PHILIPS

Xitanium

LED indoor drivers

Spot & Downlight

Design-in Guide

Enabling **future-proof LED technology** for dynamic LED markets

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Introduction to LEDSet
Introduction to SimpleSet®

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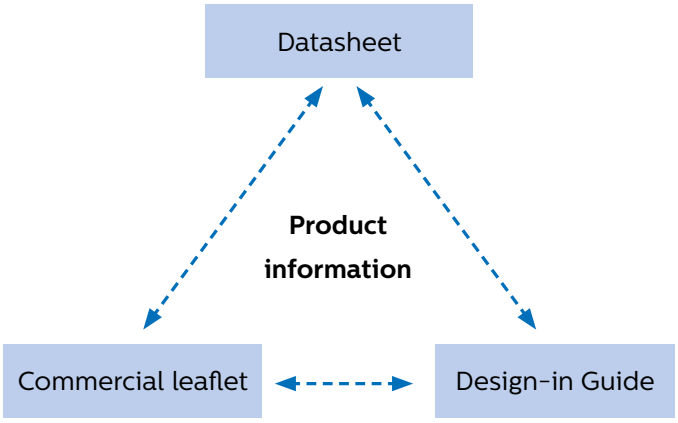


Thank you for choosing the Philips Xitanium drivers. In this guide you will find the information needed to integrate these drivers into a LED luminaire or LED system.

This edition describes the Xitanium LED drivers optimized for indoor down- and spotlighting. We advise you to consult our websites for the latest up-to-date information.

Applications

The Xitanium Indoor Spot & Downlight LED drivers are designed to operate LED solutions for indoor lighting, like offices, public buildings and retail environments. If you use Philips LED drivers in combination with Philips LED modules, specific design-in guides are available from the below mentioned technology websites.

Information and support

Please consult your local Philips office or visit:
www.philips.com/technology
www.philips.com/multiOne

Design-in support

On request Design-in support from Philips is available. For this service please contact your Philips sales representative.

Determine which documents contain what information

In order to provide information in the best possible way, Philips' philosophy on product documentation is the following.

- Commercial leaflet contains product family information & system combinations
- Datasheet contains the product specific specifications
- Design-in guide describes how the product is to be designed-in

All these documents can be found on the download page of the OEM website www.philips.com/Technology. If you require any further information or support please consult your local Philips office.

Safety precautions

Warning:

- Avoid touching live parts!
- Do not use drivers with damaged housing and/ or connectors!
- Do not use drivers with damaged wiring!
- Class I luminaires must be connected to protective earth!
- An external DC-rated fuse must be used when operated on DC mains.

Safety warnings and installation instructions

- Do not use damaged or defective contacts or housings
- Do not use damaged products
- Cap off all unused wires to prevent accidental contact with the luminaire or driver housing
- The luminaire manufacturer is responsible for his own luminaire design and has to comply with all relevant safety standards
- The Xitanium Indoor LED drivers are intended for indoor use and should not be exposed to the elements such as snow, water and ice. It is the luminaire manufacturer's responsibility to prevent exposure.
- Do not service the driver when the mains voltage is connected, this includes connecting or disconnecting the LED load.
- Please provide adequate earth connection when applicable.

Philips Design-in support is available; please contact your Philips sales representative.

Introduction to Xitanium LED indoor drivers – Spot & Downlight

Xitanium LED Drivers

Introduction

Xitanium LED drivers are designed to operate LED solutions for general lighting applications such as downlighting and spot/accent lighting.
Reliability is guaranteed for 5 years, enhanced by specific features that protect the connected LED module, e.g. hot wiring, reduced ripple current and thermal de-rating. Most drivers feature central DC operation.
In the coming years LEDs will continue to increase in efficiency, creating generation and complexity challenges for OEMs. With Xitanium LED drivers, flexibility in luminaire design is assured thanks to an adjustable output current. Application-oriented operating windows offer the flexibility required to provide the stable lumen output and light quality levels that lighting specifiers and architects demand. The adjustable output current also enables operation of various LED PCB solutions from different manufacturers.

Xitanium LED driver versions

The Xitanium LED drivers described in this guide are available in different versions, e.g. fixed-output and dimmable (trailing edge (TE) and Touch & DALI (TD)), in a wide range of power ratings that enable the most popular light output levels for general lighting applications. We recommend you always check our Xitanium LED driver leaflet for the most up-to-date overview of our range. This leaflet can be found on the www.philips.com/technology website.

Xitanium LED driver segments

The Xitanium LED drivers described in this guide are categorized in different segments, namely: Statement, Performance and Core. These segments are defined based on specifications, features and intended applications.

Statement drivers

Statement drivers are the most advanced Xitanium drivers, fully programmable via the Philips MultiOne interface, configurable using the SimpleSet® feature via the Philips MultiOne interface and dimmable by means of DALI and TouchDim. All statement drivers have the complete package of features like hot wiring, reduced ripple current, window functionality, Rset, etc.

Performance drivers

Performance drivers have the same package of features like the statement drivers. The only difference is that these drivers are not programmable via MultiOne and DALI. Some performance drivers also have the SimpleSet® functionality which can be used to configure the device via the Philips MultiOne interface.
The Xitanium fixed output drivers and mains dimmable (trailing edge-TE) drivers are a part of this segment.

Core drivers

Core drivers are value engineered Xitanium drivers. This implies that these drivers still have the window flexibility, the quality and reliability expected with Xitanium drivers, but they have optimized specifications for specific applications. It depends on the intended application which specification is adjusted.

Detailed specifications can be found in the Xitanium driver datasheets which can be downloaded via www.philips.com/technology.

Features

SimpleSet®

Philips SimpleSet® new wireless programming technology allows luminaire manufacturers to quickly and easily program Xitanium LED drivers at any stage during the manufacturing process, without a connection to mains power, offering great flexibility. As a result orders can be met faster, while reducing costs and inventory.

For more information, please visit www.philips.com/multiOne or contact your local Philips representative.

Adjustable Output Current (AOC)

Flexibility in luminaire design is ensured by the adjustable output current (AOC). The adjustable output current enables operation of various LED configurations from different LED manufacturers whilst also ensuring the solution remains “future proof” for new LED generations. The output current can be set with an external resistor (Rset) in case this provision is there in the selected driver. With the TD drivers, the output current setting can also be programmed using the Philips MultiOne programming hardware interface and the matching software “MultiOne driver configurator”. Drivers with SimpleSet® functionality can be configured with the Philips MultiOne Software and the SimpleSet® interface.
More information about AOC and how to set the output current can be found in the chapter “Electrical design-in”. Information about configuring drivers with SimpleSet® can be found in the chapter “Configurability”.

Amplitude Modulation (AM) output dimming

Philips Xitanium indoor point LED drivers dim the output to the LEDs by means of Amplitude Modulation (AM) dimming. This means that at no stage of the dimming, Pulse Width Modulation (PWM) at the output to the LEDs is involved. AM dimming guarantees the most smooth and flicker-free operation over the entire dimming range.

Active cooling
Selected Xitanium LED drivers feature a 12V output to operate active cooling. Please check the datasheet at www.philips.com/technology to know if the selected driver has this feature.

Thermal derating
Thermal de-rating of an in-house designed LED PCB is possible by integrating a NTC (negative thermal coefficient) component on the LED PCB. More details about the NTC resistor can be found in the Chapter "Thermal design-in". Please check the datasheet at www.philips.com/technology to know more about the selected driver.

Controllability
The Xitanium indoor Spot & Downlight drivers are available in 3 different versions:
- Fixed output
- Trailing edge dimming (TE)
- Touch & dim + DALI (TD)

The method of control is shown in the name of the driver. If no dimming protocol is given in the name, the Xitanium driver can only be used as a fixed output driver.

Hot wiring
All Xitanium Indoor Spot & Downlight LED drivers within the statement and performance segments can be serviced, connected or disconnected from the LED load when the mains voltage is connected. Please make sure that all electrical safety regulations are followed when working on a Xitanium driver, while powered.

DC mains operation
It is possible to connect the mains side of the Xitanium Indoor Spot & Downlight LED drivers within the statement and performance segments to a DC power grid (e.g. central emergency system).
When operating a driver on DC mains an additional external DC voltage/current rated fuse must be used because the internal driver fuse is not rated for DC operation.

