duration link selection

Duration	Link Position
1 hr	 without jumper
2 hr	 position A
3 hr	 position B

Jumper selection
Module supplied with jumper in 3 hours position (position B).

The position of the link will only be read on first power up. If it is changed afterwards both the battery and mains supply must be disconnected for 10 seconds to enable the EM powerLED to read the new link position on reconnection of the battery and mains. It will lead to a false battery failure indication if the link is changed after installation without this reset.

Technical data batteries

Accu-NiCd
4.2 / 4.5 Ah

Battery voltage/cell	1.2 V
Cell type	D
Case temperature range to ensure 4 years design life	5 °C to +55 °C
Max. short term battery case temperature (shorter than 1 month over the battery lifetime)	70 °C
Max. number discharge cycles	4 cycles per year plus 4 cycles during comissioning
Max. storage time	6 months

Accu-NiMH
2.2 Ah

Battery voltage/cell	1.2 V
Cell type	Cs
Case temperature range to ensure 4 years design life	
When used with EM powerLED 4W ST	+5 °C to +50 °C
When used with EM powerLED 4W ST NiMH	+5 °C to +55 °C
Max. short term battery case temperature (shorter than 1 month over the battery lifetime)	70 °C
Max. number discharge cycles	4 cycles per year plus 30 cycles during comissioning
Max. storage time	12 months

4.0 Ah

Battery voltage/cell	1.2 V
Cell type	LA
Case temperature range to ensure 4 years design life	
When used with EM powerLED 4W ST	+5 °C to +45 °C
When used with EM powerLED 4W ST NiMH	+5 °C to +50 °C
Max. short term battery case temperature (shorter than 1 month over the battery lifetime)	70 °C
Max. number discharge cycles	4 cycles per year plus 30 cycles during comissioning
Max. storage time	12 months

For further information refer to corresponding battery datasheet.

Short-circuit protection
In case of a short circuit the battery protection opens the connection to the driver and the output is therefore free of voltage. The output will be reactivated again when the short circuit is removed.

Storage, installation and commissioning
Relevant information about storage conditions, installation and commissioning are provided in the battery datasheets.

Further technical data

The EM powerLED has a unique power regulation circuit; this is designed to limit the total power drawn from the battery in the event of using LED's with a forward voltage (Vf) higher than 3.4 V.

In such cases the unit will reduce the LED current in order to maintain an acceptable drain current from the battery and hence meet the required duration time. This feature enables the EM powerLED to have minimum battery count for a given range of LED's.

Lifetime
Average lifetime 50,000 hours under rated conditions with a failure rate of less than 10 %. Average failure rate of 0.2 % per 1000 operating hours.

Testing

Functional test
Functional tests are carried out for 5 seconds on a weekly basis under the control of the Micro controller. Initiation and timing of these tests is set during the commissioning of the luminaire.

Duration test
A full duration test is carried out yearly to check the capacity of the batteries.

For a full description of commissioning and test features please refer to application notes.

Commissioning
After installation of the luminaire and initial connection of the mains supply and battery supply to the EM powerLED ST the unit will commence charging the batteries for 20 hours (initial charge). Afterwards the module will conduct a commissioning test for the full duration. The 20 hours recharge occurs also if a new battery is connected or the module exits the rest mode condition.
The following automatic commissioning duration test is only performed when a battery is replaced and fully charged (after 20 hours).
The easy commissioning feature will set the initial test day and time to ensure random testing of units.

Test switch
An optional test switch can be wired to each EM powerLED ST. This can be used to to:

- initiate a 5 seconds function test — press 200 ms < T < 1 s
- execute function test as long as switch pressed — > 1 s press
- adjust local timing — > 10 s press

Timer reset functionality
The timer for function and duration test can be set to a particular time of the day by either pressing the test switch for longer than 10 seconds or cycling the unswitched line supply 5 times within 1 minute. The timer adjustment will enable the test start time to be defined manually at time in day when the timer was reset. It will also disable the adaptive test algorithm thereby forcing the unit to perform the test at the same time rather than it being defined by the adaptive algorithm. This function will only work provided the interval time is greater than zero (automatic test mode enabled). The delay timer value set when the unit was commissioned will be reloaded in order to randomise the tests between adjacent units.
The factory programmed delay offset (1 – 28 days) will be loaded after the reset into the delay timer for the function and duration test in order to randomize the tests between adjacent units.

