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Technical application guide

2DIMLT2 P LED drivers

OSRAM

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1 Introduction

1.1 OSRAM LED drivers with 2DIM functionality for outdoor and industrial applications

Long lifetime, low maintenance costs and high efficiency are very important for outdoor and industrial applications. OPTOTRONIC® LED drivers for outdoor applications meet these requirements and unlock the full potential of LED-based light sources.

Thanks to the flexibility of the fast, power-off programming of OPTOTRONIC® 2DIMLT2 P LED drivers, LED luminaire systems can be optimally adapted to the required conditions and their cost can be optimized. With the two integrated dimming functions (2DIM), significant energy savings and a reduction of greenhouse gas emissions can be achieved.

In order to be ready for smart city infrastructures, the 0–10V interface allows for the simple integration into tele-management systems.

Due to the wide operating window (voltage/current) of these LED drivers, both OSRAM LED modules for outdoor applications and customer-specific LED modules can be operated. This also means that the overall amount of different LED drivers on stock can be kept low and that the overall complexity of luminaire maintenance over the entire life cycle can be reduced.























With the LEDset2 interface, we have created a new path towards standardizing the communication between the LED driver and the LED modules. Without reprogramming, LEDset2 ensures optimal efficiency, a high level of reliability and the adaptability of the LED drivers to the latest LED technologies.

Finally, due to integrated overvoltage protection, LED drivers with 2DIM functionality are also setting a new standard against surges of up to 6 kV for class I and II luminaires.

1.2 2DIMLT2 P product family

The 2DIMLT2 P product family consists of two different output power classes of up to 110W and two current ranges of up to 1.4 A. All types have the same 2DIM dimming capabilities and the new multi-vendor LEDset2 interface. They can be programmed via the Tuner4TRONIC® software. The following overview shows the main features of these new LED drivers.

Table 1: Family overview

				
Product name	OT 50/120-277/800 2DIMLT2 P	OT 50/120-277/1A2 2DIMLT2 P	OT 100/120-277/800 2DIMLT2 P	OT 110/120-277/1A4 2DIMLT2 P
General				
Maximum power	 50W	50W	100W	110W
Input voltage L/N	 120 V, 220–240 V, 277 V	120 V, 220–240 V, 277 V	120 V, 220–240 V, 277 V	120 V, 220–240 V, 277 V
Output current range	 105–800 mA	180–1250 mA	105–800 mA	180–1400 mA
Surge (dif/com)	6/6 kV	6/6 kV	6/6 kV	6/6 kV
Insulation (primary/secondary)	 SELV	SELV	Double	SELV
Insulation of casing	 Double	Double	Double	Double
Dimming features				
DALI	 Not supported	Not supported	Not supported	Not supported
0–10V	 ✓	✓	✓	✓
StepDIM (SD)	 ✓ + ext. relay	✓ + ext. relay	✓ + ext. relay	✓ + ext. relay
StepDIM inverse (SD)	 ✓ + ext. relay	✓ + ext. relay	✓ + ext. relay	✓ + ext. relay
AstroDIM (astro-based)	 ✓	✓	✓	✓
AstroDIM (time-based)	 Not supported	Not supported	Not supported	Not supported
MainsDIM	 Not supported	Not supported	Not supported	Not supported
Presence detection	 ✓ + ext. relay	✓ + ext. relay	✓ + ext. relay	✓ + ext. relay
Other features				
Constant lumen function	 ✓	✓	✓	✓
Fit for SMART GRID	 Not supported	Not supported	Not supported	Not supported
LEDset2	 ✓	✓	✓	✓
External NTC	 ✓	✓	✓	✓
Programming software				
Tuner4TRONIC®	 ✓	✓	✓	✓

0–10 V



All OSRAM 2DIMLT2 P LED drivers are equipped with a 0–10V interface which provides an easy and proven dimming possibility. Due to the wide distribution of the 0–10V interface in the market, there are many suitable sensors and control systems available.

StepDIM/StepDIM inverse



Dimming via an external control phase: In combination with an external switch-over relay connected to the 0–10V interface, the 2DIMLT2 P LED driver is applicable for StepDIM installations. The dimming value can be set using the Tuner4TRONIC® software.

AstroDIM



Automatic dimming via an integrated timer (no real-time clock): Five independent dimming levels and zones can be set with the Tuner4TRONIC® software. Brightness variation is possible in combination with an external presence sensor.

CLO (constant lumen output)



The decrease in the luminous flux of an LED module can be compensated over its entire lifetime via a preprogrammed current curve. This not only ensures stable lighting but also saves energy and increases the lifetime of the LEDs.

LEDset (Generation 2)



The new generation LEDset2 is an improved LED module interface for the combination of single or multiple LED modules with one LED driver via a single analog control line. This interface enables external current setting and temperature monitoring. The LEDset2 interface has no auxiliary supply and is not compatible with LEDset (Generation 1). LEDset2 has an absolute current coding, while LEDset (Generation 1) only has a relative one.

External temperature sensor



This feature allows the temperature protection of the LED module or the complete luminaire in hot ambient temperatures via an external sensor (e.g. NTC, negative temperature coefficient resistor). The derating can be modified via the Tuner4TRONIC® software.

Note:

It is not possible to use the LEDset2 interface and an external NTC at the same time since they share the same port.

Integrated overvoltage protection



The 2DIMLT2 P LED drivers have an integrated overvoltage protection of up to 6kV for differential and 6kV for common mode overvoltages.

1.3 Nomenclature

The product name of each OPTOTRONIC® 2DIMLT2 P LED driver is defined as shown below.

Figure 1: OT 110/120-277/1A4 2DIMLT2 P



- OT:** OPTOTRONIC® LED driver
- 110:** Power class: 110W
- 120-277:** Input voltage range (L/N): 120–277 V
- 1A4:** Max. output current: 1400 mA
- 2DIM:** 2DIM functionality (0–10 V, AstroDIM)
- LT2:** LEDset2 (LED module interface)
- P:** Humidity-protected with IP 64

1.4 Operating windows

The OPTOTRONIC® 2DIMLT2 P LED driver family is split up into two different power classes to provide the best suitable power supply for different applications.

Table 2: 2DIMLT2 P maximum allowed output power

Type	P _{max}	t _a	V _{in} (nominal)
OT 50/120-277/ 800 2DIMLT2 P	50 W	-40...+50 °C	120/277 V
		-40...+55 °C	220–240 V
OT 50/120-277/ 1A2 2DIMLT2 P	50 W	-40...+50 °C	120/277 V
		-40...+55 °C	220–240 V
OT 100/120-277/ 800 2DIMLT2 P	90 W	-40...+45 °C	120 V
	100 W	-40...+55 °C	220–240 V
	100 W	-40...+50 °C	277 V
OT 110/120-277/ 1A4 2DIMLT2 P	110 W	-40...+40 °C	120 V
		-40...+55 °C	220–240 V
		-40...+55 °C	277 V

