TRIDONIC

LED Driver
Linear dimming

Driver LC 50W 100–400mA 140V o4a h16 PRE
premium series non-SELV

Product description
- Dimmable built-in constant current LED Driver
- Dimming range 1 – 100 %
- For luminaires of protection class I and protection class II
- Adjustable output current between 100 and 400 mA via ready2mains™ Programmer, I-SELECT 2 plugs or DALI
- Max. output power 50 W
- Up to 90 % efficiency
- Power input on stand-by < 0.15 W
- Nominal life-time up to 100,000 h
- 5-year guarantee

Housing properties
- Low profile metal casing with white cover
- Only 16 mm housing height
- Type of protection IP20

Interfaces
- one4all (DALI-2 DT 6, DSI, switchDIM, corridorFUNCTION)
- ready2mains™ (configuration and dimming via mains)
- Terminal blocks: 0° push terminals

Functions
- Adjustable output current in 1-mA-steps (DALI, ready2mains™, I-SELECT 2)
- Constant light output function (CLO)
- Power-up fading at AC
- Configurable via ready2mains™
- Service monitor to log certain events
- Protective features (overtemperature, short-circuit, overload, no-load, input voltage range, reduced surge amplification)
- Intelligent Voltage Guard (overvoltage and undervoltage monitoring)
- Suitable for emergency escape lighting systems acc. to EN 50172

Benefits
- Application-oriented operating window for maximum compatibility
- Best energy savings due to low stand-by losses and high efficiency
- Flexible configuration via DALI, ready2mains™ and I-SELECT 2

Typical applications
- For linear/area lighting in office applications

Standards, page 5

TRIDONIC

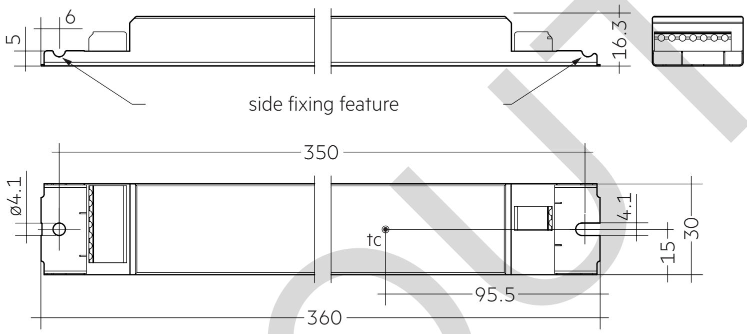
LED Driver
Linear dimming

RoHS

Driver LC 50W 100–400mA 140V o4a h16 PRE
premium series non-SELV

Technical data

Rated supply voltage	220 – 240 V
AC voltage range	198 – 264 V
DC voltage range	176 – 280 V
Mains frequency	0 / 50 / 60 Hz
Overvoltage protection	320 V AC, 48 h
Typ. current (at 230 V, 50 Hz, full load)① ②	87 – 241 mA
Typ. current (220 V, 0 Hz, full load, 15 % dimming level)②	29 – 53 mA
Leakage current	< 330 μA
Max. input power	56 W
Typ. efficiency (at 230 V / 50 Hz / full load)②	90 %
λ (at 230 V, 50 Hz, full load)①	0.99
Typ. power input on stand-by③	< 0.15 W
Typ. input current in no-load operation	17 mA
Typ. input power in no-load operation	0.42 W
In-rush current (peak / duration)	23.4 A / 182 μs
THD (at 230 V, 50 Hz, full load)①	< 5 %
Starting time (AC mode)	< 0.6 s
Starting time (DC mode)	< 0.3 s
Switchover time (AC/DC)⑥	< 0.3 s
Turn off time (at 230 V, 50 Hz, full load)	< 16 ms
Output current tolerance①	± 3 %
Max. output current peak (non-repetitive)	≤ output current + 35 %
Output LF current ripple (< 120 Hz)	± 2 %
Output P_{st}LM	≤ 1
Output SVM	≤ 0.4
Max. output voltage (no-load voltage)	250 V
Dimming range	1 – 100 %
Mains surge capability (between L – N)	1 kV
Mains surge capability (between L/N – PE)	2 kV
Surge voltage at output side (against PE)	< 500 V
Type of protection	IP20
Life-time	up to 100,000 h
Dimensions L x W x H	360 x 30 x 16.3 mm