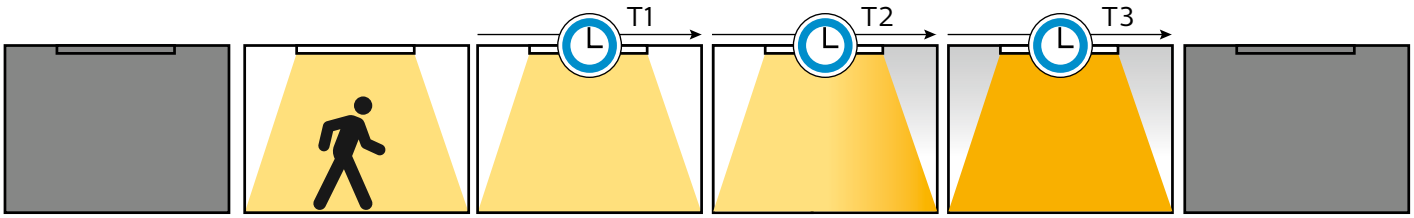
Constant Light Output (CLO, programmable drivers only)
Traditional light sources suffer from depreciation in light output over time. This applies to LED light sources as well. The CLO feature enables LED solutions to deliver a constant lumen output throughout the life of the light engine. Based on the type of LEDs used, heat sinking and driver output current, it is possible to estimate the depreciation of light output for specific LEDs and this information can be entered into the driver. The driver counts the number of light source working hours and will increase the output current based on this input to enable CLO.

Since the CLO curve is not generic, the OEM needs to determine the appropriate CLO curve. This can be used to differentiate on e.g. lumen output or power consumption over lifetime.

The CLO feature can be programmed with the Philips MultiOne configurator tool. More information can be found on www.philips.com/MultiOne

Corridor Mode (TD drivers only)

The Corridor Mode is typically used in corridors, stairwells, entrance halls, storage rooms, etc. It is a simple function, available with the Xitanium indoor Spot & Downlight TD LED drivers, that controls the light level when presence is detected by a simple mains on/off sensor. It is easy to use and can be activated using default parameters, so no programming via software is required.
When the sensor detects presence, the light switches on. When it no longer detects any presence, instead of the light switching off immediately, the TD driver takes over control of the light level and dims it down to a background level. The settings can be customized using the Philips MultiOne configurator software. Please check the datasheet of your driver which can be found on www.Philips.com/Technology to check if this feature is available.



Presence detected, light on at normal level

No presence, light stays on at normal level

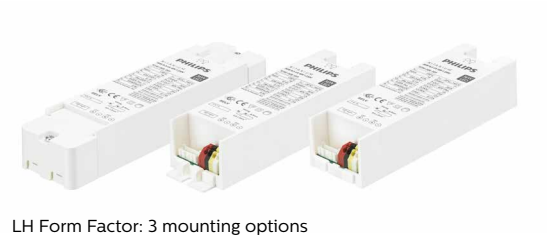
Light fades to background level

Light switches off

Driver diagnostics (TD drivers only)

On selected TD drivers the diagnostics functionality is available. The purpose of Diagnostics is to gather information and help diagnose the history of the driver and connected LED module. The diagnostics consist mainly of counters which keep track of specific variables like the number of startups of the driver, temperature of driver and LED modules, current and voltages etc.

When the driver is shutdown the diagnostics data is stored automatically.



LH Form Factor: 3 mounting options
From left to right: Independent, Screw, Click mounting

SH Form Factor

WH form factor

/s Form Factor

/m Form Factor

Example: Xitanium 17W LH 0.3-1A 24V TD/Is 230V

Xitanium	: Brand name for highly efficient and extremely reliable LED drivers
17W	: Maximum output power
LH	: Linear Housing
0.3-1A	: Output current range
24V	: Maximum output voltage (minimum being ~50% of this value)
TD	: Dimming protocol (Touch & Dali)
/I	: Independent housing design
s	: Small version
230V	: Mains AC input voltage

Form factors

The linear housing design (LH)

The linear housing design incorporates three different mounting options:

- Independent
- Screw
- Click mounting.

Screw-mounting and Click-on parts are assembled within the independent housing

The square independent housing design (SH)

The square independent housing is equipped with a 12 V power output for active cooling, strain relief possibility for all cables and loop-through functionality for the mains wiring.

Wide housing design (WH)

The “WH” drivers have a 3 in 1 housing design which makes them suited for built in applications and independent use with strain relief and the loop through option.

Small housing design (/s)

The “/s” is the most compact Xitanium form factor within the performance segment. It has a form factor identical to the Philips HID-PrimaVision driver, enabling an easy transformation of your luminaire from HID to LED.

Mini housing design (/m)

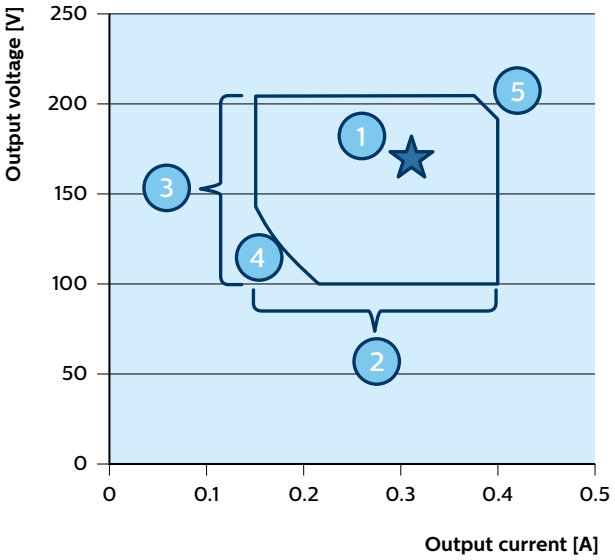
The “/m” drivers are placed within the Core segment of the Xitanium drivers. It has a form factor which is exactly the same as the Philips HID-PrimaVision mini, thus helping you to easily transform your luminaire from HID to LED. This range of drivers comes with optimal specifications for most spot applications.

Each form factor has different dimensions. The dimensions of the same housing type can also differ between different power packages. The correct dimensions can be found in the driver datasheet on www.philips.com/technology.

Naming of the drivers

I	: independent housing design
TE	: trailing edge dimming
TD	: Touch & DALI dimming
/s	: small housing
SH	: square independent housing
WH	: wide housing
LH	: linear independent housing
/m	: mini housing (HID-PrimaVision mini form factor)

Electrical design-in



1. Required set point for the LED solution
2. Current can be set to needs within range
3. Driver adapts to required voltage, given it fits range
4. Driver minimum power limit
5. Driver maximum power limit

Example Operating window of a Xitanium driver

Note: by means of dimming it is possible to go below the minimum value of the specified output current.

Xitanium Driver Operating window

LED technology is rapidly evolving. Using more efficient LEDs in a next generation means the same light output can be achieved with lower currents. At the same time, LEDs can be driven at different currents levels based on the application requirement. Typically, LED drivers are available in discrete current levels e. g. 350 mA, 530 mA or 700 mA. It is often necessary to replace a driver when more efficient LEDs or different LED boards become available.

One of the key features of the Xitanium LED drivers is the adjustable output current (AOC), offering flexibility and future-proof luminaire design. The Xitanium drivers can operate in a certain “operating window”. This window is defined by the maximum and minimum voltage and current that the driver can handle. An example of an operating window is shown on the left. The area indicates the possible current/voltage combinations. The current selected will depend on the type and manufacturer of the LEDs or the specific LED configuration of the PCB design. The voltage is the sum of the LEDs used (total Vf string). The operating window of every driver can be found in the datasheets which can be downloaded at www.philips.com/technology.

The output current of these drivers can be set in two ways.

1. By connecting a specific resistor value to the driver’s Rset input.
2. Drivers with SimpleSet® functionality can be configured using the Philips MultiOne software and SimpleSet® interface.
3. TD driver versions can be programmed via the MultiOne interface in order to set the desired current, more information can be obtained at www.philips.com/multiOne.

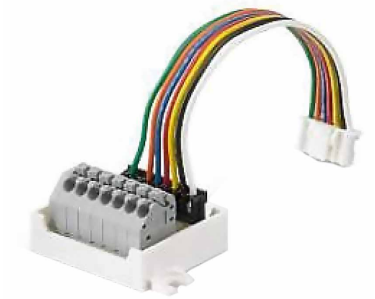
To Select an Appropriate Driver

Depending on your requirements, several drivers can be a solution for you. The following steps can help you in selecting a driver. For a complete overview of the available drivers, please refer to the website www.philips.com/technology.