Figure 2: Overview of 2DIMLT2 P operating windows

- OT 50/800 2DIMLT2 P
- OT 100/800 2DIMLT2 P
- OT 50/1A2 2DIMLT2 P
- OT 110/1A4 2DIMLT2 P

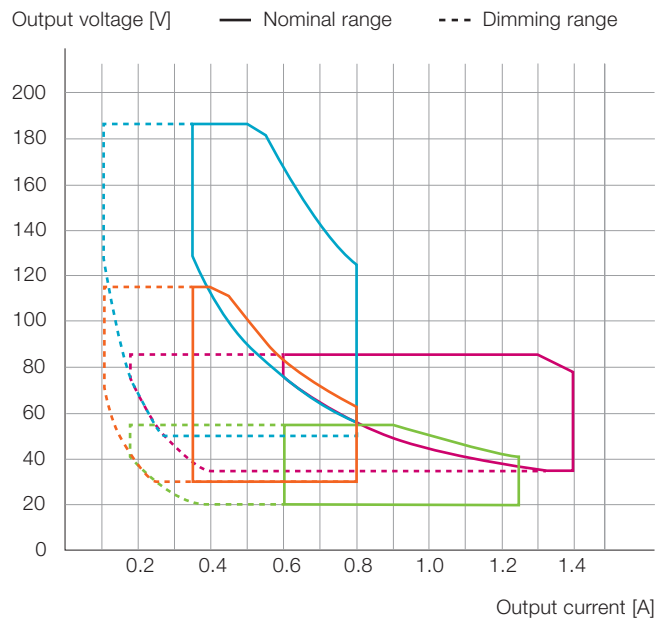


Table 3: 2DIMLT2 P operating range

Type	Minimum dimming current	Minimum nominal current	Maximum nominal current	Minimum output voltage	Maximum output voltage
OT 50/120-277/800 2DIMLT2 P	105 mA	350 mA	800 mA	30 V	115 V
OT 50/120-277/1A2 2DIMLT2 P	180 mA	600 mA	1250 mA	20 V	55 V
OT 100/120-277/800 2DIMLT2 P	105 mA	350 mA	800 mA	50 V	186 V
OT 110/120-277/1A4 2DIMLT2 P	180 mA	600 mA	1400 mA	35 V	85 V

Warning:

When LED drivers are permanently operated below an output level of 30 %, it is necessary to ensure compliance with relevant IEC standards (for example mains current distortion and power factors). According to UL standards, dimming down to 10 % is allowed.

1.4.1 Supported LEDs

Table 4 shows how many LEDs can be driven with one LED driver. The values are based on the following assumptions:
 $V_{f,LED} = 3.25V$ at 1400 mA and $V_{f,LED} = 2.5V$ at 105/180 mA

Table 4: Supported number of LEDs

Type	Minimum number of LEDs	Maximum number of LEDs
OT 50/120-277/800 2DIMLT2 P	12	35
OT 50/120-277/1A2 2DIMLT2 P	8	17
OT 100/120-277/800 2DIMLT2 P	20	57
OT 110/120-277/1A4 2DIMLT2 P	14	26

Warning:

The real number of supported LEDs needs to be checked according to the minimum and maximum forward voltage in the worst case conditions. They have to match the minimum and maximum output voltage of the used LED drivers.

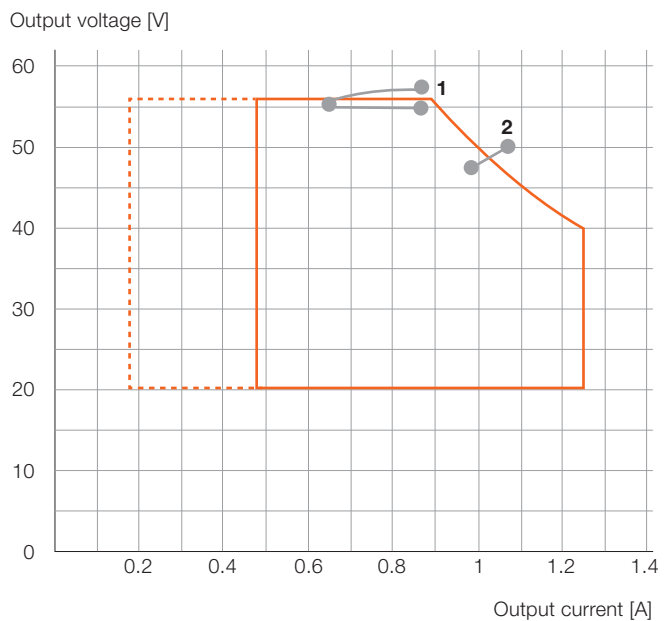
The forward voltage of the connected LED module in dimming condition is lower than the forward voltage in nominal condition but still has to be above the minimum output voltage of the LED driver.

1.4.2 Current foldback

The intelligent 2DIMLT2 P family allows a safe start-up of the system. In case the input voltage of the load exceeds the output voltage range of the driver [1], it automatically reduces the output current to keep the output voltage controlled to the maximum allowed output voltage. If no permitted operating point is achieved, the driver may shut down. The driver automatically reduces the output current in case the maximum allowed output power is exceeded [2], as long as the input voltage of the load is within the declared output voltage range of the driver. In all other cases, the driver may shut down the load.

If the voltage of the load falls below the minimum allowed value of the driver, the output is switched off until the next power-off/on cycle. The same behavior occurs if no load is detected during the power-up phase of the driver (hot-plug protection).

Figure 3: Current foldback (example: OT 50/120-277/1A2 2DIMLT2 P)



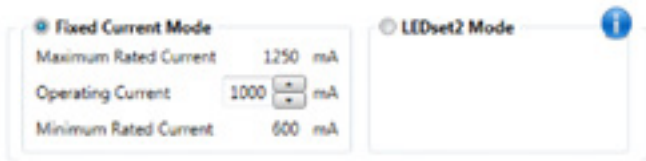
2 Features

2.1 Operating current

Flexible current setting allows taking advantage of the continuously improving LED technology and building a future-proof system. The 2DIMLT2 P family offers two modes for current setting, which can be set via the Tuner4TRONIC® software:

- Fixed current: Current setting via programmable interface
- LEDset2: Current setting via the LEDset2 interface

Figure 4: Setting of the operating current



The LEDset2 interface is disabled by default and has to be activated using the Tuner4TRONIC® software.

Note:

In addition to the LEDset functionality, the LEDset port on the 2DIMLT2 P LED drivers is used to program the driver or realize a thermal protection. The LEDset2 mode and the thermal protection cannot be used at the same time.

2.1.1 Fixed current mode

To use the fixed current mode, it has to be selected in the Tuner4TRONIC® software. The minimum and maximum rated output currents are displayed according to the selected LED driver. The output current of the LED driver can be set by changing the value in the "Operating Current" field.

2.1.2 LEDset2 mode

The LEDset2 interface (LEDset generation 2) is a standardized LED module interface to set the right output current and establish an easy and low-cost temperature protection for the connected LED module. This multi-vendor interface is suitable for LED modules connected in parallel or series.

Note:

In the following figures, the LED module is displayed in a simplified way. The real number of LEDs depends on the output voltage of the driver.

