

EM powerLED SELFTEST 1 – 2 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 (conditions at www.tridonic.com)

Properties

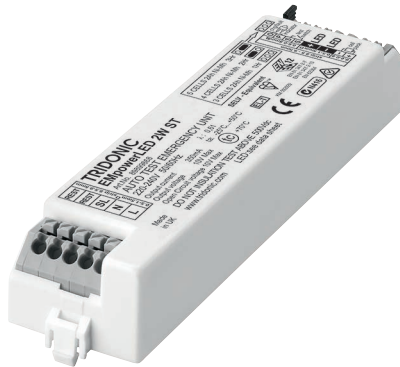
- Mains and emergency operation
- Self-test as per IEC 62034
- Constant current mode
- With either screw or clip fastening (clip-fix)
- 1, 2 or 3 h rated duration
- Selectable operating time (jumper)
- Output power limitation
- Two-colour status display LED
- „Rest mode“ function
- Simple set-up
- Automatic restart after LED replacement
- Electronic multi-level charge system
- Pulse current charging to optimize battery life
- 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
 - Lifetime test

Batteries

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



Screw-fix



Clip-fix



Standards, page 5

For wiring diagrams and installation examples, page 6

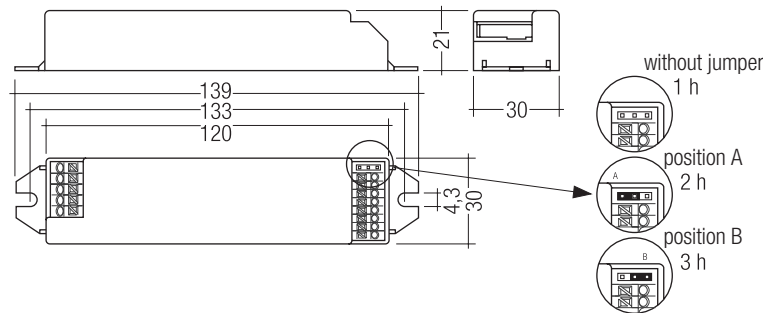


EM powerLED SELFTEST 1 – 2 W

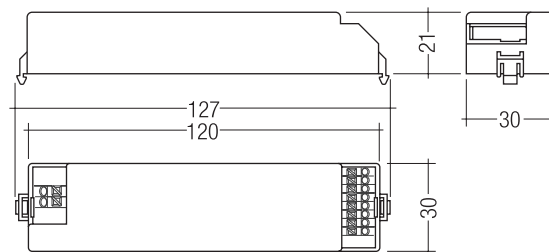
Combined emergency lighting LED driver 1 – 4 W

Technical data

Rated supply voltage	220 – 240 V
Mains frequency	50 / 60 Hz
Forward voltage range LED module (1 x LED) [®]	2.8 – 3.4 V
Forward voltage range LED module (2 x LED) [®]	5.6 – 6.8 V
Max. open circuit voltage	10 V
Time to light	0.31 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 ... +50 °C
Mains voltage changeover threshold	according to EN 60598-2-22
Type of protection	IP20
Lifetime	up to 50,000 h
Guarantee (conditions at www.tridonic.com)	5 years



Screw-fix



Clip-fix

Ordering data

Type [®]	Article number	Dimensions L x W x H	Max. number of LED	Packaging, carton	Packaging, pallet	Weight per pc.
Screw fastening version						
EM powerLED 1 W ST	89899860	139 x 30 x 21 mm	1	25 pc(s).	1,200 pc(s).	0.056 kg
EM powerLED 2 W ST	89899861	139 x 30 x 21 mm	2	25 pc(s).	1,200 pc(s).	0.056 kg
Clip fastening version						
EM powerLED 1 W ST	89899867	127 x 30 x 21 mm	1	25 pc(s).	1,200 pc(s).	0.056 kg
EM powerLED 2 W ST	89899868	127 x 30 x 21 mm	2	25 pc(s).	1,200 pc(s).	0.056 kg