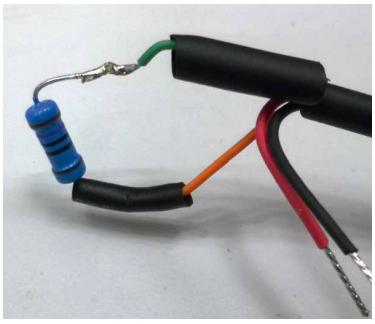
1. Determine your required driver current (Idrive) and voltage (Vf)
2. Calculate the required power (Pdrive) where Pdrive = Vf x Idrive (W)
3. Select the datasheets from the website mentioned above based on the driver having a higher power than required.
4. Does the required current fit the current range of the driver? The current range of the driver can be seen in the name itself. For example, in the 17W LH 0.3-1A 24V TD/Is 230V, the minimum driver current is 0.3 A and maximum is 1 A.
   • Idriver min ≤ Idrive ≤ Idriver max?
5. Does the required voltage fit the voltage range of the driver? The voltage range of the driver can be seen in the name itself. For example, in the 17W LH 0.3-1A 24V TD/Is 230V, the maximum driver voltage is 24 V and the minimum is ~50% of this value, which is 12 V in this case. The exact value can be checked from the datasheet as well.
   • Vdriver min ≤ Vf ≤ Vdriver max?
6. Does the required power fit the power range of the driver? In the naming of the driver, you can see the maximum possible output power. For example, in the 17W LH 0.3-1A 24V TD/Is 230V, the maximum output power is 17 W.
   • Pdriver min ≤ Pdrive ≤ Pdriver max?
7. Choose your preferred dimming. Please refer to the section about naming of the drivers to know what the naming tells you about the possibilities.

JST connector (driver side) pin layout

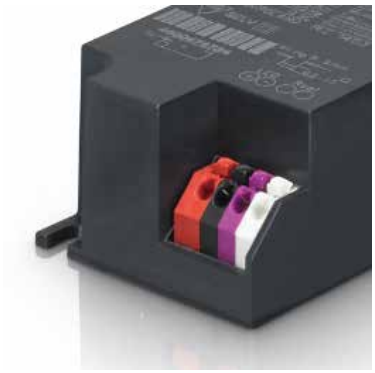
JST connector with soldered rset



Example of the JST to Push-in adapter



Example of resistor being integrated in the cable



Poke-in Connectors

Connectors

Different connectors are used on the Philips Xitanium Indoor Spot & Downlight drivers. More info about the type of connector and wiring (diameter, length, etc.) can be found in the datasheet. The datasheets of each driver can be downloaded via www.philips.com/technology.

JST Connectors

Some of the Xitanium LED drivers feature a JST connector that combines the power connection to the LEDs with the Rset and NTC features. The pin layout for this connector is shown on the left. In case a JST connector is to be used to set the current via an Rset, there are 3 options:

1. Use a JST connector with a resistor soldered on to pins 6 and 7 for Rset2 and pins 5 and 7 for Rset1.
2. Use a JST-poke-in adaptor
3. Integrate the resistor into the cable running from the driver to the module (valid for modules that have cables connecting the JST connector of the driver to the module). In this case, the resistor must be integrated into the wire connecting the appropriate pin for Rset 1 or 2.

Poke-in Connectors

Some Xitanium LED drivers feature poke-in connectors on the input and output side of the driver for ease and flexibility.

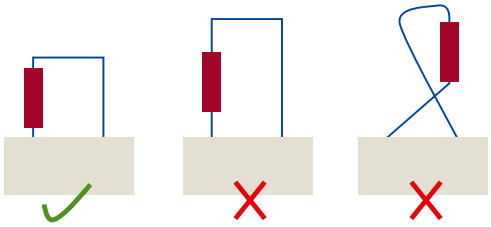
Note: All new drivers and modules are moving away from such connectors towards poke-in options. Please refer to the driver (and module) datasheet at www.philips.com/technology for details on the type of connector available. In case a choice is made to use a driver with a JST connector and a module with poke-in connectors, there are special cables available to allow for this. More information can be seen in the datasheets of the modules or you can contact your Philips representative.

Mains Connectors

Orange push-in connectors are used to connect the drivers to the mains. The connector for PE is colored green (if present). The Xitanium drivers with the SH form factor have 2 connectors for each mains connection to enable loop through functionality.

DALI – Touch Dim Connectors

Blue push-in connectors are used to connect the DALI or Touch Dim connection wires to the Xitanium driver.



JST connector (driver side) pin layout 75 W & 110 W

Connection details in the case of poke-in connectors

The connections for the mains, 12 V output and the RSet are done using a poke-in connector for selected drivers. Please keep in mind the following while making the connection:

- Make sure to push in the springs before inserting the wires in order to ensure a good connection.
- While connecting the resistor, please refer to the picture shown. The resistor must be inserted such that there is no possibility of a short.

Special attention for 75 W and 110 W Xitanium LED drivers

Due to the higher output voltage (>100 V) of these LED drivers more creepage/clearance distance is required for safety reasons. The + terminal of the LED driver output current has therefore been moved from pin 2 to pin 1.

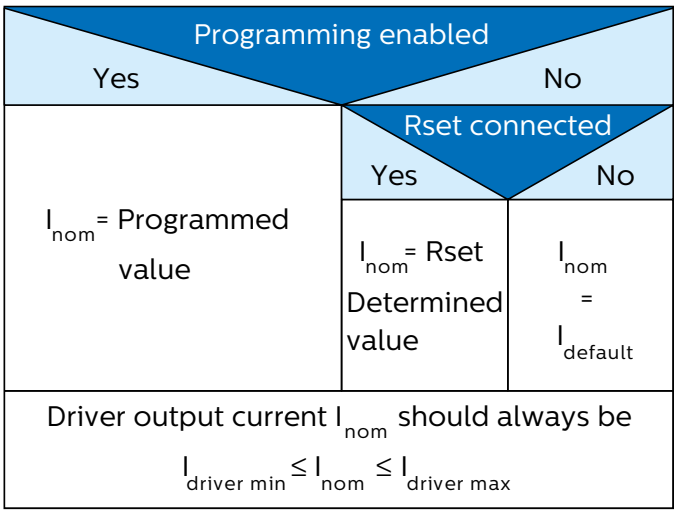
Adjustable Output Current (AOC) – set the driver output current

Output current can be set by placing an external resistor (LEDset and Rset) into the driver's Rset input. Next to that TD driver versions allow also setting of the output current via software configuration. Note: Rset is used as generic indication for Rset1, Rset2 or LEDset. Note: LEDset and Rset-interface are not meant to be used as a control or dimming interface (for instance 1...10 V). If this is not observed, both performance and safety requirements of the installation may be affected.

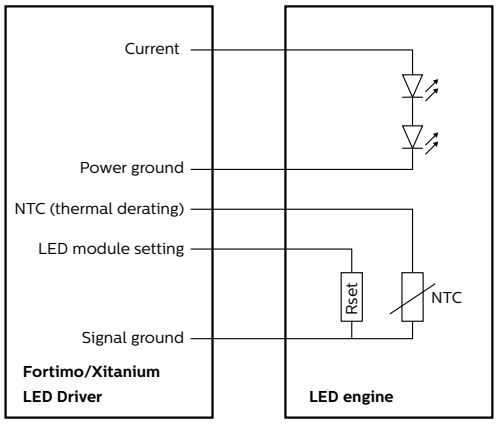
Default driver output current

Because of safety requirements Philips decided to structurally implement the minimum output current as a default setting for Philips' LED drivers. In addition, the LED driver will go into a safe state if the Rset resistor is not functioning well (e.g. broken or disconnected). However, as a result of the LEDset standard, the default minimum is not an absolute minimum current anymore. For instance, for a LED driver a given minimum current of 700mA will now become ≤ 700mA. The reason for this specification is to allow the thermal derating functionality on the LED module, which is a part of the new LEDset standard.
An 'open' situation (no resistor placed) should therefore be avoided.

In case the LEDset connections are being short circuited, the output of the driver will go to the maximum output power (Pout-max). In this case the required Vf of the LED load defines if at Pout-max the maximum output current (I-max) is also reached. The accuracy in this situation is less than when using a resistor to select and set the output current.
It is strongly advice is to always use a well-connected resistor, which will result in a well-defined output current.



Priority selection citeria for Group 1 - 1% minimum dim level



Schematic block diagram of Rset

Determine AOC priority with TD drivers

Since the TD drivers allow two methods to set the output current (AOC), it is good to take note of the priority of each method with respect to the other. There are two groups of TD drivers; those which can dim down to 1% (newer) and those which can dim down to 10% (older).

Group 1: 1% minimum dim level (newer drivers)
AOC programming has priority over Rset. For the priority selection criteria see table on the left.
Group 2: >1% minimum dim level
The value that sets the lowest current has priority over the other.

1. Iprogramming < IRset ? => priority for Iprogramming
2. IRset < Iprogramming ? => priority for IRset

E.g. programming 200 mA has priority over Rset which would generate 250 mA. And Rset that generates 200 mA has priority over programming 250 mA.

Note: default current is stated in the driver's datasheet in the download section on www.philips.com/technology.

Why a resistor?