Ordering data

Type	Article number	Packaging carton	Packaging pallet	Weight per pc.
LC 50/100-400/140 o4a h16 PRE	**28002370**	10 pc(s).	760 pc(s).	0.202 kg

Specific technical data

Type	Output current[4]	Min. forward voltage	Max. forward voltage	Max. output power	Typ. power consumption (at 230 V, 50 Hz, full load)	Typ. current consumption (at 230 V, 50 Hz, full load)	Max. casing temperature tc	Ambient temperature ta max.	I-SELECT 2 resistor value[5]
LC 50/100-400/140 o4a h16 PRE	100 mA	50 V	140 V	14.0 W	18.4 W	87 mA	80 °C	-25 ... +60 °C	open
	125 mA	50 V	140 V	17.5 W	22.1 W	102 mA	80 °C	-25 ... +55 °C	40.20 kΩ
	150 mA	50 V	140 V	21.0 W	25.7 W	117 mA	80 °C	-25 ... +55 °C	33.20 kΩ
	175 mA	50 V	140 V	24.5 W	29.3 W	132 mA	80 °C	-25 ... +55 °C	28.70 kΩ
	200 mA	50 V	140 V	28.0 W	33.0 W	148 mA	80 °C	-25 ... +50 °C	24.90 kΩ
	225 mA	50 V	140 V	31.5 W	36.5 W	162 mA	80 °C	-25 ... +50 °C	22.10 kΩ
	250 mA	50 V	140 V	35.0 W	40.1 W	178 mA	80 °C	-25 ... +50 °C	20.00 kΩ
	275 mA	50 V	140 V	38.5 W	43.7 W	194 mA	80 °C	-25 ... +50 °C	18.20 kΩ
	300 mA	50 V	140 V	42.0 W	47.3 W	209 mA	80 °C	-25 ... +50 °C	16.50 kΩ
	325 mA	50 V	140 V	45.5 W	51.0 W	225 mA	80 °C	-25 ... +50 °C	15.40 kΩ
	350 mA	50 V	140 V	49.0 W	54.7 W	241 mA	75 °C	-25 ... +50 °C	14.30 kΩ
	375 mA	50 V	133 V	49.9 W	55.4 W	244 mA	75 °C	-25 ... +50 °C	13.30 kΩ
	400 mA	50 V	125 V	50.0 W	55.6 W	245 mA	75 °C	-25 ... +50 °C	short circuit (0 Ω)

[1] Valid at 100 % dimming level. Output current is mean value.

[2] Depending on the selected output current.

[3] Depending on the DALI traffic at the interface.

[4] The table only lists a number of possible operating points but does not cover each single point. The output current can be set within the total value range in 1-mA-steps. Output current is mean value.

[5] Not compatible with I-SELECT (generation 1). Calculated resistor value.

[6] Valid for immediate change of power supply type otherwise the starting time is valid.

ACCES-
SORIES

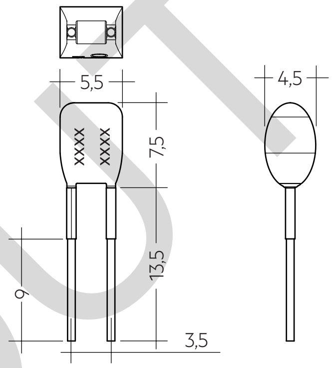
I-SELECT 2 PLUG PRE / EXC

Product description

- Ready-for-use resistor to set output current value
- Compatible with LED Driver featuring I-SELECT 2 interface; not compatible with I-SELECT (generation 1)
- Resistor is base insulated
- Resistor power 0.25 W
- Current tolerance ± 2 % to nominal current value
- Compatible with LED Driver series PRE and EXC

Example of calculation

- R [kΩ] = 5 V / I_out [mA] x 1000
- E96 resistor value used
- Resistor value tolerance ≤ 1 %; resistor power ≥ 0.1 W; base insulation necessary
- When using a resistor value beyond the specified range, the output current will automatically be set to the minimum value (resistor value too big), respectively to the maximum value (resistor value too small)