Specific technical data

Type [®]	Rated duration	Typ. λ (at 230 V, 50 Hz) [®]	Typ. output power	Non-maintained operation: Mains current			Non-maintained operation: Mains power			Maintained operation: Mains current			Maintained operation: Mains power		
				Initial charge	Fast recharge	Trickle charge	Initial charge	Fast recharge	Trickle charge	Initial charge	Fast recharge	Trickle charge	Initial charge	Fast recharge	Trickle charge
EM powerLED 1 W ST	1 h	0.52c	1 W	14 mA	16 mA	13 mA	1.1 W	1.4 W	1.0 W	28 mA	30 mA	25 mA	3.2 W	3.6 W	2.8 W
EM powerLED 1 W ST	2 h	0.52c	1 W	14 mA	16 mA	13 mA	1.1 W	1.4 W	1.0 W	28 mA	30 mA	25 mA	3.2 W	3.6 W	2.8 W
EM powerLED 1 W ST	3 h	0.52c	1 W	15 mA	18 mA	13 mA	1.1 W	1.6 W	1.0 W	28 mA	30 mA	25 mA	3.2 W	3.6 W	2.8 W
EM powerLED 2 W ST	1 h	0.55c	2 W	15 mA	18 mA	13 mA	1.2 W	1.7 W	1.0 W	40 mA	45 mA	33 mA	4.8 W	5.2 W	4.0 W
EM powerLED 2 W ST	2 h	0.55c	2 W	18 mA	21 mA	13 mA	1.6 W	2.1 W	1.0 W	40 mA	45 mA	33 mA	5.0 W	5.5 W	4.0 W
EM powerLED 2 W ST	3 h	0.55c	2 W	20 mA	24 mA	13 mA	1.9 W	2.5 W	1.0 W	40 mA	45 mA	33 mA	5.2 W	5.8 W	4.0 W

[®] Maintained operation

[®] EM = Emergency

[®] Tolerance range for electrical data: $\pm 10\%$

ACCESSORIES

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

ACCESSORIES

Status indication bi-colour LED

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

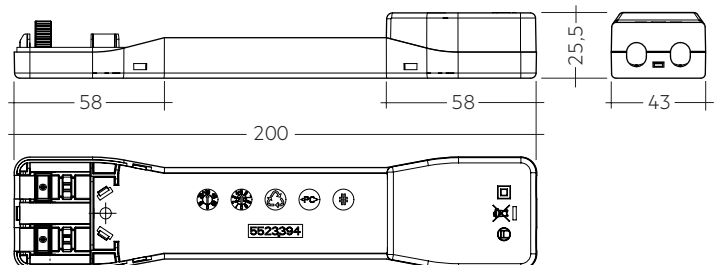
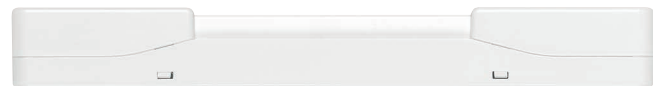
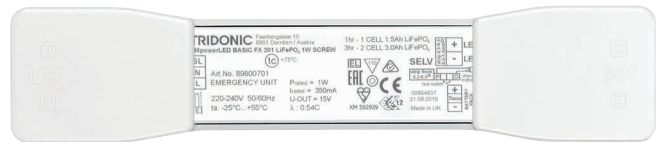
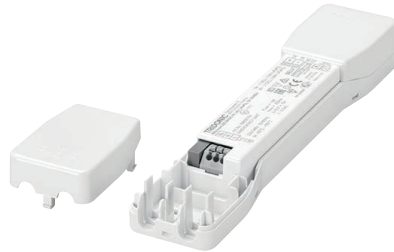


ACCES-
SORIES

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

1. Standards

- EN 61347-2-7
- EN 61347-2-13
- EN 62384
- EN 55015
- EN 61000-3-2
- 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

1.1 Glow-wire test

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

1.2 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.