1. Worldwide standardized building block
2. Worldwide availability and well documented
3. Freedom for OEM to choose the value and supplier

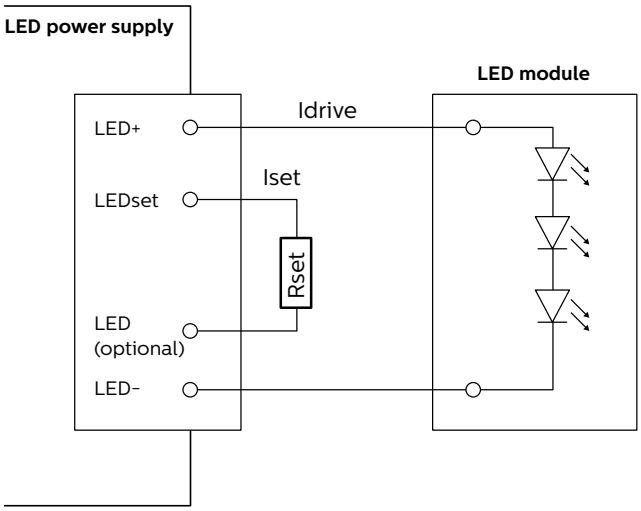
Resistor placed into driver enables you to

1. Connect different configurations, not just a unique solution
2. Drive different type of LED boards, not restricted to one type
3. Select and tune the current, hence flux or Tc

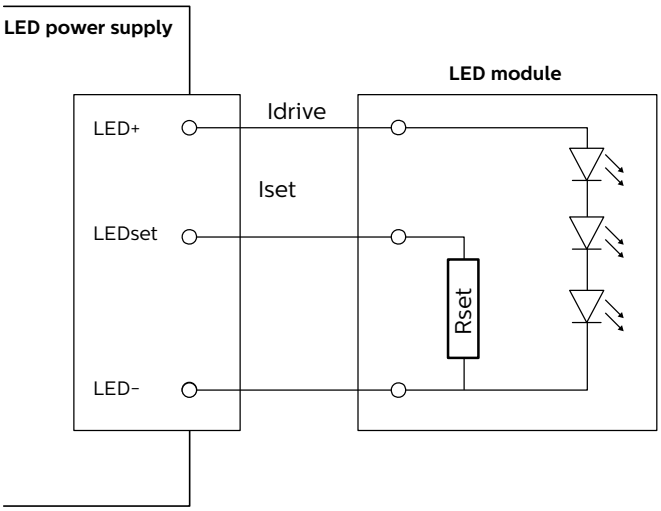
Setting the output current via Rset

By use of a resistor with a certain value (minimum 125 mW/50 V rated) you can determine the required current for the used LED module. A schematic block diagram is shown on the left. 3 different Rset resistors can be used.

- Rset1 is used for drivers that have a maximum output current of 700 mA.
- Rset2 is used for a wider selection of currents, 0.1 A to 2 A. Please refer to the following table for information.
- LEDSet is intended to become an international standard and will be used in all Indoor drivers in the future. It can cover a wide range of currents from 0.05 A to 8 A.



Rset resistor mounted directly onto the driver



Rset resistor mounted onto the LED module

Rset1 and Rset2 use different pins in the JST connector of the driver.
The Rset1 and Rset2 values with the corresponding drive currents are shown in following tables. It is advised to select the nearest lower resistor value that is available, if the exact determined value is not at hand. The Rset2 table shows the Rset values for currents up to 2 A.
The current Xitanium indoor Spot & Downlight drivers have a maximum current of 1.5 A. The exact operating window can be found in the datasheet of the driver at www.philips.com/technology.

With the shift from JST connectors towards poke-in connectors, drivers with LEDSet will have poke-in functionality.

Rset1 and Rset2 use different pins on the driver (and on the JST connector).

The Rset1 and Rset2 values with the corresponding drive currents are shown in following tables. It is advised to select the nearest lower resistor value that is available to you, if the exact determined value is not at hand.

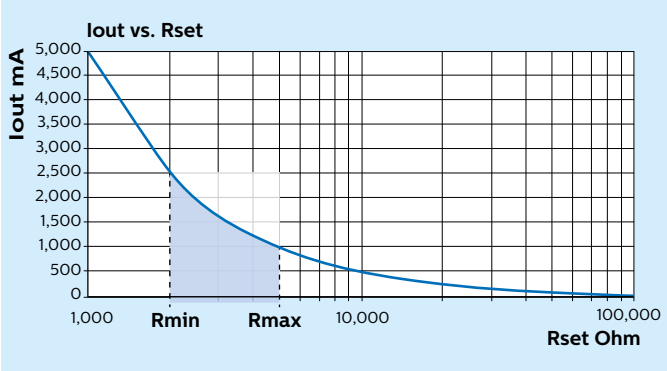
To set the output current via LEDset

Rset 1 and Rset 2 have been the traditional ways to set the current in the Xitanium window drivers. Next generation drivers will now be introduced with LEDset. LEDset is introduced by several vendors in the market to provide an industry standardized Rset interface. LEDset is, in essence, like Rset1 and Rset2, where one resistor value leads to one output current value only, differing only in the look-up table. Please find the table for E96 resistor values in the next section.

What does LEDset offer

Like Rset1 and Rset2, LEDset is an analogue interface, allowing basic output current setting. The interface supports the following functions:

- Output current setting of the constant current LED driver to LED modules
- Thermal protection of the LED module(s) via thermal dynamic resistors circuit



How does LEDset work

LEDset is based on a 3 wire connection between LED driver and one or more LED modules as shown in the figure on the left. Only one additional wire, besides the two LED current supply wires, is used for transferring information from the LED module(s) to the LED driver, provided the Rset is mounted on the LED module. Alternatively a standard resistor can be put directly into the driver's LEDset input connectors.

The LEDset interface measures the current Iset which flows from a 5V constant voltage source within the LED driver through the setting resistor(s) Rset which is/are located either on the LED modules or directly into the driver's Rset-input.

The current Iset flowing through one setting resistor Rset is determined by the equation:

Iset [A] =5 [V] / Rset [Ω]

A LED driver with LEDset interface is able to measure Iset and to set the LED driver output current Idrive dependent on the measured value of Iset according to the equation

Idrive=Iset x 1000 [A]

Therefore the overall relationship between the setting resistor and the LED driver output current Idrive is then given by

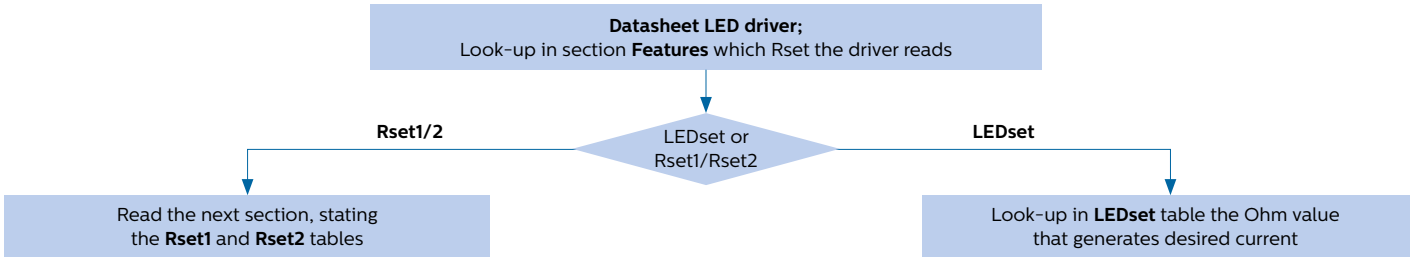
Idrive [A] =(5 [V] / Rset [Ω]) x 1000

To calculate the required resistor value for a desired drive current Idrive use:

Rset [Ω] = (5 [V] / Idrive [A]) x 1000

The LEDset interface is intended to cover a LED driver output current range from 0.05 A to 8 A. The corresponding resistor Rset is therefore within the range 100 kOhm to 625 Ohm.

In addition, it is possible to add an over temperature protection circuit on the LED module which decreases the setting current in case of an over temperature event and thus limits or folds back the LED driver output current.