Ordering data

Type	Article number	Colour	Marking	Current	Resistor value	Packaging bag	Weight per pc.
I-SELECT 2 PLUG 125MA BL	**28001101**	Blue	0125 mA	125 mA	40.20 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 150MA BL	**28001102**	Blue	0150 mA	150 mA	33.20 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 175MA BL	**28001103**	Blue	0175 mA	175 mA	28.70 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 200MA BL	**28001104**	Blue	0200 mA	200 mA	24.90 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 225MA BL	**28001105**	Blue	0225 mA	225 mA	22.10 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 250MA BL	**28001106**	Blue	0250 mA	250 mA	20.00 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 275MA BL	**28001107**	Blue	0275 mA	275 mA	18.20 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 300MA BL	**28001108**	Blue	0300 mA	300 mA	16.50 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 325MA BL	**28001109**	Blue	0325 mA	325 mA	15.40 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 350MA BL	**28001110**	Blue	0350 mA	350 mA	14.30 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 375MA BL	**28001111**	Blue	0375 mA	375 mA	13.30 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG 400MA BL	**28001112**	Blue	0400 mA	400 mA	12.40 kΩ	10 pc(s).	0.001 kg
I-SELECT 2 PLUG MAX BL	**28001099**	Blue	MAX	MAX	0.00 kΩ	10 pc(s).	0.001 kg

1. Standards

EN 55015
EN 61000-3-2
EN 61000-3-3
EN 61347-1
EN 61347-2-13
EN 62384
EN 61547
EN 62386-101 (DALI-2)
EN 62386-102 (DALI-2)
EN 62386-207 (DALI-2)
According to EN 50172 for use in central battery systems
According to EN 60598-2-22 suitable for emergency lighting installations

2. Thermal details and life-time

2.1 Expected life-time

Expected life-time

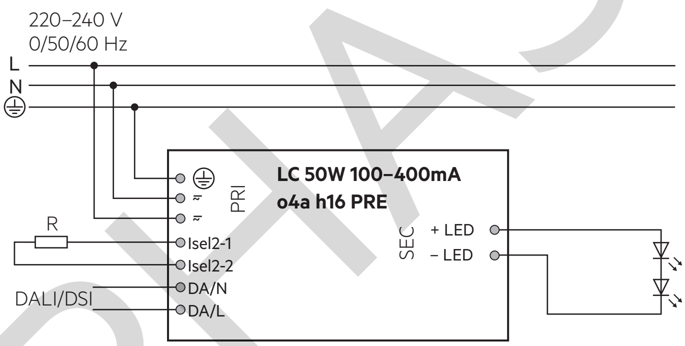
Type	Output current	ta	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
LC 50/100-400/140 o4a h16 PRE	100 mA	tc	60 °C	65 °C	70 °C	75 °C	78 °C	80 °C
		Life-time	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h
	> 100 – 200 mA	tc	65 °C	68 °C	70 °C	75 °C	80 °C	–
		Life-time	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h	–
	> 200 – 300 mA	tc	65 °C	70 °C	75 °C	80 °C	–	–
		Life-time	> 100,000 h	> 100,000 h	> 100,000 h	95,000 h	–	–
	> 300 – 400 mA	tc	60 °C	65 °C	70 °C	75 °C	–	–
		Life-time	> 100,000 h	> 100,000 h	> 100,000 h	> 100,000 h	–	–

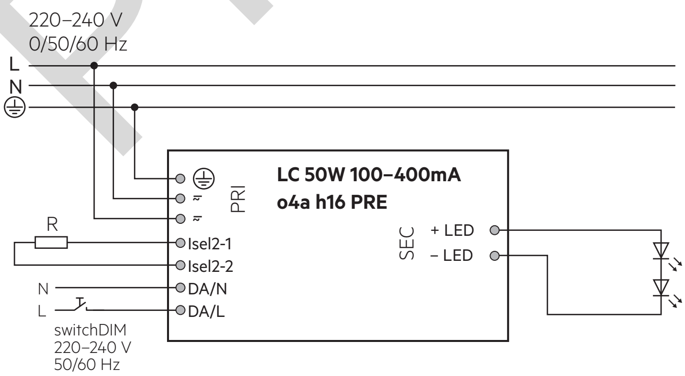
The LED Driver is designed for a life-time stated above under reference conditions and with a failure probability of less than 10 %.

The relation of tc to ta temperature depends also on the luminaire design.
If the measured tc temperature is approx. 5 K below tc max., ta temperature should be checked and eventually critical components (e.g. ELCAP) measured. Detailed information on request.