Rest Mode / Inhibit Mode

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. If the Inhibit Mode has been activated before the mains supply is switched off, Rest Mode will be automatically activated if the mains supply is switched off within 15 minutes.
Rest Mode and Inhibit Mode can be initiated by applying a short pulse between 9.5 and 22.5 V_{DC} in amplitude for a period of 150 to 1,000 ms. This pulse shall be applied to terminals marked Rest.
After a mains reset the EM powerLED ST exits the Rest Mode. Rest Mode and Inhibit Mode can both be disabled by applying a voltage pulse of 1,000 to 2,000 ms to the terminals marked as Rest to send the RE-LIGHT/ RESET INHIBIT command.

Pulse/Mode	Standby	Emergency	Rest
150 – 1,000 ms	Inhibit	Rest	–
1,000 – 2,000 ms	Cancel inhibit	–	Re-light

Insulation and electric strength testing of luminaires

Electronic devices can be damaged by high voltage. This has to be considered during the routine testing of the luminaires in production.

According to IEC 60598-1 Annex Q (informative only!) or ENEC 303-Annex A, each luminaire should be submitted to an insulation test with 500 V_{DC} for 1 second. This test voltage should be connected between the interconnected phase and neutral terminals and the earth terminal. The insulation resistance must be at least 2 MΩ.

As an alternative, IEC 60598-1 Annex Q describes a test of the electrical strength with 1,500 V_{AC} (or 1,414 x 1,500 V_{DC}). To avoid damage to the electronic devices this test must not be conducted.

Status indication

System status is indicated by a bi-colour LED.

LED Indication	Status	Commentary
Permanent green	System OK	AC mode
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	
Red LED on	Load failure	Open circuit / Short circuit / LED failure ①
Slow flashing red (1 s on – 1 s off)	Battery failure	Battery failed the duration test or function / Battery is defect / Incorrect battery voltage
Fast flashing red (0.1 s on – 0.1 s off)	Charging failure	Incorrect charging current
Double pulsing green	Rest mode	Switching into blocking mode via controller
Green and red off	DC mode	Battery operation (Emergency mode)

① If the EM powerLED is operated in non-maintained mode and an LED fault is detected, the red indicator LED will be illuminated and the output will be stopped. The unswitched mains supply must be switched off before the LED is changed in order that the new LED can be detected. A function or duration test will not reset the fault indication.

Mechanical details

Case manufactured from polycarbonate.

Glow-wire test according to EN 61347-1 with increased temperature of 850 °C passed.

LED bi-colour status indicator
- Green / red
- Mounting hole 6.5 mm diameter, 1 – 1.6 mm thickness
- Lead length 1,000 mm
- Insulation rating: 90 °C

Test switch
- Mounting hole 7.0 mm diameter
- Lead length 550 mm

Battery leads
- Quantity: 1 red and 1 black
- Length: 1 m
- Wire type: 0.5 mm^2 solid conductor
- Insulation rating: 90 °C

Battery end termination
Push on 4.8 mm receptacle to suit battery spade fitted with insulating cover

Module end termination
8.0 mm stripped insulation

Two-piece batteries are supplied with a 200 mm lead with 4.8 mm receptacles at each end and insulating covers to connect the separate sticks together.

Batteries

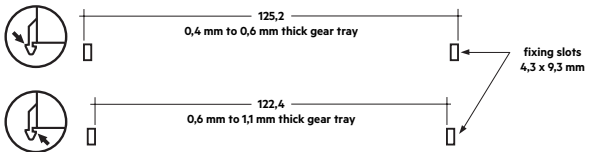
Connection method: 4.8 x 0.5 mm spade tag welded to end of cell

For stick packs this connection is accessible after the battery caps have been fitted.