Figure 5: LEDset2 parallel connection

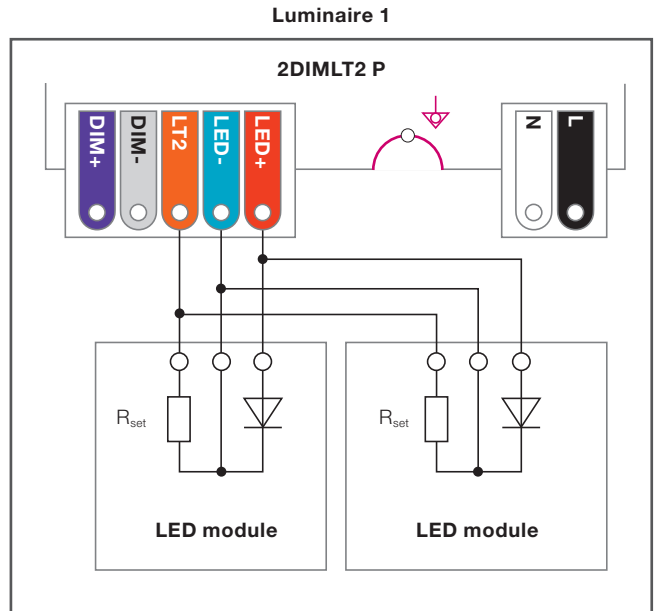
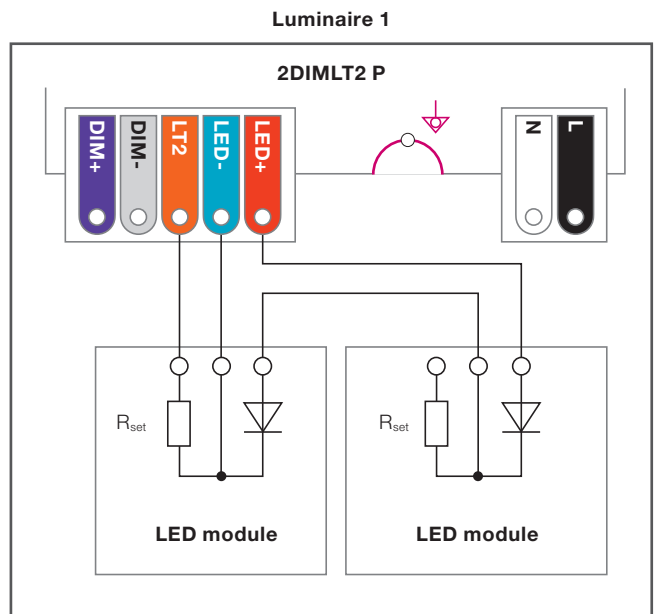
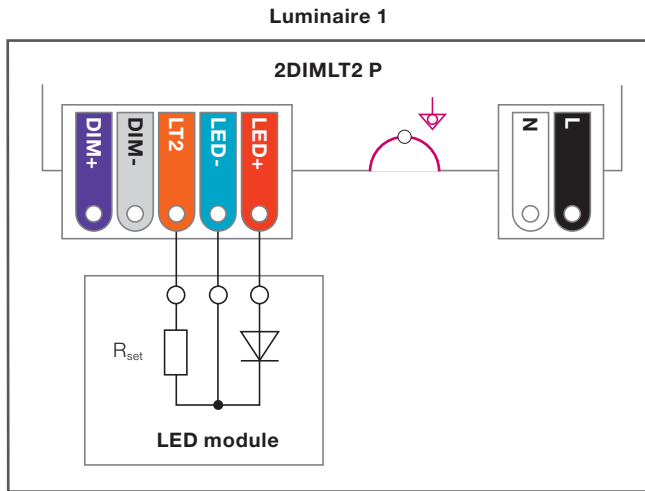


Figure 6: LEDset2 series connection



The output current of the LED driver can be set using an externally connected resistor (min. power rating 50mW, max. tolerance 0.5%). This provides the possibility to set the LED current manually without the need for an additional programming of the LED driver. With a resistor mounted on the LED module as shown in figure 7, the correct LED current can be set automatically. With this resistor, the desired current for the LED module is set according to the used LED bin and needed lumen output, offering a real plug-and-play solution and making the system future-proof.

Figure 7: R_{set} connection



The LEDset2 coding for the 2DIMLT2 P family is shown in the following graphs.

Figure 8: OT xxx/120-277/800 2DIMLT2 P

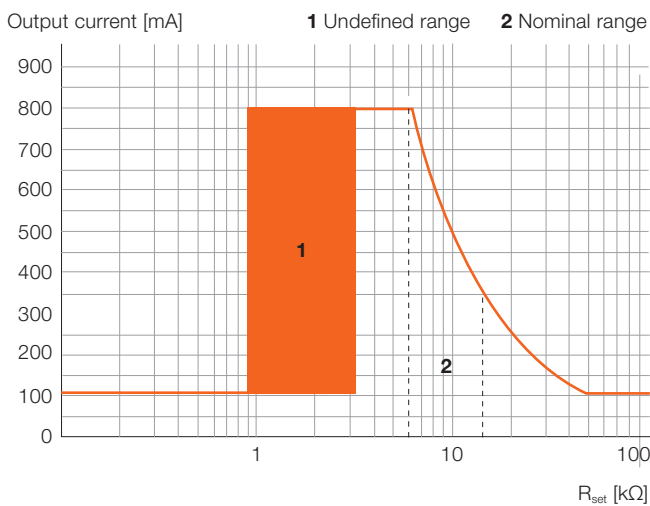


Table 5: LEDset2 resistor coding

I _{out} [mA] reference	R _{set} [kΩ]	I _{out} [mA] nominal
Open circuit	> 47.6	105
350	14.0 (E192)	357
500	10.0 (E192)	500
700	7.15 (E192)	699
800	6.19 (E192)	808
Undefined	< 3.12	800/105
Short circuit	< 900	105

Figure 9: OT 50/120-277/1A2 2DIMLT2 P

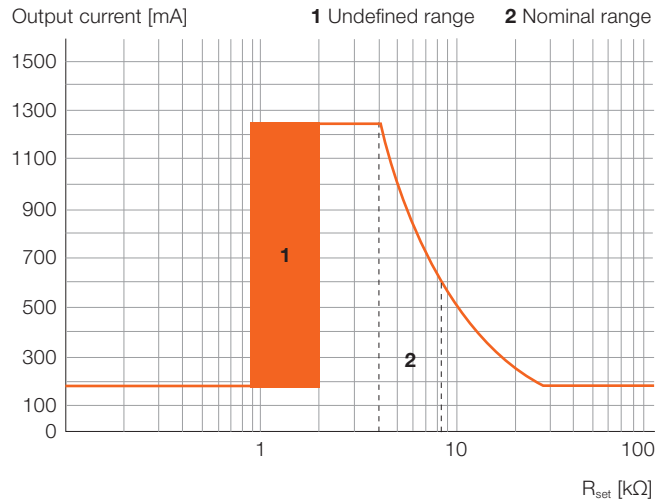


Table 6: LEDset2 resistor coding

I _{out} [mA] reference	R _{set} [kΩ]	I _{out} [mA] nominal
Open circuit	> 27.7	180
600	8.25 (E192)	606
700	7.15 (E192)	699
1050	4.75 (E192)	1052
1250	4.02 (E192)	1243
Undefined	< 2.00	1250/180
Short circuit	< 900	180

Figure 10: OT 110/120-277/1A4 2DIMLT2 P

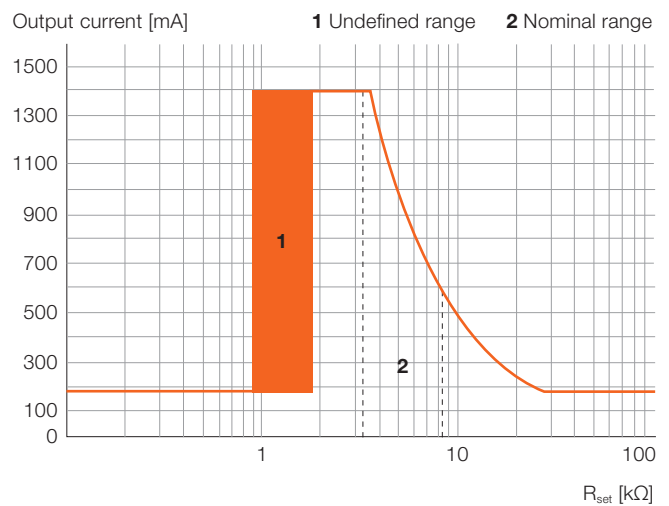


Table 7: LEDset2 resistor coding

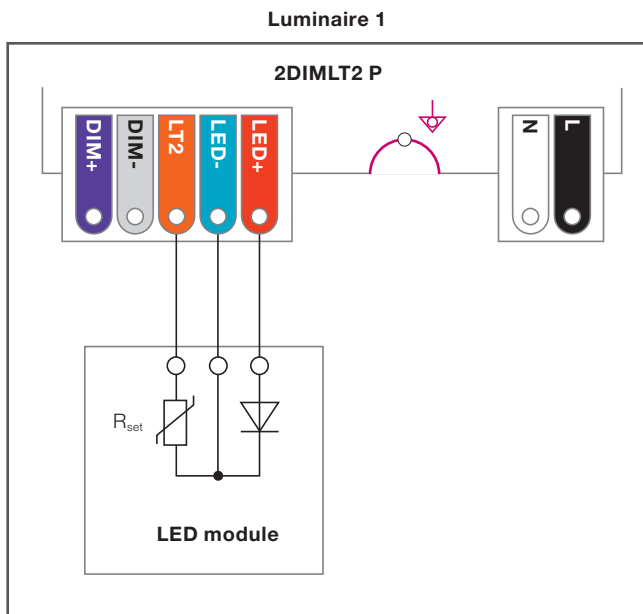
I _{out} [mA] reference	R _{set} [kΩ]	I _{out} [mA] nominal
Open circuit	> 27.7	180
600	8.25 (E192)	606
700	7.15 (E192)	699
1050	4.75 (E192)	1052
1400	3.57 (E192)	1400
Undefined	< 1.79	1400/180
Short circuit	< 900	180

2.2 Thermal derating and protection

2.2.1 External temperature sensor

By connecting an external temperature sensor to the NTCset port of the 2DIMLT2 P LED driver, a very easy and cost-efficient temperature protection of the LED module can be realized. As an example, an NTC (negative temperature coefficient resistor) can be mounted on the LED module and connected as shown in figure 11. In case the thermal protection feature is enabled and nothing is connected to the NTCset terminal, the driver delivers 100 % light output.