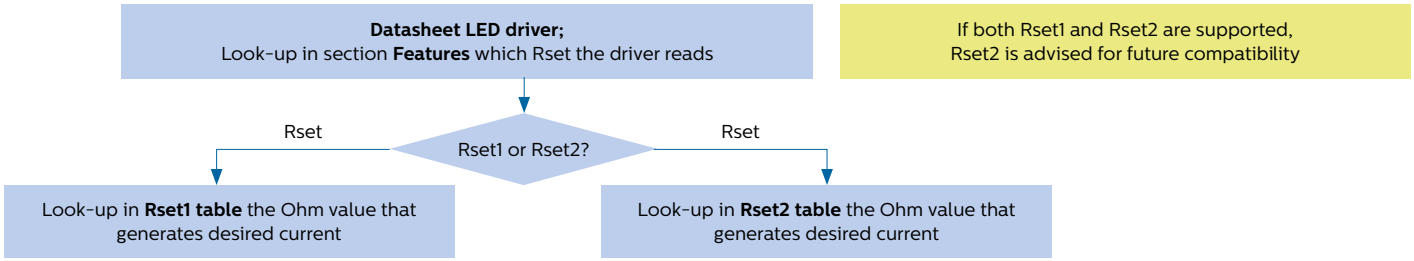
Note on E-series: in electronics, international standard IEC 60063 defines preferred number series for amongst others resistors. It subdivides the interval between subsequent values from 1 to 10 into 6, 12, 24, 48, 96 etc. steps. These subdivisions ensure that when some arbitrary value is replaced with the nearest preferred number, the maximum relative error will be on the order of 20%, 10%, 5%, 1% etc.

LEDset – E96 series: table with E96 resistor values

LEDset [Ω]	Idrive [mA]	LEDset [Ω]	Iset [mA]	LEDset [Ω]	Iset [mA]	LEDset [Ω]	Iset [mA]
open	avoid*	23700	211	11000	455	5110	978
49100	102	23600	212	10700	467	4910	1018
48700	103	23200	216	10500	476	4870	1027
47500	105	22100	226	10200	490	4750	1053
46400	108	21600	231	10000	500	4640	1078
45300	110	21000	238	9760	512	4530	1104
44200	113	20500	244	9530	525	4420	1131
43200	116	20000	250	9310	537	4320	1157
42200	118	19600	255	9090	550	4220	1185
41200	121	19100	262	8870	564	4120	1214
40200	124	18700	267	8660	577	4020	1244
39200	128	18200	275	8450	592	3920	1276
38300	131	17800	281	8250	606	3830	1305
37400	134	17400	287	8060	620	3740	1337
36500	137	16900	296	7870	635	3650	1370
35700	140	16500	303	7680	651	3570	1401
34800	144	16200	309	7500	667	3480	1437
34000	147	15800	316	7320	683	3400	1471
33200	151	15400	325	7150	699	3320	1506
32400	154	15000	333	6980	716	3240	1543
31600	158	14700	340	6810	734	3160	1582
30900	162	14300	350	6650	752	3090	1618
30100	166	14000	357	6490	770	3010	1661
29400	170	13700	365	6340	789	2940	1701
28700	174	13300	376	6190	808	2870	1742
28000	179	13000	385	6040	828	2800	1786
27400	182	12700	394	5900	847	2740	1825
26700	187	12400	403	5760	868	2670	1873
26100	192	12100	413	5620	890	2610	1916
25500	196	11800	424	5490	911	2550	1961
24900	201	11500	435	5360	933	2490	2008
24300	206	11300	442	5230	956	short	avoid**

* driver's default current, however not stable. For details see section on 'Default driver output current'

** driver's maximum current, however not absolute. For details see section on 'Default driver output current'



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Note: next page shows extended Rset2 table: E96 values, stating smaller increments

Rset1 – E24 series

Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]
39	200	510	292	6k8	583	91k	690
43	201	560	300	7k5	591	100k	691
47	202	620	309	8k2	599	110k	692
51	203	680	318	9k1	60	120k	693
56	204	750	327	10k	614	130k	693
62	206	820	336	11k	621	150k	695
68	208	910	347	12k	627	160k	695
75	209	1k	358	13k	632	180k	696
82	210	1k1	369	15k	640	200k	696
91	212	1k2	379	16k	643	220k	697
100	215	1k3	388	18k	649	240k	697
110	217	1k5	406	20k	654	270k	698
120	219	1k6	414	22k	658	300k	698
130	221	1k8	429	24k	661	330k	698
150	226	2k	442	27k	665	360k	699
160	228	2k2	455	30k	669	390k	699
180	232	2k4	466	33k	671	430k	699
200	236	2k7	481	36k	674	470k	699
220	240	3k	494	39k	676	510k	699
240	244	3k3	505	43k	678	560k	700
270	250	3k6	517	47k	680	620k	700
300	256	3k9	525	51k	682	680k	700
330	261	4k3	536	56k	683	750k	700
360	267	4k7	546	62k	685	820k	700
390	272	5k1	555	68k	686	910k	700
430	279	5k6	564	75k	688	1M	700
470	286	6k2	574	82k	689	No Rset	default

Rset2 – E24 series

Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]	Ret1 [Ω]	Iset [mA]
short	100	430	245	2k	733	9k1	1558
100	100	470	261	2k2	780	10k	1604
110	106	510	277	2k4	823	11k	1653
120	111	560	297	2k7	884	12k	1694
130	116	620	318	3k	941	13k	1730
150	121	680	340	3k3	993	15k	1793
160	130	750	368	3k6	1042	16k	1817
180	13	820	392	3k9	1086	18k	1864
200	146	910	422	4k3	1143	20k	1902
220	155	1k	452	4k7	1192	22k	1935
240	166	1k1	485	5k1	1238	24k	1965
270	176	1k2	515	5k6	1293	27k	2000
300	190	1k3	545	6k2	1350	No Rset	default
330	204	1k5	602	6k8	1402		
360	215	1k6	632	7k5	1454		
390	228	1k8	684	8k2	1503		

Rset priority behavior for drivers that read both Rset1 and Rset2

Rset1	Rset1	Driver status
Open	Open	Driver's default current (see datasheet)
Rset	Open	Rset1
Open	Rset	Rset2
Rset	Rset	Rset2
Short	Open	Rset1 (driver's minimum current, see datasheet)
Short	Short	Rset2 (driver's minimum current, see datasheet)
Open	Short	Rset2 (driver's minimum current, see datasheet)

Please refer to the datasheet of the driver you use to find which Rset or Rsets the driver actually reads.

Rset2 – E96 series: table with E96 resistor values, stating smaller increments but covering same range as the E24 series on previous page

Rset2 [Ω]	Iset [mA]	Rset2 [Ω]	Iset [mA]	Rset2 [Ω]	Iset [mA]	Rset2 [Ω]	Iset [mA]	Rset2 [Ω]	Iset [mA]	Rset2 [Ω]	Iset [mA]
short	min.	255	171	665	335	1740	669	4530	1171	11800	1686
100	100	261	173	681	341	1780	679	4640	1185	12100	1698
102	101	267	175	698	347	1820	689	4750	1198	12400	1708
105	103	274	178	715	354	1870	701	4870	1212	12700	1719
107	104	280	181	732	361	1910	711	4910	1216	13000	1730
110	105	287	184	750	368	1960	724	5110	1239	13300	1739
113	107	294	187	768	374	2000	733	5230	1253	13700	1752
115	108	301	191	787	381	2050	745	5360	1267	14000	1761
118	110	309	194	806	387	2100	757	5490	1281	14300	1771
121	111	316	197	825	394	2160	770	5620	1295	14700	1783
124	113	324	201	845	400	2210	782	5760	1308	15000	1793
127	115	332	204	866	407	2320	806	5900	1322	15400	1802
130	116	340	207	887	414	2360	815	6040	1335	15800	1812
133	118	348	210	909	422	2370	817	6190	1349	16200	1822
137	119	357	214	931	429	2430	829	6340	1362	16500	1829
140	120	365	217	953	436	2490	841	6490	1375	16900	1838
143	122	374	221	976	444	2550	853	6650	1389	17400	1850
147	123	383	225	1000	452	2610	865	6810	1403	17800	1859
150	125	392	229	1020	459	2670	877	6980	1415	18200	1867
154	127	402	233	1050	469	2740	891	7150	1428	18700	1877
158	129	412	237	1070	475	2800	903	7320	1441	19100	1885
162	131	422	241	1100	485	2870	916	7500	1454	19600	1894
165	132	432	246	1130	494	2940	929	7680	1467	20000	1902
169	134	442	250	1150	500	3010	943	7870	1480	20500	1910
174	136	453	254	1180	509	3090	956	8060	1493	21000	1918
178	137	464	259	1210	518	3160	968	8250	1506	21600	1928
182	139	475	263	1240	527	3240	982	8450	1518	22100	1936
187	141	487	268	1270	536	3320	996	8660	1531	23200	1952
191	143	491	270	1300	545	3400	1009	8870	1544	23600	1959
196	145	511	278	1330	554	3480	1022	9090	1557	23700	1960
200	146	523	282	1370	565	3570	1037	9310	1569	24300	1968
205	148	536	287	1400	574	3650	1049	9530	1580	24900	1975
210	151	549	292	1430	582	3740	1062	9760	1592	25500	1982
216	153	562	297	1470	594	3830	1075	10000	1604	26100	1989
221	155	576	302	1500	602	3920	1088	10200	1614	26700	1996
232	161	590	307	1540	614	4020	1103	10500	1629	27000	2000
236	163	604	313	1580	626	4120	1117	10700	1639	open	default
237	164	619	318	1620	638	4220	1131	11000	1653		
243	167	634	323	1650	645	4320	1145	11300	1666		
249	169	649	329	1690	656	4420	1158	11500	1674		

Programming the output current

The Xitanium TD drivers offer a full range of controls, enabling customizable luminaire design and performance. It is possible to control light output levels, preset dimming protocols and set system specifications in the factory and even in the complete installations.
This can be done with the Philips MultiOne configurator. The MultiOne configurator is an intuitive tool that unlocks the full potential of all programmable drivers from Philips, ensuring that the driver performance matches the needs of the lighting solution. It offers unprecedented flexibility, before, during and after the product installation.
With the latest selected drivers, SimpleSet® functionality is also supported via MultiOne.
Please check the datasheet of the driver on www.philips.com/technology to know if your driver supports SimpleSet® or not.
For more information on MultiOne go to the chapter Configurability or visit:
www.philips.com/multiOne
This site contains detailed information on how to install the software and how to program the driver.