2. Thermal details and lifetime

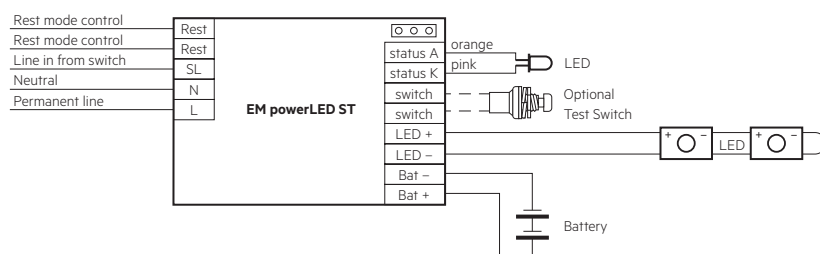
2.1 Lifetime

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.

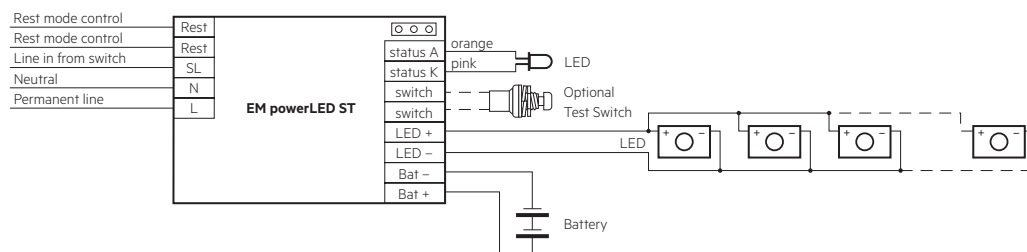
3. Installation / Wiring

3.1 Wiring diagrams

3.1.1 Serial wiring with one or two LED modules



3.1.2 Parallel wiring with multiple LED modules (3 – 12)



Take care that the LED is connected with the right polarity.
LED that are connected to the EM powerLED devices should have a reverse polarity 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 capable of handling in excess of 700 mA.

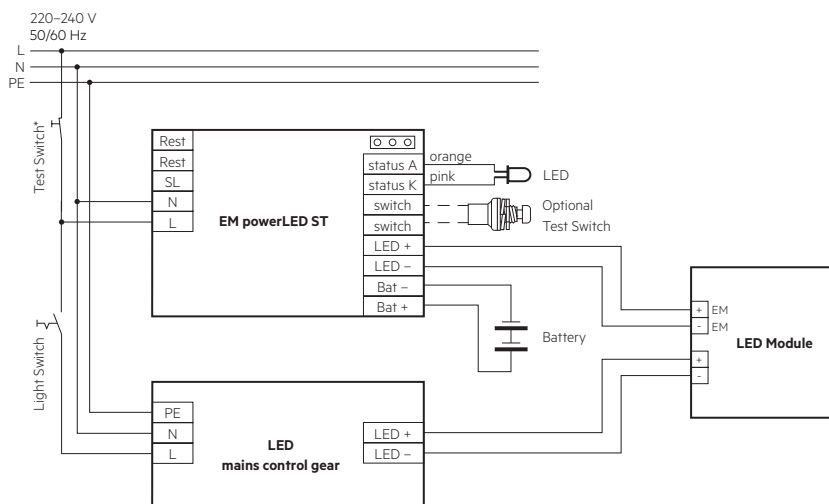
Note: Please ensure that at the terminal of the EM powerLED module the battery negative is not connected to the negative of the LED load.