Figure 11: NTC connection



The 2DIMLT2 P LED drivers only support the following temperature protection mode:

- Resistor-based mode

Note:

As the thermal protection and the LEDset interface are using the same connection, only one of the two functionalities can be used at the same time.

Resistor-based mode

The resistor-based mode is activated by default. If the connected resistor sensor value falls in the range between 6.3 and 5.0kΩ, the output current is continuously lowered down to 50 %. The derating level can be varied between 100 and 10 %, a complete switch-off is not possible.

In this mode, a common NTC can be used to achieve a fixed thermal protection as shown in table 6. The specified temperatures can vary, depending on the used NTC component and the corresponding tolerances.

Table 6: Overview of standard NTCs

NTC type	Start derating temperature [6.3 kΩ]	End derating temperature [5.0 kΩ]
22 kΩ	56 °C	62 °C
33 kΩ	66 °C	72 °C
47 kΩ	75 °C	83 °C
68 kΩ	85 °C	92 °C

Figure 12: Thermal protection settings



Figure 13: Thermal protection derating behavior



Table 7: Supported value ranges

Parameter	Min.	Max.	Increment
Resistor range	1.0 kΩ	25 kΩ	25 Ω
Derating level	10 %	100%	1 %

Warning:

The derating level cannot fall below the minimum physical dimming level of the LED driver, even if the software displays a lower value.

2.2.2 Internal LED driver temperature protection

2DIMLT2 P LED drivers also have an internal thermal protection. If the maximum t_c temperature is exceeded by 10 degrees, the output of the LED driver is switched off until the temperature has decreased and a power-off/on cycle has been performed.

Note:

To achieve the lifetime data of the driver, the luminaire manufacturer needs to ensure that the maximum t_c temperature is never exceeded.

2.3 Constant lumen function

Over the lifetime of an LED module, the light output drops due to the aging process of the LEDs. To achieve a constant light output of the module, the LED driver stores the operating hours of the LED module and increases the output current to react to the light output drop. To set this feature according to the applied LED module, the Tuner-4TRONIC® software can be used as shown, for example, in figures 14 and 15.

Figure 14: Constant lumen programming table

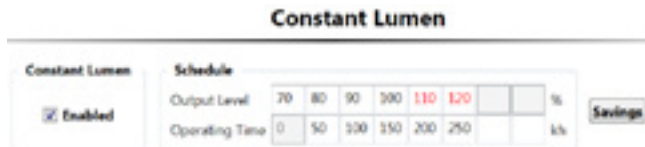
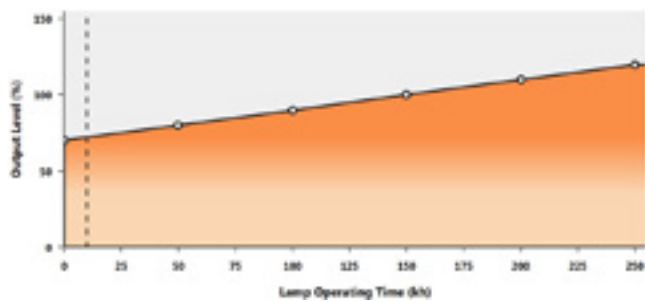


Figure 15: Constant lumen programming graph (operating time = 10kh)



The output levels have to be steadily increasing from the beginning to the end.

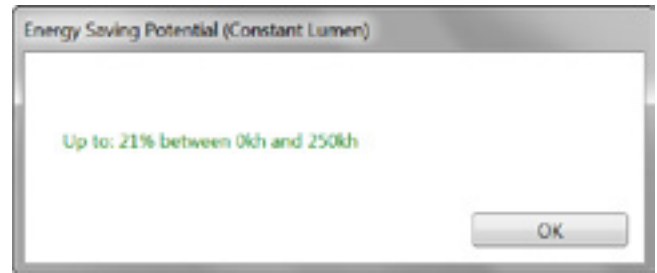
Warning:

The output level is indicated as a red number if the level is set higher than 100%. In this case, the reliability and safety of the module needs to be checked if the nominal operating current is exceeded. It is not possible to achieve a higher output current than the maximum nominal output current of the LED driver.

The output level cannot fall below the minimum physical dimming level of the LED driver, even if the software displays a lower value.

By clicking the “Savings” button, the estimated energy savings are calculated as shown in figure 16. This value is only an estimation because it does not consider, for example, the LED V_f behavior and the efficiency of the driver.

Figure 16: Constant lumen function – possible savings



The exact values for programming the constant lumen function for the connected LED module need to be obtained from the corresponding LED supplier.

2.4 End of life

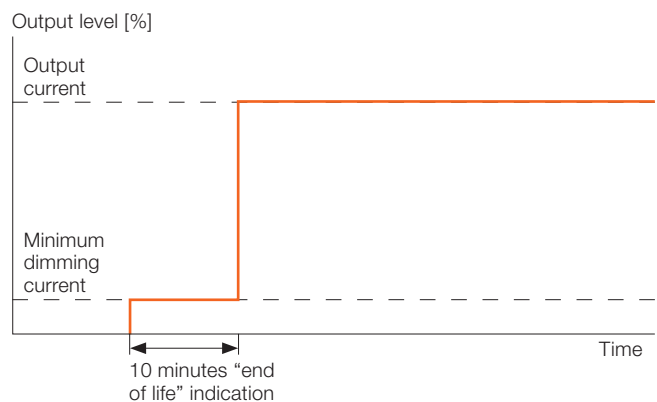
The LED driver can indicate that a preprogrammed lifetime of the connected LED module is reached and the module should be replaced. This function has to be activated in advance via the Tuner4TRONIC® software. The “end of life” indication can be programmed as shown in figure 17.

Figure 17: End of life setting



If the specified lifetime is reached, the LED driver indicates this through a lower light output during the first 10 minutes of the switch-on period, as shown in figure 18.

Figure 18: “End of life” behavior without switch-on fade time



3 Operating modes

The operating modes of a 2DIMLT2 P LED driver can be selected using the Tuner4TRONIC® software. Only one mode can be selected.