To inhibit inverter operation disconnect the batteries by removing the connector from the battery spade tag.

For battery data see separate data sheet.

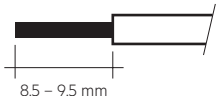
Recommended fixing details for clip fixing



Wiring type and cross section

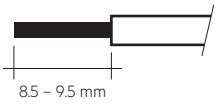
Wiring
mains (SL, N, L)
LED (LED +, LED –)

0.5 – 1.5 mm² solid or fine-stranded
0.5 – 1.0 mm² fine-stranded with ferrule



Wiring
batteries (Bat +, Bat –)
test switch (switch)
status indication LED (status K, A)

0.2 – 0.5 mm² solid or fine-stranded
0.25 mm² fine-stranded with ferrule



Use one wire for each terminal connector only.

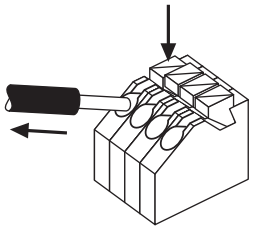
Max. lead insulation diameter

Battery	2.1 mm
Test switch	2.1 mm
Indicator LED	2.1 mm

Maximum lead length

LED	3 m
status indication LED	1 m
batteries	1 m

Release of the wiring
Press down the “push button” and remove the cable from front.



Maximum loading of automatic circuit breakers

Automatic circuit breaker type	B10	C10	B13	C13	B16	C16	B20	C20	Inrush current	
Installation Ø	1.5 mm²	1.5 mm²	1.5 mm²	1.5 mm²	2.5 mm²	2.5 mm²	2.5 mm²	2.5 mm²	I_{max}	Time
EM powerLED 4 W ST	90	180	130	260	130	260	130	260	10 A	120 µs
EM powerLED 4 W ST NiMH	90	180	130	260	130	260	130	260	10 A	120 µs

Insulation matrix

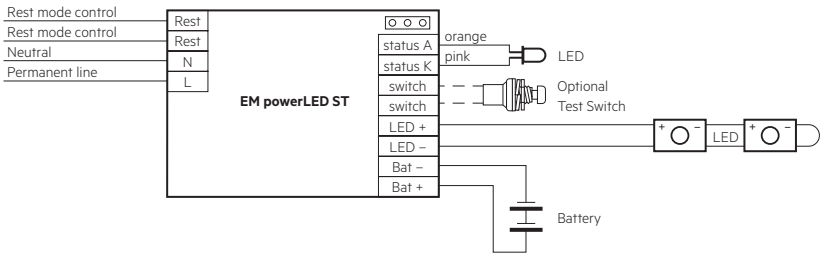
	Mains	Switched Live	Battery, LED, Test switch, Indicator LED	REST
Mains	–	•	••	•
Switched Live	•	–	••	•
Battery, LED, Test switch, Indicator LED	••	••	–	•
REST	•	•	•	–

• Represents basic insulation

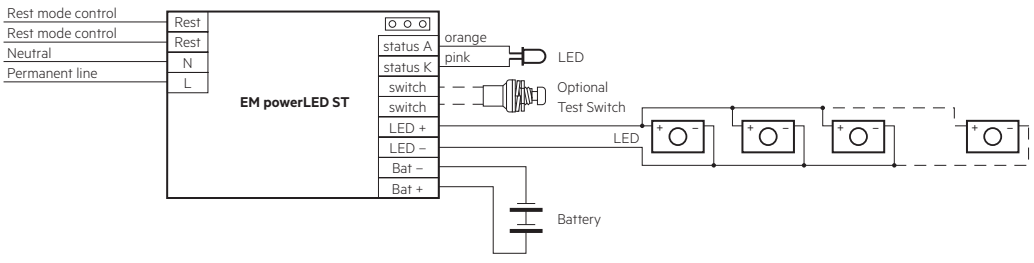
•• Represents double or reinforced insulation