3. Installation / wiring

3.1 Circuit diagram



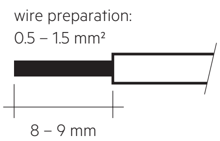


For wiring in dimming operation with ready2mains refer to the ready2mains Gateway datasheet.

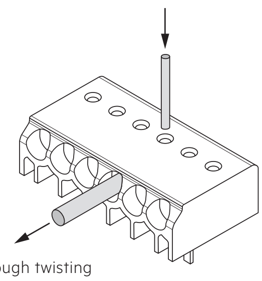
3.2 Wiring type and cross section

Solid wire with a cross section of 0.5 – 1.5 mm². Strip 8 – 9 mm of insulation from the cables to ensure perfect operation of terminals.

LED module/LED Driver/supply



3.3 Loose wiring



Loosen wire through twisting and pulling or using a Ø 1 mm release tool

3.4 Wiring guidelines

- Run the secondary lines separately from the mains connections and lines to achieve good EMC performance.
- The max. secondary cable length is 2 m (4 m circuit), this applies for LED output as well as for I-SELECT 2.
- For good EMC performance, keep the LED wiring as short as possible.
- Secondary switching is not permitted.
- The LED Driver has no inverse-polarity protection on the secondary side. Wrong polarity can damage LED modules with no inverse-polarity protection.
- Wrong wiring of the LED Driver can lead to malfunction or irreparable damage.
- To avoid the damage of the Driver, the wiring must be protected against short circuits to earth (sharp edged metal parts, metal cable clips, louver, etc.).

3.5 Hot plug-in

Hot plug-in is not supported due to residual output voltage of > 0 V.
If a LED load is connected the device has to be restarted before the output will be activated again.
This can be done via mains reset or via interface (DALI, DSI, switchDIM, ready2mains).

3.6 Earth connection

The earth connection is conducted as protection earth (PE). The LED Driver can be earthed via earth terminal or metal housing. If the LED Driver will be earthed, protection earth (PE) has to be used. There is no earth connection required for the functionality of the LED Driver. Earth connection is recommended to improve following behaviour.

- Electromagnetic interferences (EMI)
- LED glowing at stand-by
- Transmission of mains transients to the LED output

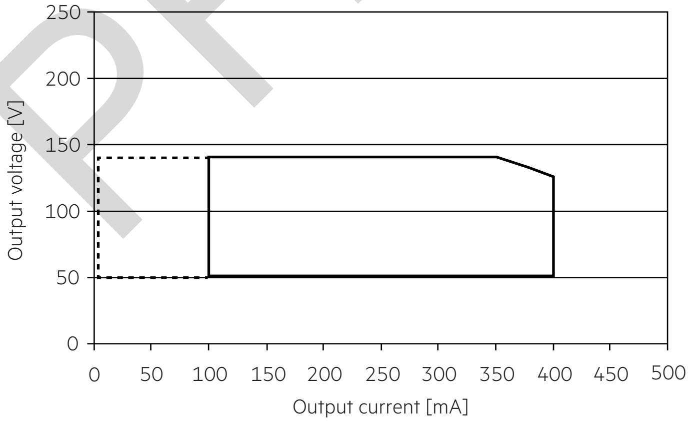
In general it is recommended to earth the LED Driver if the LED module is mounted on earthed luminaire parts respectively heat sinks and thereby representing a high capacity against earth.

3.7 External I-SELECT 2 resistors on LED modules

LED modules with on-board I-SELECT 2 resistors may cause irreparable damages, caused by surge / burst peaks.