Figure 19: Operating modes

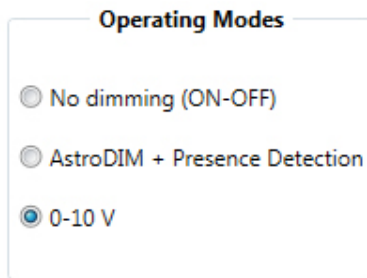
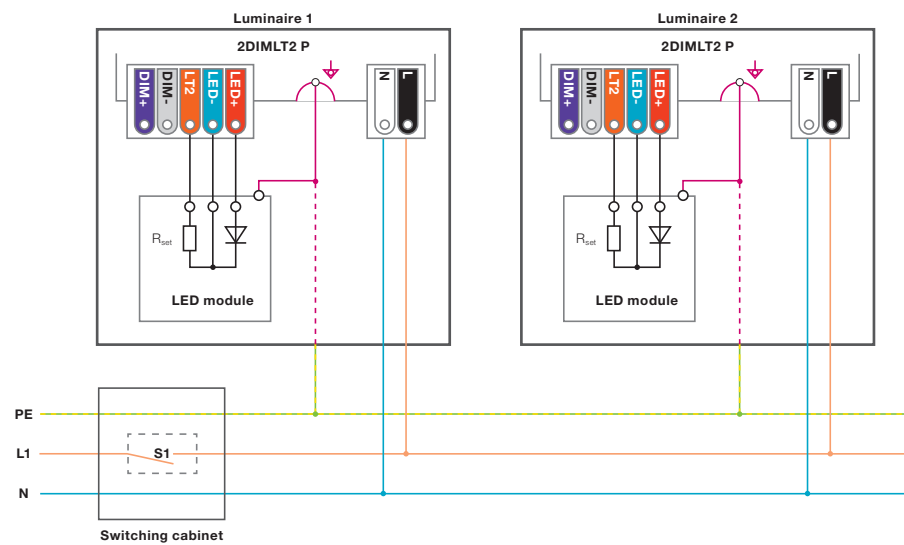


Figure 20: Wiring for on/off operation



3.1 On/off operating mode

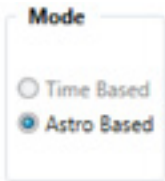
2DIMLT2 P LED drivers can also be used in a simple on/off operating mode. The dimming mode has to be set to “No dimming (ON-OFF)”.

3.2 AstroDIM feature

The AstroDIM feature allows an autonomous dimming without the need for an additional control line. The 2DIMLT2 P LED drivers support up to five independent dimming levels and flexible settings of fade times between the individual dimming levels.

The output levels can be set to between 10% and 100% in steps of 1%.

This family only supports the astro-based AstroDIM mode.



Time-based: Not supported.

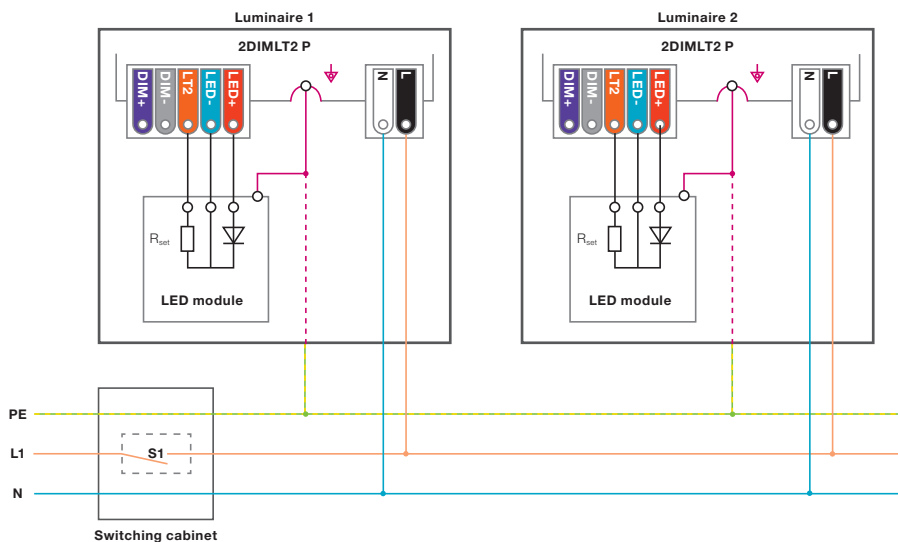
Astro-based: The dimming profile defined in the reference schedule is referenced to the annual average middle of the night, which is calculated based on the theoretical sunrise and sunset times.

The durations of the different dimming levels are derived from an internal clock. The LED driver does not have a real-time clock.

Warning:

If the output level is set below the minimum physical dimming level of the LED driver, the minimum dimming current is used. The software still displays the original value.

Figure 21: Wiring: AstroDIM



3.2.1 Astro-based mode

In this mode, the LED driver performs a dimming profile based on the daily power-on and power-off times. The dimming schedule is adapted according to the length of the night.

The Tuner4TRONIC® software calculates the annual average middle of the night based on the theoretical sunrise and sunset times, which are related to the location selected in the software. Based on this average middle of the night, five independent dimming periods can be defined in the

reference schedule. The minimum length of one dimming period has to be longer than the AstroDIM fade time. Valid time values can be set between 12:00 pm and 11:59 am. If less than five output levels need to be performed, two sequenced levels have to be set to the same value.

Note:

The maximum duration of one step is limited to ≤ 8 hours.

The defined dimming profile is already performed after the second power-off/on cycle after programming.

Figure 22: Astro-based AstroDIM



Fade timing:

- **AstroDIM fade time:** Fade time between the different dimming levels.

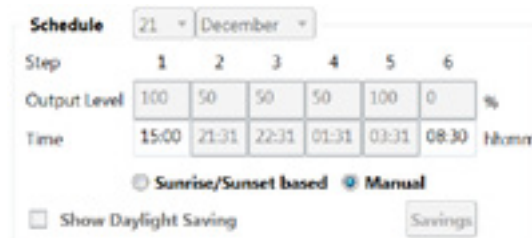
Table 8: Fade timing parameters (astro-based mode)

Parameter	Min.	Max.	Default
AstroDIM fade time	0 s	3 min	3 min

The “schedule by day” in the AstroDIM feature tab calculates the estimated dimming behavior for a specific day based on the theoretical sunrise and sunset times. If daylight saving has to be considered, the corresponding check box needs to be ticked. The LED driver itself is not able to detect summer and winter time and does not have an internal real-time clock.

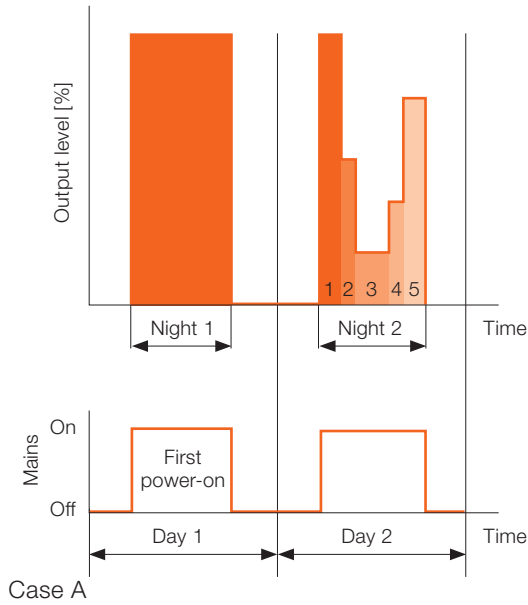
In case the installation is not powered on and off at the calculated sunrise and sunset times, the correct values can be entered in the manual mode as shown in figure 23.

Figure 23: Schedule by day

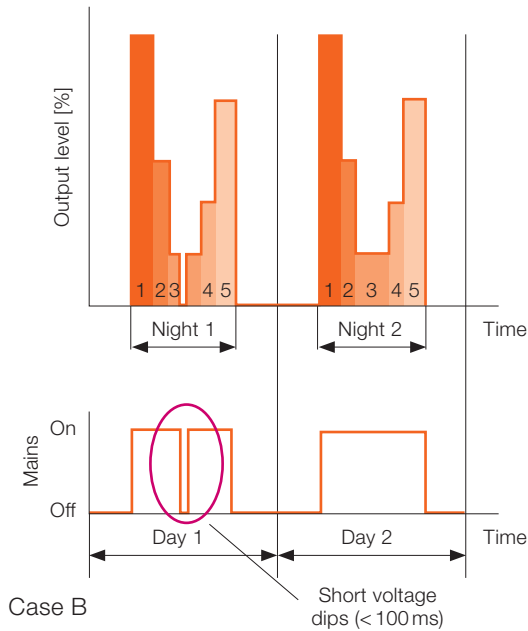


The AstroDIM function in astro-based mode relies on an intelligent algorithm. It starts after the first valid night and reaches its maximum precision after 8 valid days. A valid on-time is defined if the duration of the operation is longer than 4 hours and shorter than 24 hours.