Wiring diagrams

Wiring diagram for one LED or two LED in series



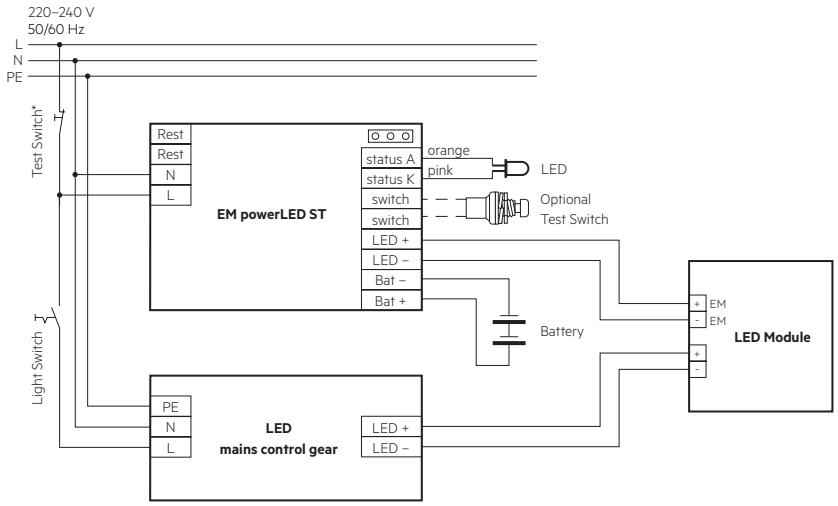
Wiring diagram for multiple LED (3–12) in parallel



Take care that the LED is connected with the right polarity.
LED that are connected to the EM powerLED PRO EZ-3 devices should have a reverse polartity protection device such as a schottky diodes fitted, otherwise irreversible damage could occur if the LED is connected in reverse polarity. Any protection device must be capaple of handling in excess of 1,000 mA.

Note: Please ensure that at the terminal of the EM powerLED module the battery negative is not connected to the negative of the LED load.

Manually tested emergency lighting with combined LED modules for general and emergency lighting (e.g. STARK QLE CLASSIC EM, STARK LLE 24-280-1250 EM, STARK CLE CLASSIC EM, STARK SLE CLASSIC EM):
Due to the fact that independent circuits are used for general and emergency lighting it is important that the normal supply of the mains LED driver is switched off together with the permanent emergency supply prior to checking the operation of the emergency LEDs.
If this is not done then it may not be possible to see that the emergency LEDs are operating.
Use a circuit similar to that shown next.



* Use 230 V Test switch

Wiring instructions

- The EM powerLED terminals, battery, indicator LED and test switch terminals are classified as SELV. Keep the wiring of the DALI and the input terminals separated from the wiring of the SELV terminals or consider special wiring (double insulation, 6 mm creepage and clearance) when these connections should be kept SELV.
- The output to the LED is DC but has high frequency content at 125 kHz, which should be considered for good EMC compliance.
- EM powerLED leads should be separated from the mains and DALI connections and wiring for good EMC performance. With some luminaires it may be necessary to add a ferrite bead inductor to obtain satisfactory EMC performance.
- Maximum lead length on the EM powerLED terminals is 3 m. For a good EMC performance keep the LED wiring as short as possible.
- The secondary wires (LED module) should be routed in parallel to ensure good EMC performance.
- 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 EM powerLED leads to prevent noise coupling.
- Battery leads are specified with 0.5 mm^2 cross section and a length of < 1.3 m.
- DALI terminals are mains proof.
- To avoid the damage of the control gear, the wiring must be protected against short circuits to earth (sharp edged metal parts, metal cable clips, louver, etc.).

Mains-connected transformers

The EM powerLED does not contain mains-connected windings of transformers.

FELV control terminals

FELV control terminals marked „Risk of electric shock“ are not safe to touch. Insulate circuits connected to any FELV control terminal for the Low Voltage supply voltage of the device. Protect terminals connected to the FELV circuit against accidental contact.

Additional information

Additional technical information at www.tridonic.com → Technical Data

Guarantee conditions at www.tridonic.com → Services

Lifetime declarations are informative and represent no warranty claim.
No warranty if device was opened.