4. Electrical values

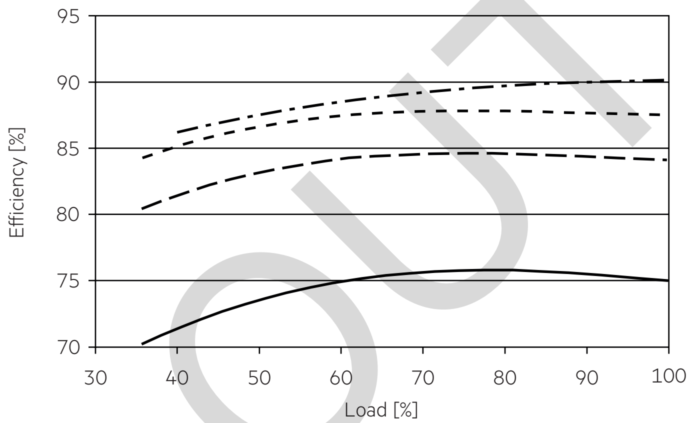
4.1 Operating window



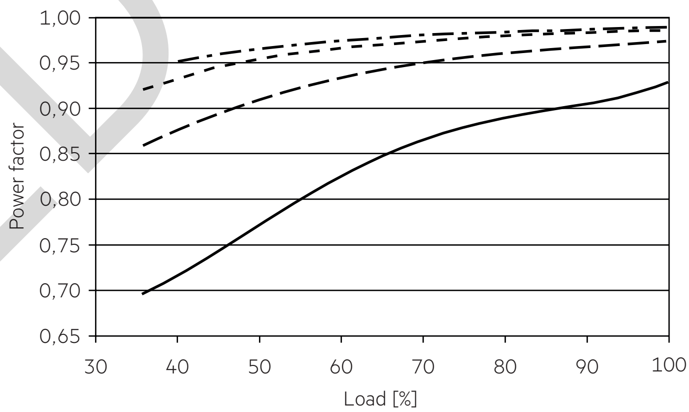
Operating window 100 %
Operating window dimmed

Make sure that the LED Driver is operated within the given window under all operating conditions. Special attention needs to be paid at dimming and DC emergency operation as the forward voltage of the connected LED modules varies with the dimming level, due to the implemented amplitude dimming technology. Coming below the specified minimum output voltage of the LED Driver may cause the device to shut-down. See chapter "6.11 Light level in DC operation" for more information.

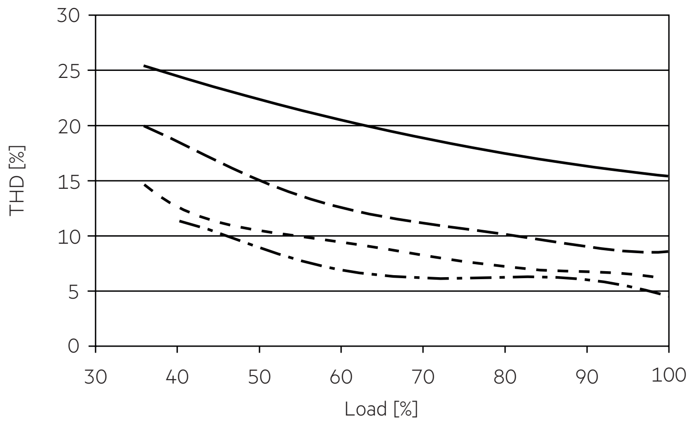
4.2 Efficiency vs load



4.3 Power factor vs load



4.4 THD vs load



100 mA
200 mA
300 mA
400 mA

100 % load corresponds to the max. output power (full load) according to the table on page 2.

4.5 Maximum loading of automatic circuit breakers in relation to inrush current

Automatic circuit breaker type	C10	C13	C16	C20	B10	B13	B16	B20	Inrush current	
Installation Ø	1.5 mm²	1.5 mm²	2.5 mm²	2.5 mm²	1.5 mm²	1.5 mm²	2.5 mm²	2.5 mm²	I_{max}	time
LC 50/100-400/140 o4a h16 PRE	21	28	35	45	13	17	21	27	23.4 A	182 µs

This are max. values calculated out of inrush current! Please consider not to exceed the maximum rated continuous current of the circuit breaker.
Calculation uses typical values from ABB series S200 as a reference.
Actual values may differ due to used circuit breaker types and installation environment.

4.6 Harmonic distortion in the mains supply (at 230 V / 50 Hz and full load) in %

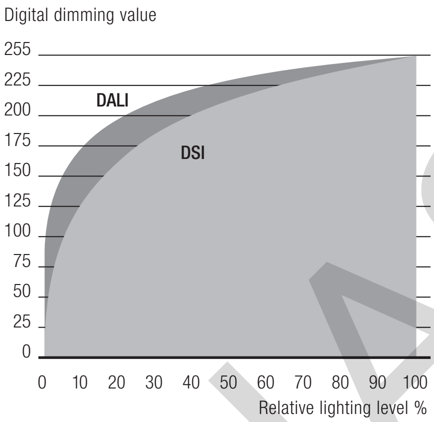
	THD	3.	5.	7.	9.	11.
LC 50/100-400/140 o4a h16 PRE	< 6	< 5	< 1	< 1	< 1	< 1