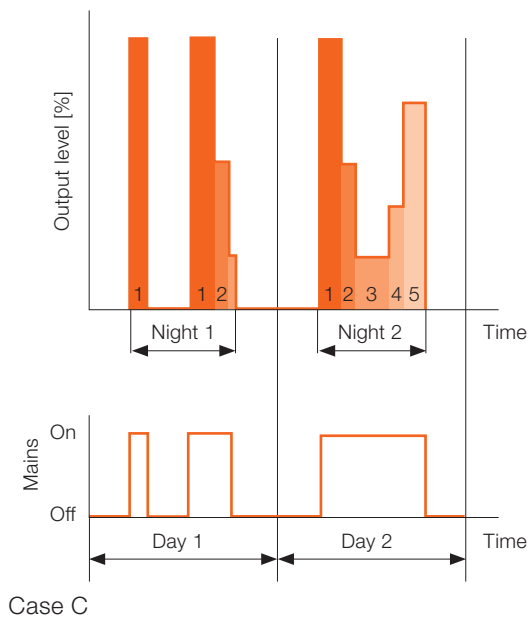
Figure 24: Use cases of AstroDIM mode



The AstroDIM profile is performed after the first valid on-time.

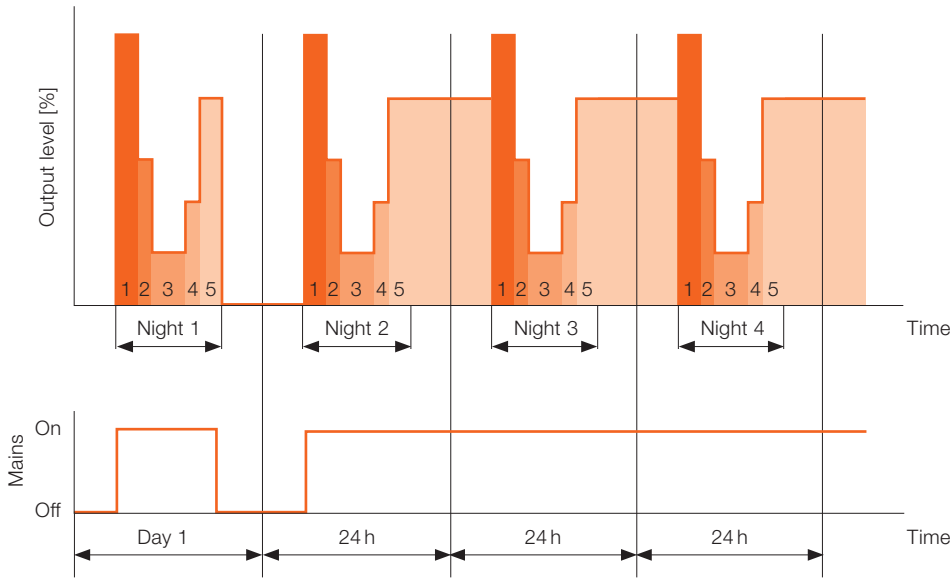


Voltage dips of less than 100 ms do not affect the on-time (case B).



If the on-time of the LED driver is shorter than 4 hours, it is not saved and therefore not used to calculate the next on-time (case C).

Operating time longer than 24 hours



Case D

If the on-time of the LED driver is longer than 24 hours, it is not saved and therefore not used to calculate the next on-time.

Note:

2DIMLT2 P LED drivers are not intended to be operated longer than 24 hours since the start time of each dimming step can vary significantly due to the tolerance of the internal clock.

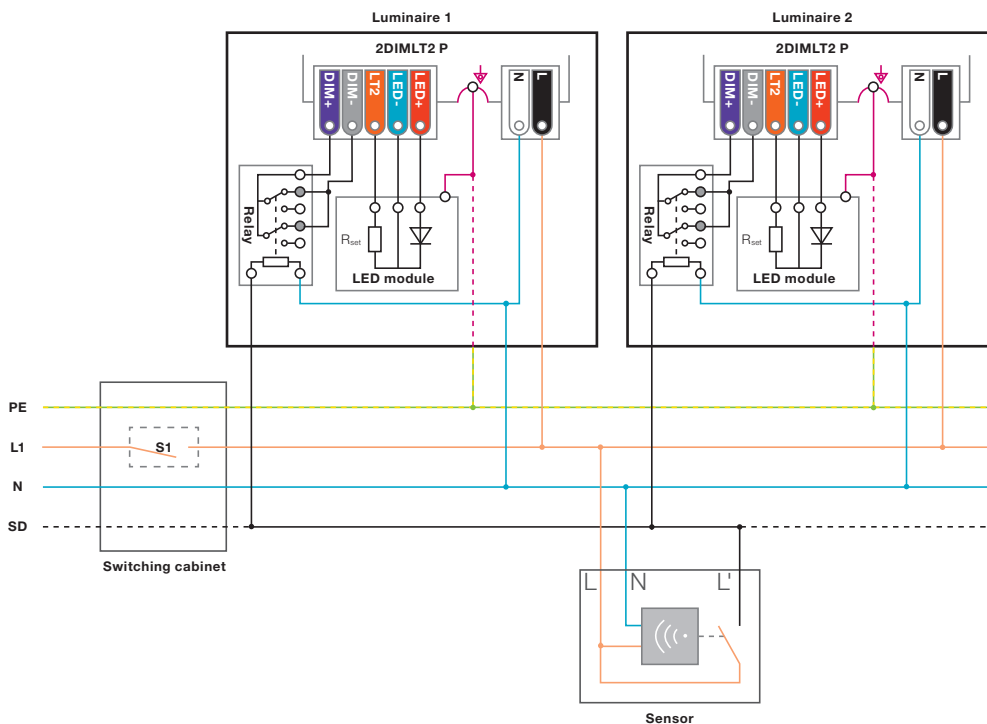
3.2.2 Presence detection in AstroDIM mode

In the “AstroDIM + presence detection” dimming mode, it is possible to override the dimming profile of AstroDIM by shortening the 0–10V interface with an external relay triggered by a sensor (e.g. motion sensor or presence sensor). If the 0–10V interface is shortened, the output level is set to 100%.

Note:

The relay should be suitable for small currents (~1 mA for the 0–10V interface) and also provide the sufficient insulation to maintain the insulation level between the primary and secondary side of the LED driver.

Figure 25: AstroDIM wiring with presence detector



3.3 StepDIM feature

StepDIM is a one-step dimming mode using an additional control line or a switched phase (pilot line) to control one or more light points and set the light output to a preprogrammed light level.

To enable StepDIM operating mode, the 2DIMLT2 P LED driver has to be set to “0–10V” operating mode using the Tuner4TRONIC® software.

In order to enable the StepDIM functionality in combination with the 2DIMLT2 P LED driver family range, an additional relay (triggered by the StepDIM line) has to be connected to the 0–10V interface. The light output level can be set in the “0–10V” feature of the Tuner4TRONIC® software.

Note:

Please select a relay suitable for low currents (~1 mA on 0–10V interface). To ensure a high reliability; the 0–10V interface has to be switched using two relay contacts connected in parallel.