3.1.3 Manually tested emergency lighting with combined LED modules for general and emergency lighting

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

3.1.4 Simple CORRIDOR FUNCTION with EM powerLED 1-2 W

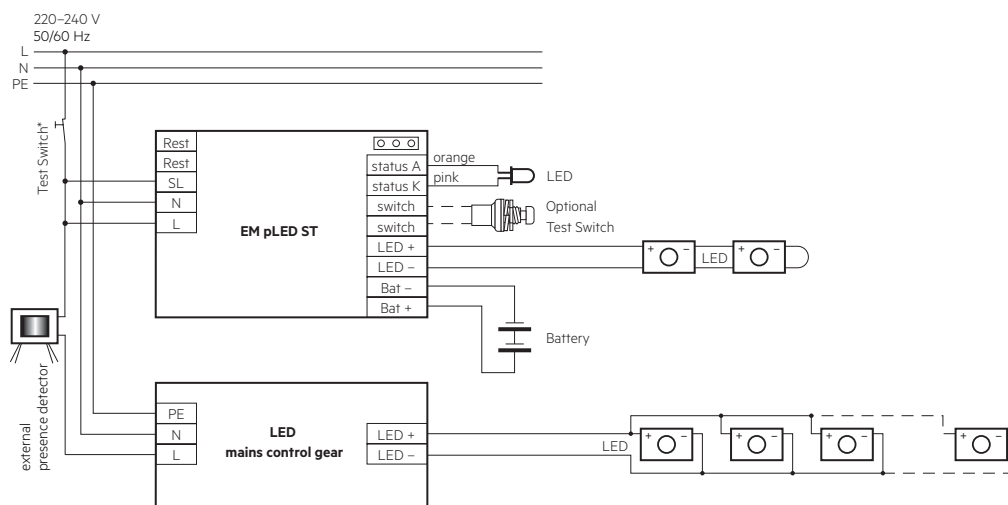
With the mains operation function of the EM powerLED 1-2 W a simple corridor function can be realised.

An external presence detector switches the mains LED driver.

The EM powerLED 1-2 W has the switched line SL connected to permanent mains supply.

On presence both mains LED driver and EM powerLED 1-2 W are active and driving all LEDs. With no presence the mains LED driver is switched off by the presence detector and the EM powerLED 1-2 W stays on operating the emergency LEDs at low power.

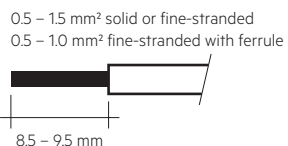
Use a circuit similar to that shown next.



3.2 Wiring type and cross section

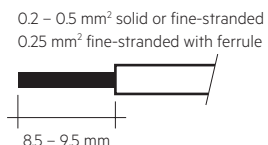
Wiring

mains (SL, N, L)
LED (LED +, LED -)



Wiring

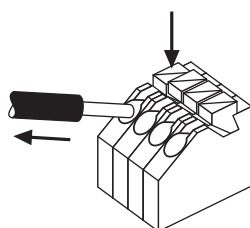
batteries (Bat +, Bat -)
test switch (switch)
status indication LED (status K, A)



Use one wire for each terminal connector only.

3.3 Release of the wiring

Press down the "push button" and remove the cable from front.



3.4 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.
- 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 mm² cross section and a length of < 1.3 m.
- DALI terminals are mains proof.
- Switched live and unswitched live supplies must be off the same phase.
- 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.).

3.5 Max. lead insulation diameter

Battery	2.1 mm
Test switch	2.1 mm
Indicator LED	2.1 mm

3.6 Maximum lead length

LED	3 m
Status indication LED	1 m
Batteries	1 m

4. Mechanical details

Case manufactured from polycarbonate.

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 mm² solid conductor
- Insulation rating: 90 °C

Battery end termination

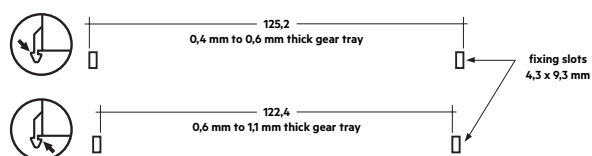
Push on 4.8 mm receptacle to suit battery spade fitted with insulating cover

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.

4.1 Recommended fixing details for clip fixing



Max. torque at the clamping screw: 0.5 Nm / M4

5. Electrical values

5.1 Maximum loading of automatic circuit breakers

Automatic circuit breaker type	B10	C10	B13	C13	B16	C16	B20	C20	Inrush current	
Installation Ø	1.5 mm ²	1.5 mm ²	1.5 mm ²	1.5 mm ²	2.5 mm ²	2.5 mm ²	2.5 mm ²	2.5 mm ²	I _{max}	time
EM powerLED 1 W ST	90	180	130	260	130	260	130	260	10 A	120 µs
EM powerLED 2 W ST	90	180	130	260	130	260	130	260	10 A	120 µs