4.7 Dimming

Dimming range 1 % to 100 %
Digital control with:
- DSI signal:
  8 bit Manchester Code Speed 1 % to 100 % in 1.4 s
- DALI signal:
  16 bit Manchester Code Speed 1 % to 100 % in 0.2 s
  Programmable parameter:
  Minimum dimming level Maximum dimming level Default minimum = 1 %

Dimming curve is adapted to the eye sensitiveness.
Dimming is realized by amplitude dimming.

4.8 Dimming characteristics



Dimming characteristics as seen by the human eye

5. Interfaces / communication

5.1 Control input (DA/N, DA/L)

Digital DALI signal or switchDIM can be wired on the same terminals (DA/N and DA/L).

The control input is non-polar for digital control signals (DALI, DSI). The control signal is not SELV. Control cable has to be installed in accordance to the requirements of low voltage installations.
Different functions depending on each module.

5.2 Control input ready2mains (L, N)

The digital ready2mains protocol is modulated onto the mains signal which is wired to the mains terminal (L and N).

5.3 switchDIM

Integrated switchDIM function allows a direct connection of a pushbutton for dimming and switching.
Brief push (< 0.6 s) switches LED Driver ON and OFF. The dimm level is saved at power-down and restored at power-up. When the pushbutton is held, LED modules are dimmed. After repush the LED modules are dimmed in the opposite direction.
In installations with LED Drivers with different dimming levels or opposite dimming directions (e.g. after a system extension), all LED Drivers can be synchronized to 50 % dimming level by a 10 s push.
Use of pushbutton with indicator lamp is not permitted.

6. Functions

6.1 Adjustable current

The output current of the LED Driver can be adjusted in a certain range. For adjustment there are three options available.

Option 1: DALI
Adjustment is done by masterCONFIGURATOR (see masterCONFIGURATOR documentation).

Option 2: I-SELECT 2
By inserting a suitable resistor into the I-SELECT 2 interface, the current value can be adjusted. The relationship between output current and resistor value can be found in the chapter “Accessories I-SELECT 2 Plugs”.
If the resistor is connected by wires a consistent base insulation must be ensured. Furthermore, a max. wire length of 2 m may not be exceeded and potential interferences have to be avoided.

Please note that the resistor values for I-SELECT 2 are not compatible with I-SELECT (generation 1). Installation of an incorrect resistor may cause irreparable damage to the LED module(s).

Resistors for the main output current values can be ordered from Tridonic (see accessories).

Option 3: ready2mains
Adjustment is done by the ready2mains programmer and the corresponding configuration software (see ready2mains documentation).

The priority for current adjustment methods is DALI (highest priority), I-SELECT 2, ready2mains (lowest priority).

6.2 ready2mains – configuration

The ready2mains interface can be used to configure the main parameters of LED Drivers via the mains wiring, such as LED output current, CLO and DC level. These parameters can be adjusted either via ready2mains-capable configuration software or directly via the ready2mains programmer (output current only).

6.3 ready2mains – dimming

At a later stage, ready2mains will allow for mains-based group dimming, controlled via the ready2mains protocol and appropriate dimming interfaces.

For details on the operation of ready2mains and its components see the relevant technical information.

6.4 Short-circuit behaviour

In case of a short-circuit at the LED output the LED output is switched off. After restart of the LED Driver the output will be activated again. The restart can either be done via mains reset or via interface (DALI, DSI, switchDIM, ready2mains).

6.5 No-load operation

The LED Driver will not be damaged in no-load operation. The output will be deactivated and is therefore free of voltage. If a LED load is connected the device has to be restarted before the output will be activated again.

6.6 Overload protection

If the output voltage range is exceeded the LED Driver turns off the LED output. After restart of the LED Driver the output will be activated again. The restart can either be done via mains reset or via interface (DALI, DSI, switchDIM, ready2mains).

6.7 Overtemperature protection

The LED Driver is protected against temporary thermal overheating.
If the temperature limit is exceeded the output current of the LED module(s) is reduced. The temperature protection is activated above tc max.
The activation temperature differs depending on the LED load.
On DC operation this function is deactivated to fulfill emergency requirements.