Figure 26: StepDIM wiring

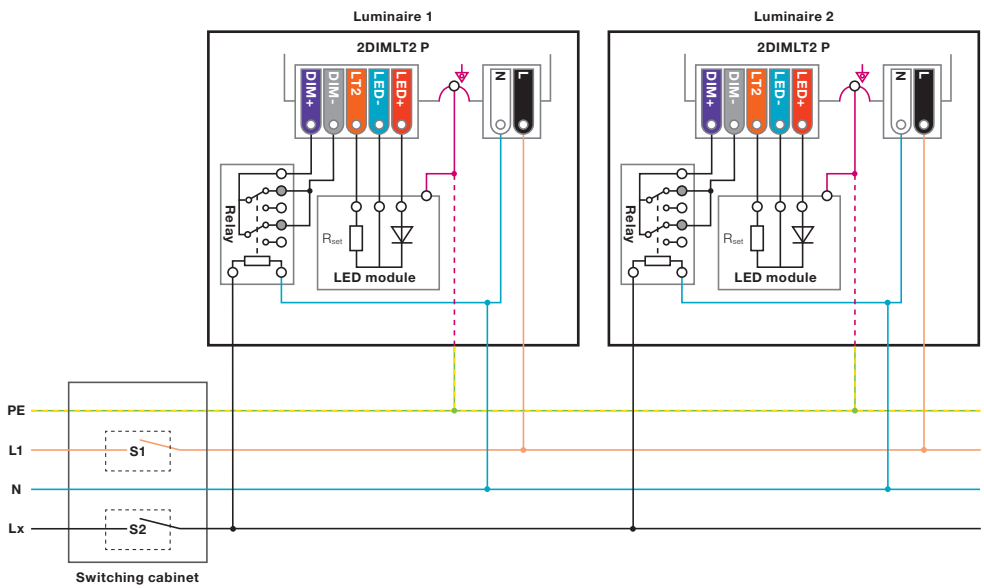
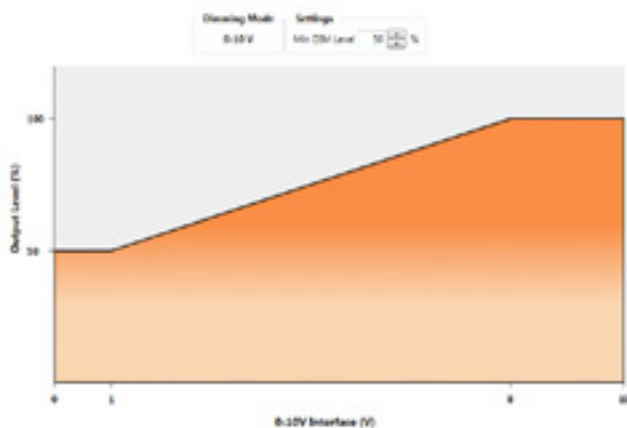


Figure 27: StepDIM settings via 0–10V feature

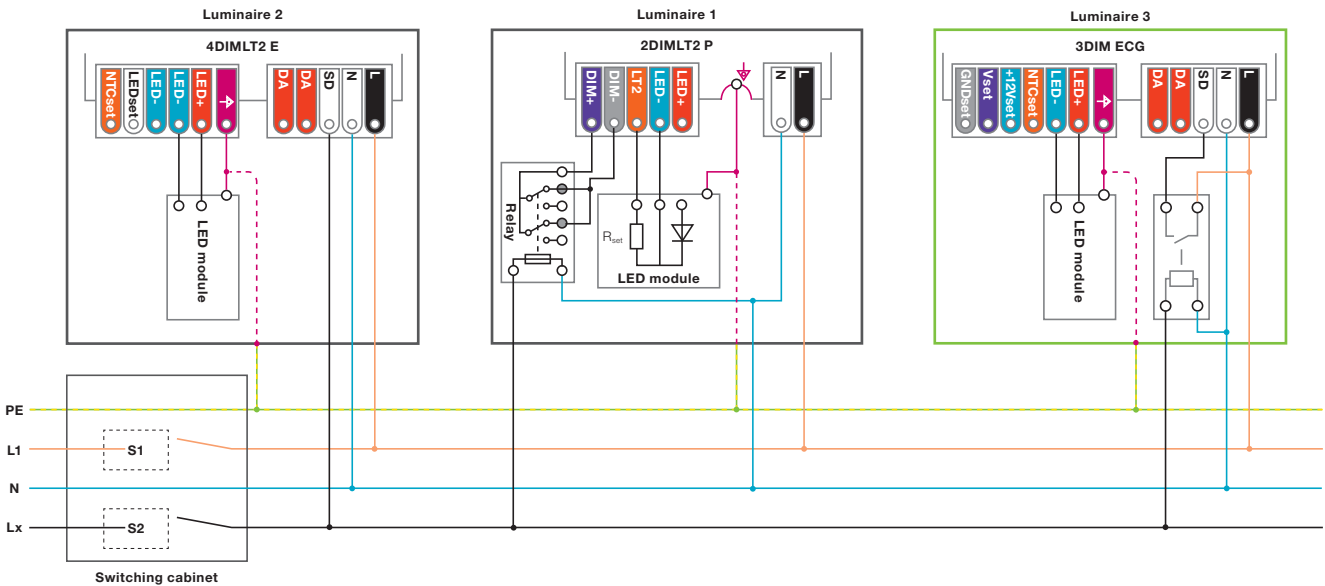


In some installations, leakage currents might occur between the different phases due to old or damaged cables, which have insufficient insulation or high-capacitance coupling. The relay can be triggered if the leakage currents exceed the inactive SD input current. False triggering can be avoided by connecting the SD input to the neutral, using a bypass capacitance/resistance between SD and N and/or a relay with a high release voltage.

3.3.1 Mixed StepDIM installations with 3DIM and 2DIMLT2 P LED drivers

2DIMLT2 P LED drivers with an external relay can be used directly with 4DIMLT2 LED drivers while compatibility with 3DIM drivers is only given in case they also have an external upstream relay (as described in the 3DIM application guide).

Figure 28: 2DIMLT2 P StepDIM with mixed 3DIM drivers and 4DIMLT2 LED drivers



3.4 0–10V operating mode

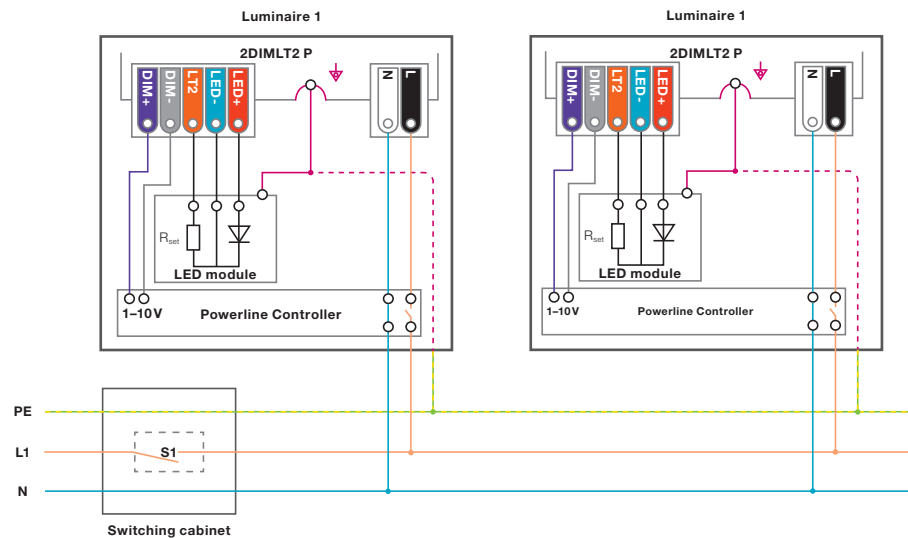
In order to be able to control the 2DIMLT2 P outdoor LED drivers, an isolated (potential-free) 0–10V dimming interface is integrated in this driver family. It can be used with common 0–10V dimmers such as brightness sensors or power-line controllers with a valid voltage range of 1–8V.

The controller has to be able to switch off the mains voltage of the LED driver if the output has to be switched off completely (see figure 29).

Note:

The master device has to be able to dissipate a current of 1 mA which is provided by the driver. If dimming levels below 30% are set, it is necessary to ensure compliance with relevant IEC standards (for example mains current distortion and power factor). According to UL standards, dimming down to 10% is allowed.

Figure 29: 0–10V wiring with SLC Controller











4 Additional information

4.1 Insulation

2DIMLT2 P LED drivers have a double/reinforced insulation between the primary and the secondary side and a double/reinforced insulation between all electronic parts and the casing.