Mains voltage fluctuations

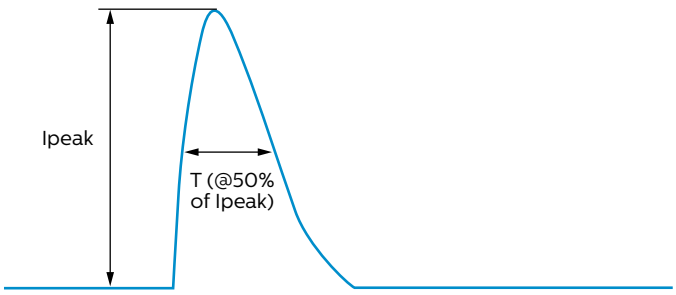
The driver is able to withstand high and low mains voltages for limited periods of time.

Allowable voltage difference between mains input and control input

The majority of our LED-drivers do comply with a voltage isolation difference up to 250 V between mains and the Touch Dim control input, as can be caused by a different phase of the power grid in an installation in the field. Future drivers might have a value higher than 250 V by design.

Low mains voltage

A continuous low AC voltage (<198 V) can have an adverse effect on the driver's lifetime. The output power will be limited accordingly. A low voltage will not cause the driver to fail over a maximum period of 48 hours at minimum operating AC voltage and maximum ballast ambient temperature.



Graphical representation of inrush current

High mains voltage

A high mains voltage will stress the driver and have an adverse effect on the lifetime (maximum of 264-320 V for a period of 48 hours, 321-350 V for a period of two hours).

DC, DCemDIM and Emergency operation

Depending on the Xitanium LED driver type, they are released in compliance with IEC 61347-2-3 Part J or IEC 61347-2-7 lamp control gear standards. As a result these drivers are suitable for emergency luminaires in compliance with IEC 60598-2-22, excluding high-risk task areas.

For some drivers (details in driver datasheet), an external EMI filter is recommended to be used in the emergency operation. The following filter has been tested for use: www.conrad.nl → Yunpen-Netfilter-250-V126-YK01T1.

For specific input requirements, please check the driver's datasheet at www.philips.com/technology.

Note: The allowed DC voltage range accepted by the driver is stated in the driver's datasheet. Values outside that range will have an adverse effect on the driver's performance and possibly reliability.

On selected drivers DCemDIM is available, allowing a pre-defined dim level of the driver's output when switched to DC. More on setting parameters of DCemDIM can be found in the section for Controllability. For specific input requirements, please check the driver's datasheet at the download section on www.philips.com/technology.

Inrush current

'Inrush current' refers to the briefly occurring high input current which flows into the driver during the moment of connection to mains; see the illustration on the left. Typically, the amplitude is much greater than the steady-state input current.

The cumulative inrush current of a, given, combined number of drivers may cause Mains Circuit Breakers (MCB) to trip. In such a case, either one or a combination of the following measures need to be taken to prevent nuisance tripping:

1: Replace existing MCB for a less sensitive type (e.g. exchange B type for C type)
2: Distribute the group of drivers over multiple MCB groups or phases
3: Power up drivers sequentially instead of simultaneously
4: Install external inrush-current limiting devices

Inrush parameters are driver-specific an can be found in the driver datasheet at www.Philips.com/Technology.

Note: The amplitude and pulse time of the inrush current are not in any way affected by the driver feature Adjustable Startup Time (AST).

MCB type	Rating (A)	Relative number of LED drivers (%)
B	16	100 (stated in datasheet)
B	10	63
B	13	81
B	20	125
B	25	156
C	16	170
C	10	104
C	13	135
C	20	208
C	25	260
L, I	16	108
L, I	10	65
G, U, II	16	212
G, U, II	10	127
K, III	16	254
K, III	10	154

Conversion Table for maximum number of drivers on Different types of Miniature Circuit Breakers.

To Determine the Number of Drivers on a MCB

The maximum amount of drivers on a 16 A type B Miniature Circuit Breaker (MCB) is stated in the driver's datasheet on www.Philips.com/Technology.
In the conversion table on the left that stated amount is used as reference (100%).
The maximum quantity of drivers on different types of MCB can be calculated by the reference (see driver's datasheet) x Relative number (last column).
Example;
If datasheet states: max number on type B, 16 A = 20,
then for type C, 13 A the value will be 20 x 135% = 27

Notes:

1. Data is based on a mains supply with an impedance of 400 mΩ (equal to 15 m of 2.5mm^2 cables and another 20 m to the middle of the power distribution) in the worst-case scenario. With an impedance of 800 mΩ the number of drivers can be increased by 10%.
2. Measurements will be verified in real installations; data is therefore subject to change.
3. In some cases the maximum number of drivers is not determined by the MCB but by the maximum electrical load of the installation.
4. Note that the maximum number of drivers is given when these are all switched on at the same time, e.g. by a wall switch.
5. Measurements were carried out on a single-pole MCB. For multiple MCB's it is advisable to reduce the number of drivers by 20%.
6. The maximum number of drivers that can be connected to one 30 mA Residential Current Detector is 30.

Surge protection

The Xitanium Indoor Down- and Spotlight drivers have limited built-in surge protection. Depending on the mains connected, additional protection against excessive high surge voltages may be required by adding a Surge Protection Device.
The actual limit can differ per driver and can be found in the driver's datasheet in the download section on www.philips.com/technology.

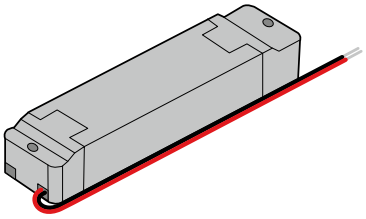
Touch current

The Xitanium Indoor Spot & Downlight LED drivers are designed to meet touch current requirements per IEC 61347-1 standard. The specified maximum values are 0.7 mA peak for IEC and 0.75 mA RMS for UL norms. The test is done with the driver alone. In a luminaire, touch current may be higher, since the LED load may introduce additional touch current. Precautions may be required on the luminaire level and if multiple drivers are used in a single luminaire.

Electromagnetic compatibility (EMC)

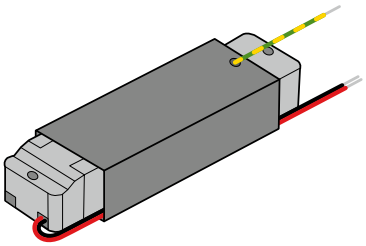
Electromagnetic compatibility (EMC) is the ability of a device or system to operate satisfactorily in its electromagnetic environment without causing unacceptable interference in practical situations. Xitanium indoor LED drivers meet EMC requirements per CISPR15 ed 7.2. This test is conducted with a reference setup that includes a driver and an LED load/heat sink combination mounted on a metal plate.

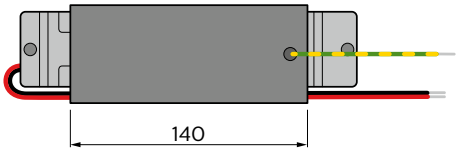
The reference set-up defined for point-source drivers used in a plastic Class II fixture is visualized below:

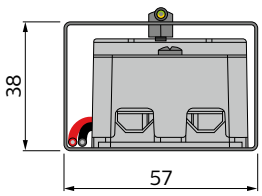


The output wiring routed along the total enclosure, although not recommendable, is very common in track-luminaires and simply had to be defined this way as reference.