5.2 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

5.3 Typ. LED current

EM powerLED 1-2 W ST, 1 / 2 / 3 h

Type	EM powerLED 1 W ST	EM powerLED 2 W ST
Article no.	89899860, 89899867	89899861, 89899868
LED current in emergency operation		
1 x LED	350 mA	600 mA
2 x LED	–	350 mA
LED current in mains operation		
1 x LED	350 mA	350 mA
2 x LED	–	350 mA

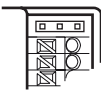


6. Emergency output factor EOFi

EM powerLED 1-2 W ST, 1 / 2 / 3 h

Type	EM powerLED 1 W ST	EM powerLED 2 W ST
Article no.	89899860, 89899867	89899861, 89899868
Cells	2 / 3 cells	3 / 4 / 5 cells
LED current	LED load	LED load
350 mA	100 %	100 %
350 mA	100 %	100 %
350 mA	100 %	100 %
600 mA	–	170 %
600 mA	–	170 %
600 mA	–	170 %

7. Functions

7.1 Duration link selection

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

7.2 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.

7.3 Status indication

System status is indicated by a bi-colour LED.

LED Indication	Status	Commentary
Permanent green	System OK	AC mode
Fast flashing green (0.1s on – 0.1s off)	Function test underway	
Slow flashing green (1s on – 1s off)	Duration test underway	
Red LED on	Load failure	Open circuit / Short circuit / LED failure ^①
Slow flashing red (1s on – 1s off)	Battery failure	Battery failed the duration test or function / Battery is defect / Incorrect battery voltage
Fast flashing red (0.1s on – 0.1s 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.

7.4 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

7.5 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 (V_f) 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.

At a low charge state of the battery (<1.5 V at the 1 W driver and <3 V at the 2 W driver) the LED will not be driven in maintained mode via the switched line until the rated battery voltage levels are exceeded.

8. Battery data

8.1 Battery selection

EM powerLED 1-2 W ST, 1 / 2 / 3 h

				Type	EM powerLED 1 W ST			EM powerLED 2 W ST		
				Article no.	89899860, 89899867			89899861, 89899868		
				Duration	1 h	2 h	3 h	1 h	2 h	3 h
				Cells	2 cells	3 cells	3 cells	3 cells	4 cells	5 cells
Technology and capacity	Design	Number of cells	Type	Article no.	Assignable batteries					
NiMH 2.2Ah Cs cells	stick	1 x 2	Accu-NiMH 2A	28002087	•					
	stick	1 x 3	Accu-NiMH 3A	28002088		•	•	•		
	stick	1 x 4	Accu-NiMH 4A	28002089					•	
	stick	1 x 5	Accu-NiMH 5A	28002090						•
	side by side	5 x 1	Accu-NiMH 5B	28002093						•

8.2 Battery charge / discharge data

EM powerLED 1-2 W ST, 1 / 2 / 3 h

	Type	EM powerLED 1 W ST			EM powerLED 2 W ST		
	Article no.	89899860, 89899867			89899861, 89899868		
	Duration	1 h	2 h	3 h	1 h	2 h	3 h
	Cells	2 cells	3 cells	3 cells	3 cells	4 cells	5 cells
Battery charge time	Initial charge	20 h					
	Fast recharge	12 h					
	Trickle charge	continuously (pulse charge)					
Charge current	Initial charge	130 mA					
	Fast recharge	210 mA					
	Trickle charge	130 mA / 0 mA (4 min. / 16 min.)					
Discharge current	1 x LED	770 mA	460 mA	460 mA	900 mA	640 mA	500 mA
	2 x LED	—	—	—	870 mA	630 mA	500 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).

8.3 Accu-NiMH 2.2 Ah

Battery voltage/cell	1.2 V
Cell type	Cs
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 30 cycles during commissioning
Max. storage time	12 months

8.4 Accupack-NiMH 2.2 Ah

Battery voltage/cell	1.2 V
Cell type	Cs
Ambient temperature range to ensure 4 years design life	+5 °C to +35 °C
tc point	+40 °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 commissioning
Max. storage time	12 months

8.5 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 further information refer to corresponding battery datasheet.

8.6 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.

8.7 Storage, installation and commissioning

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

9. Miscellaneous

9.1 Mains-connected transformers

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

9.2 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.

9.3 Additional information

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

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