Table 9: Insulation and U_{out}

Type	OT 50/120- 277/800 2DIMLT2 P	OT 50/120- 277/1A2 2DIMLT2 P	OT 100/120- 277/800 2DIMLT2 P	OT 110/120- 277/1A4 2DIMLT2 P
Insulation (primary/ secondary)	 SELV	 SELV	 Double	 SELV
Insulation of casing	 Double	 Double	 Double	 Double
U_{out}	120V	60V	200V	120V

The equipotential connection (housing/EQUI) meets the requirements for double insulation versus the primary side and requirements for basic insulation versus the secondary side (it complies with the requirements of IEC 60598-1 Annex A – “safe to be touched” – in case of insulation fault between all secondary circuits and accessible conductive parts).

The detailed insulation levels are defined in the instruction sheet of the product.

4.2 Wiring/connection

2DIMLT2 P LED drivers come with pre-stripped solid copper wires to ensure an easy and quick wiring while ensuring a high IP rating of the driver. All wires meet the UL1452 safety standards. The EQUI connection needs to be established via the casing. Please ensure a proper electrical connection. The EQUI must be connected to the heat sink of the LED module to improve the surge withstand capability of the system and EMI in critical luminaires. The connection of the EQUI (= casing) to protective earth is only necessary in protection class I luminaires or to meet UL approbation in case of connection to dead metal parts.

Table 10: Max. output cable length

LED+/LED-	10m
NTCset/LT2	2m

4.3 Ingress protection (IP)

The unit is intended for built-in use. The 2DIMLT2 P LED drivers have passed the test for IP 64. Nevertheless, the LED driver has to be protected from direct exposure, for example to sunlight, water, snow or ice.

IP-proof cable connection

In order to maintain the protection rating on the luminaire level, the open wires of the LED drivers also have to be protected with an IP-proof cable connection.

4.4 Incorrect wiring on the output side

2DIMLT2 P LED drivers are inherently protected against incorrect wiring on the output side. Incorrect wiring between LED+ and LT2/NTCset can irreversibly damage the ECG. All other wrong wirings do not irreversibly damage the ECG. As soon as they are removed, the LED driver works regularly again.

The NTCset/LT2, LED+ and LED- as well as the 0–10V wires are ESD-protected up to 4kV according IEC 61000-4-2.

4.5 Input overvoltage

The 2DIMLT2 P LED driver can withstand up to 350V_{AC} for a maximum of two hours.

4.6 Surge protection

2DIMLT2 P LED drivers offer a protection level of up to 6 kV with a unique integrated overvoltage suppression for the connected LED module, which minimizes the stress on the LED module and thus ensures high reliability in the field. To achieve the surge protection levels, the housing of the driver (EQUI) needs to be electrically connected to the heat sink of the LED module (see figures 30 and 31). For the surge protection levels and test conditions mentioned below, the voltage stress between the LED module and the heat sink can be kept below $1.0\text{ kV}_{\text{peak}}$. The EQUI pin meets the requirements for protection class I and II luminaires.

The following protection levels can be achieved for class I and II luminaires:

Table 11: 2DIMLT2 P surge protection levels

Surge between	Test condition acc. to EN 61547
L-N	6 kV at 2-Ω source
SD-N	6 kV at 2-Ω source
L-EQUI/N-EQUI	6 kV at 12-Ω source

If an additional external surge protection device is used, please contact your INVENTRONICS sales contact for support.

Figure 30: Protection class I luminaire

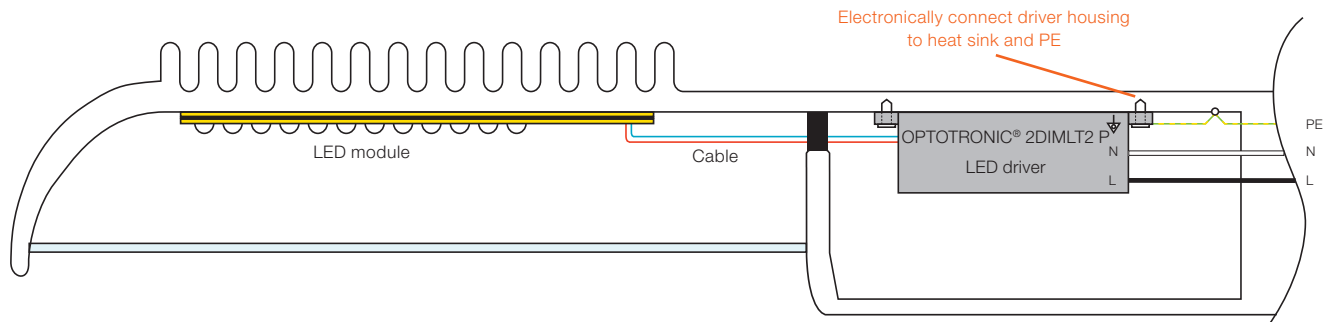
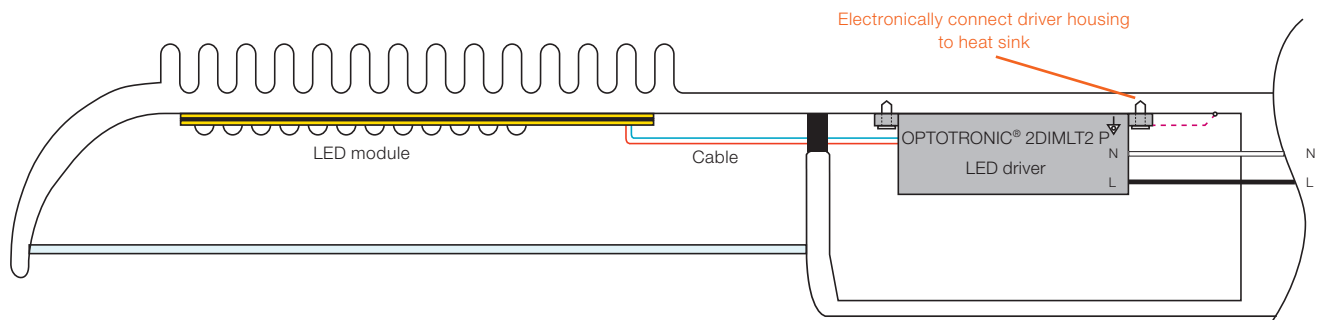


Figure 31: Protection class II luminaire



5 Programming

2DIMLT2 P LED drivers can be programmed using the Tuner4TRONIC® software together with the hardware programmer “OT Programmer”. This software consists of the following software packages:

- T4T – Development
- T4T – Production
- T4T – Dynamic Link Library (DLL)
- T4T – Command Line Version

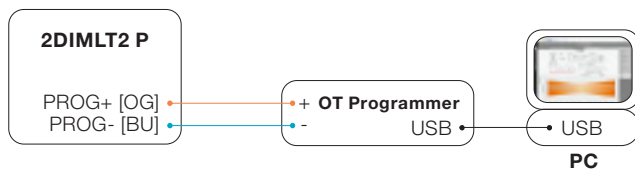
After registration, the software can be downloaded from the www.inventronics-light.store portal.

For more information on the programming of 2DIMLT2 P LED drivers, please consult the Tuner4TRONIC® manuals.

Disclaimer

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Figure 32: LED driver programming



2DIMLT2 P LED drivers have to be programmed without supply voltage (see figure 32). This prevents electric shocks and reduces complexity during the production process. The system is still safe in case the LED driver is powered and the OT Programmer is connected. The cable length between the OT Programmer and the LED driver should not exceed 2 m.

Note:

A power-off/on cycle is necessary to activate the programmed parameters.

Performance check:

If electronically controlled control gears are combined with electrical power supplies, the electronic circuits of both devices might influence each other.

This could lead to wrong measurements (e.g. lower power factor compared to the mains grid). In order to avoid these effects, a mains filter should be installed after the electrical power supply.

Use our contact form

www.inventronics-light.com/contact-us



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