The reference set-up defined for point-source drivers used in a Class I fixture is visualized below under different viewing angles including dimensions:







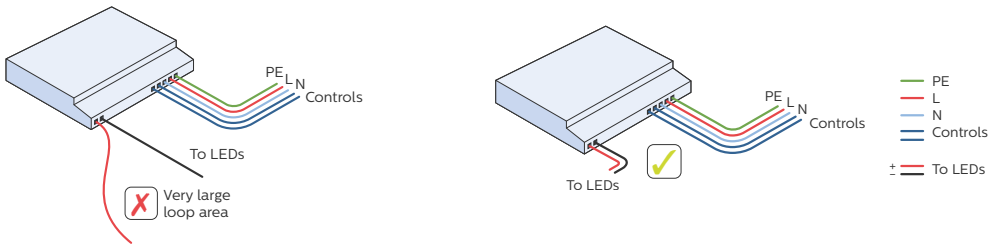
To represent a standard metal (track) luminaire the metal sleeve around the driver has been defined having approximately the same dimensions as the inside of the commonly used track fixture luminaire.

The distance from plastic housing towards the metal sleeve can influence the EMI performance.
This metal sleeve must be connected to earth to represent the Class I application.
The mains wiring should be kept as short as possible and be routed with maximum distance from the wiring to the LED's.

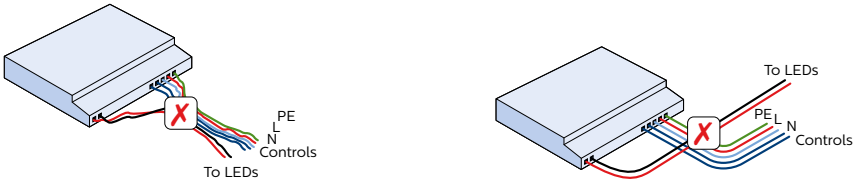
Improvement in EMC Performance

The following practical precautions need to be taken into account in a lighting system to minimize EMC:

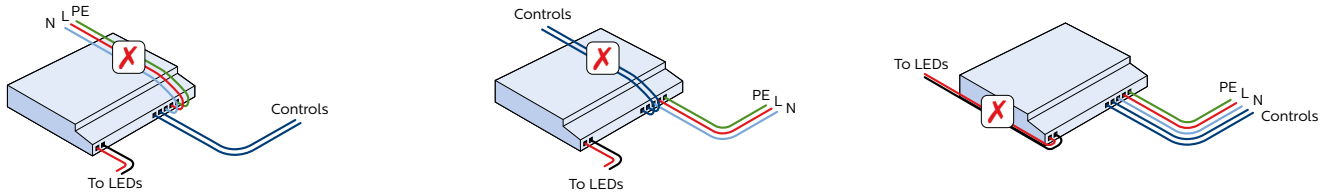
- Minimize the differential mode loop area of the lamp wires going from the driver to the light source by keeping the wires close together (bundling). This will minimize the magnetic field and reduce the radiated EMI.



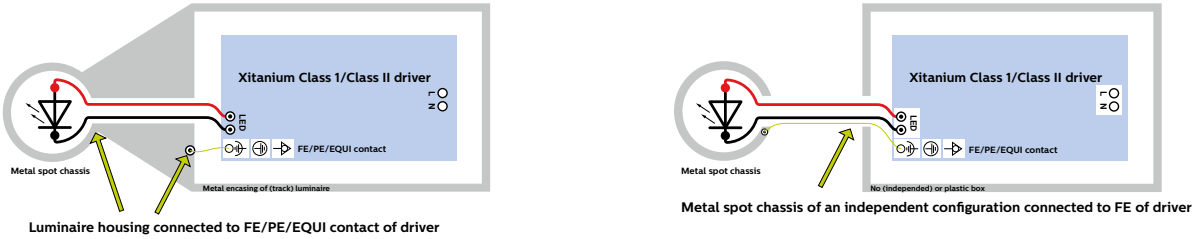
- Minimize the common mode parasitic capacitance of the output wiring + light source to earth by keeping the length of the wires between driver and light source as short as possible. Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and control wires(DALI, 0-10 V) separated from the output wires. Do not bundle or cross the wires.



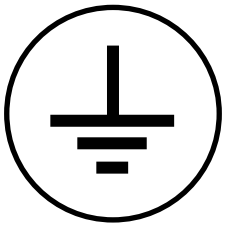
- Do not route any wiring over and/or along the driver enclosure to avoid any coupling/crosstalk with internal components of the driver.



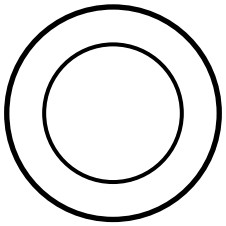
- Ground the lighting system chassis and other internal metal parts to protective earth (class I luminaires): do not let large metal parts electrically insulated from functional or protective earth. Always connect the protective/functional earth/equipotential connector or wire from the driver and use equipotential bonding wires for all large unconnected metal luminaire parts like luminaire housing, driver mounting plate, reflector, heatsink etc. Keep the protective/ functional earth/equipotential wires as short as possible to maximize their effectiveness and use, as much as possible, large metal areas (chassis, mounting plates, brackets) for earthing purposes instead. Establish a reliable electrical connection by using a toothed washer and screw(s) fastened with adequate torque.



Adhering to these rules will help in EMC compliance. For further questions and/or design-in support please contact your local Philips representative.



Symbol for Protective Earth (PE)



Symbol for Double Isolation between primary and secondary side of a driver, in combination with built-in usage.

Isolated drivers (SELV output)

These drivers have double isolation from the primary to the secondary side and a plastic chassis. The presence of the Protective Earth (PE) symbol on the driver housing of some SH types indicates the possibility of looping through of the PE-terminal to serve other equipment, but these drivers are inherently Class II equipment by construction. This means that these isolated drivers (SELV output) can be used in both Class I and Class II luminaires under the following conditions:

- When used for Class I the protective earth connection should be present
- When applied for insulation Class II, the driver should be incorporated in the luminaire in such a way that either:

  a) The PE terminals are not used at all (no PE from the mains, neither loop through, nor grounding connections to accessible parts of the luminaire)

  b) The PE terminal is used functionally (not to PE of mains) and in this case, to reconstruct the double insulation associated with Class II, all accessible parts (fixture chassis, connected luminaire parts) need to be isolated complying with basic insulation towards the PE terminal.

Note: for Class II, EMC requirements should be met without PE connection

Cable length and EMC

Philips has successfully performed EMC tests for systems with a cable length of 60cm. For longer cables it is advised to repeat these tests.

Electrical isolation

All Xitanium Indoor Spot & Downlight LED drivers, except the 110 W range, are SELV. This means that the output voltage doesn't exceed the SELV voltage limitations (<50 VAC,rms, <120 VDC). Also the output circuitry is double isolated from the mains.

Because the 110 W driver has a maximum output voltage of 160 V, this driver cannot be SELV. This driver has also basic isolation instead of double isolation.

Configurability

MultiOne Interface USB2DALI

MultiOne SimpleSet® interface

Introduction

This chapter describes the way you can configure the drivers with the MultiOne Configurator. Please check the datasheet of the driver on www.philips.com/technology to know if your driver supports configurability.

The characteristics of the MultiOne configurator are:

- One tool for all Philips configurable drivers: Xitanium LED Indoor and Outdoor drivers; HF-R Indoor gear; DynaVision Xtreme HID electronic gear...
- Future proof by design: modular approach, very scalable and backwards compatible
- Provides access to all features built in the driver
- Tool combines configuration with debugging
- Settings of the drivers can be changed any point in the product lifecycle.

This configurator consists of:

1. Philips MultiOne Interface tool
2. USB cable (connection to PC or laptop)
3. Philips MultiOne Software

Philips MultiOne Interface tool

There are 2 versions of MultiOne interface tooling depending on the type of communication:

1. LCN8600/00 MultiOne Interface USB2DALI

The interface that can be used with the MultiOne PC software to commission, configure, diagnose drivers via the DALI interface

2. LCN9600 MultiOne SimpleSet® interface

The interface that can be used with the MultiOne PC software to configure drivers wirelessly using SimpleSet® technology.

Note: The programming of the drivers with SimpleSet must be done while disconnected from mains.

When ordering the MultiOne Interface, the correct USB cable will be supplied with the interface tool.
The tool can be ordered via your Philips sales representative or via the Philips OEM webshop, http://oemwebshop.philips.com.

Philips MultiOne Software

There are 2 versions of MultiOne Software depending on functionality and location:

1. MultiOne Engineering

Especially developed to access all functionality of the driver; to configure, diagnose and prepare the configuration file for the production environment. Includes also:

- DALI commands, scheduler.
- SimpleSet®.

2. MultiOne Workflow

Developed to configure all devices or subassemblies in the production environment or field in a simple and quick way.

Get your software (free downloadable) or check if you have the latest version via the website, http://www.philips.com/multione.