6.8 corridorFUNCTION

The corridorFUNCTION can be programmed in two different ways.
To program the corridorFUNCTION by means of software a DALI-USB interface is needed in combination with a DALI PS. The software can be the masterCONFIGURATOR.
To activate the corridorFUNCTION without using software a voltage of 230 V has to be applied for five minutes at the switchDIM connection.
The unit will then switch automatically to the corridorFUNCTION.

Note:
If the corridorFUNCTION is wrongly activated in a switchDIM system (for example a switch is used instead of pushbutton), there is the option of installing a pushbutton and deactivating the corridorFUNCTION mode by five short pushes of the button within three seconds.

switchDIM and corridorFUNCTION are very simple tools for controlling gears with conventional pushbuttons or motion sensors.
To ensure correct operation a sinusoidal mains voltage with a frequency of 50 Hz or 60 Hz is required at the control input.
Special attention must be paid to achieving clear zero crossings. Serious mains faults may impair the operation of switchDIM and corridorFUNCTION.

6.9 Constant light output (CLO)

The luminous flux of an LED decreases constantly over the life-time. The CLO function ensures that the emitted luminous flux remains stable. For that purpose the LED current will increase continuously over the LED life-time.
In masterCONFIGURATOR it is possible to select a start value (in percent) and an expected life-time. The LED Driver adjusts the current afterwards automatically.

6.10 Power-up/-down fading

The power-up/-down function offers the opportunity to modify the on-/off behavior. The time for fading on or off can be adjusted in a range of 0.2 to 16 seconds. According to this value, the device dims either from 0 % up to the power-on level or from the current set dim level down to 0 %. This feature applies while operating via switchDIM, ready2mains and when switching the mains voltage on or off. By factory default no fading time is set (= 0 seconds).

6.11 Light level in DC operation

The LED Driver is designed to operate on DC voltage and pulsed DC voltage. For a reliable operation, make sure that also in DC emergency operation the LED Driver is run within the specified conditions as stated in chapter "4.1 operating window".

Light output level in DC operation: programmable 1 – 100 % (EOFi = 0.13).
Programming by DALI or ready2mains.
In DC operation dimming mode can be activated.

The voltage-dependent input current of Driver incl. LED module is depending on the used load.

The voltage-dependent no-load current of Driver (without or defect LED module) is for:
AC: < 17 mA
DC: < 38 mA

6.12 Intelligent Voltage Guard

Intelligent Voltage Guard is the name of the electronic monitoring of the mains voltage. It immediately shows if the mains voltage rises above certain thresholds. Measures can then be taken quickly to prevent damage to the LED Driver.

- If the mains voltage rises above approx. 280 Vrms (voltage depends on the LED Driver type), the LED light starts flashing on and off.
- To avoid a damage of the LED Driver the mains supply has to be switched off at this signal.

6.13 Software / programming

With appropriate software and a interface different functions can be activated and various parameters can be configured in the LED Driver. To do so, a DALI-USB or ready2mains programmer and the software (masterCONFIGURATOR) are required.

6.14 masterCONFIGURATOR

From version 2.8:
For programming functions (CLO, I-SELECT 2, power-up fading, corridorFUNCTION) and device settings (fade time, ePowerOnLevel, DC level, etc.). For further information see masterCONFIGURATOR manual.

6.15 deviceCONFIGURATOR

PC (windows) based software application to transfer parameters into our drivers.
Workflow optimised for the use in OEM production line.
For further information see deviceCONFIGURATOR manual.

7. Miscellaneous

7.1 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 1500 V_{AC} (or 1.414 x 1500 V_{DC}). To avoid damage to the electronic devices this test must not be conducted.

7.2 Conditions of use and storage

Humidity:	5 % up to max. 85 %, not condensed (max. 56 days/year at 85 %)
Storage temperature:	-40 °C up to max. +80 °C

The devices have to be acclimatised to the specified temperature range (ta) before they can be operated.

7.3 Maximum number of switching cycles

All LED Driver are tested with 50,000 switching cycles.
The actually achieved number of switching cycles is significantly higher.

7.4 Additional information

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

Guarantee conditions at www.tridonic.com → Services

Life-time declarations are informative and represent no warranty claim.
No warranty if device was opened.