System requirements

The MultiOne configurator must be connected to a system with minimum system requirements:

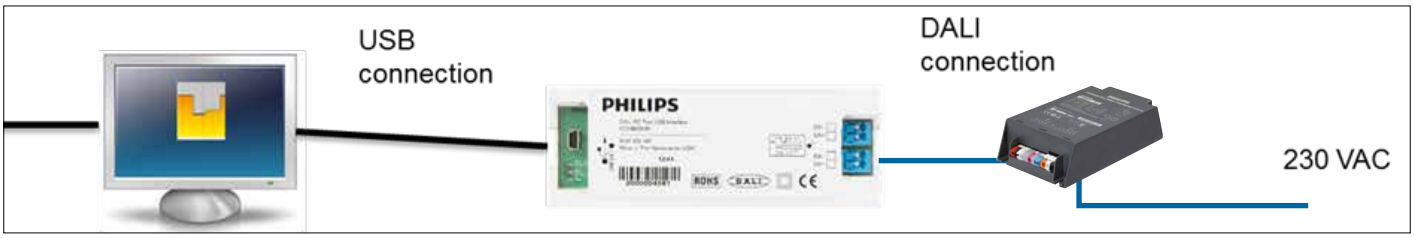
- Windows PC or Laptop
- Microsoft Windows XP + SP3 or Windows 7, Windows 8.0, Windows 8.1
- USB 2.0 ports (preferable two free ports)
- Min 35 MB of free disk space
- Microsoft.NET Framework 3.5 SP1 (!)

Getting Started

Connect the USB cable of the MultiOne Configurator between the PC and the configuration tool.
To install the software, launch the installation file for the latest version and follow the instructions on your screen. The installation wizard will guides through the process of installing the software and will asks where the software needs to be installed, if a shortcut is needed on the desktop and a new program is also created in the Start Menu.

More information on how to program a driver, can be found in getting started and the instruction manual on the website, http://www.philips.com/multione.

MultiOne System



Settings

The Xitanium configurable LED drivers have a fixed set of features and factory settings when supplied. The set of features is defined in the datasheet of the driver. The default settings of the driver can be found in the driver's datasheet in the download section on www.philips.com/technology

Note: DM stands for Differential Mode, CM for Common Mode.

Thermal design-in

Introduction

This chapter describes two aspects of the thermal design of the Xitanium/Fortimo LED drivers:

1. The LED driver itself and relationship between Tc point and lifetime of the LED driver
2. Module Temperature Protection (MTP) function to ensure lifetime of LED module/PCB.

To facilitate design-in of LED drivers, the critical thermal management points of the LED driver are set out in this section. In Philips' product design phase all possible precautions have been taken to keep the component temperature as low as possible. However, the design of the luminaire and the ability to guide the heat out of the luminaire are of utmost importance. If these thermal points are taken into account this will ensure the optimum performance and lifetime of the system.

Case Temperature Point (Tc point)

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the driver remains within its rating. In the LED driver design, all precautions are taken to ensure that the components within the driver are at the lowest possible temperatures.

The case temperature (Tc) is a reference for the temperatures of the critical internal driver components. The location of the Tc point is identified on the product label. Tc point is marked by the ● -sign on the label of the driver.

To measure Tc at the Tc point

The temperature can be measured using a thermocouple that is firmly glued to the driver housing. For a representative measurement the temperature must be stable before any reliable data can be obtained (typically > 0.5 hours).

Relation between Tc and ambient temperature

The Tc increases, by approximation, linearly with the ambient temperature (Tamb). The temperature offset between Tamb and Tc depends on the thermal design of the luminaire. The Xitanium LED driver has been designed for indoor use. For approved ambient temperature range please check the associated driver datasheet on www.philps.com/technology.

Module Temperature Protection (MTP)

NTC and thermal design

This feature helps to protect the LEDs when operated in a hot ambient environment. The thermal design of an LED module/PCB should be designed in such a way that the temperature of the LED board (Tc-life) is not exceeded under normal application conditions. The utilization of a Negative Temperature Coefficient (NTC) component serves the purpose to help achieve the lifetime of the LED module or LED PCB if external thermal influences result in the temperature for lifetime (Tlife) being exceeded. When this occurs the light output will be regulated to remain below the critical temperature by the driver dimming down.

The following are two NTC part numbers which are supported in combination with Philips LED modules:

1. 15 k NTC - Vishay 15 kOhm ±2% NTC, B25/85 = 3700, 2381 615 54153
2. 15 k NTC - Murata 15 k, Part number NCP15XW153E03RC (with a separate 390 ohms resistor in series with the NTC)

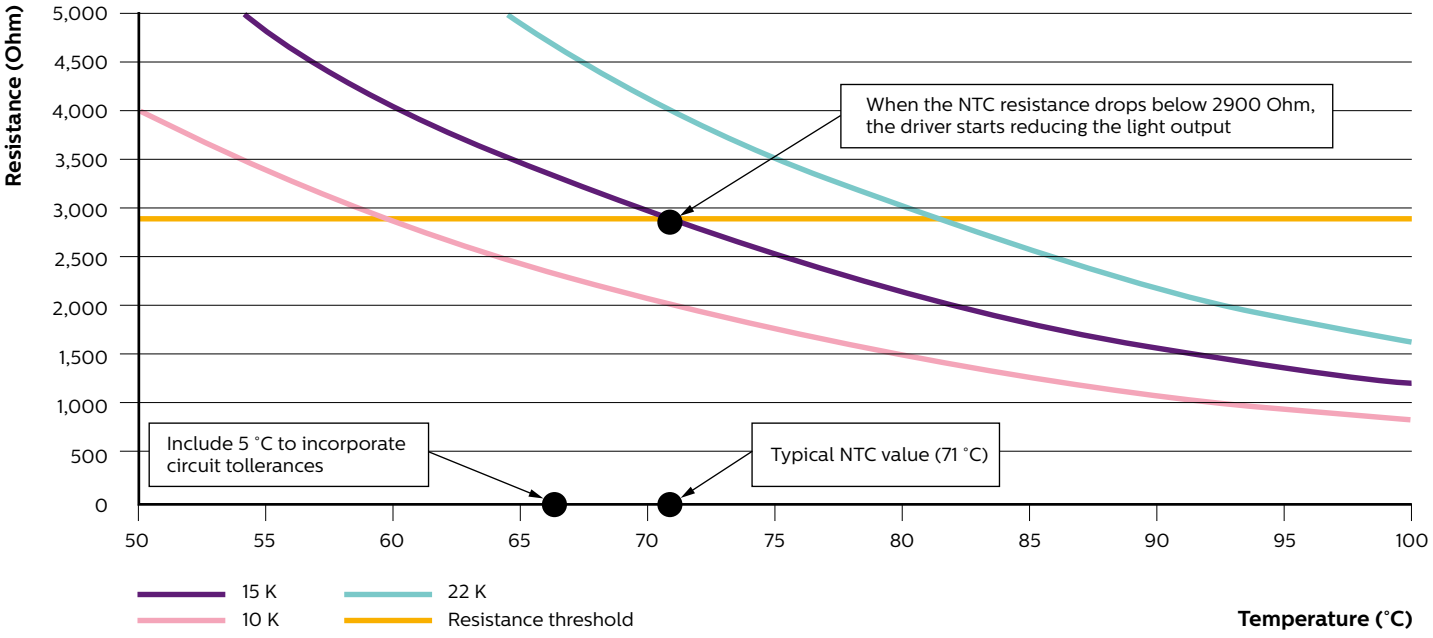
Setting MTP behavior (programmable drivers only)

It is possible to set the temperature at which MTP feature is activated, defined by “MTP warn” and the slope, defined by “MTP max”. Using the MultiOne Configurator software the settings can be changed.

Setting the thermal de-rating point via NTC

The LED driver will start reducing the light output when the NTC reaches a value of
2900 Ω. The NTC should be selected such that 2900 Ω represents the desired critical temperature inside your LED module/PCB.

For example: The Fortimo LED DLM Gen3+ has a defined Tc life at 65 ˚C. Taking the tolerances of the NTC into account results in ±5 ˚C. This gives a typical value for the NTC of 71 ±5 ˚C. By choosing this setting of 71 ˚C, we ensure that the driver will not dim the output, due to a too high temperature, before the module reaches 65 ˚C. The following graph shows a typical R vs. T curve of an NTC resistor. To match 2900 Ω at this temperature, the NTC of 15 kΩ has been selected.



Controllability

Amplitude Modulation (AM) output dimming

Philips Xitanium indoor point LED drivers dim the output to the LEDs by means of Amplitude Modulation (AM) dimming. This means that at no stage of the dimming, Pulse Width Modulation (PWM) at the output to the LEDs is involved. AM dimming guarantees the most smooth and flicker-free operation over the entire dimming range.

Control characteristics

Control input

Regulating level (module dimming)	10 to 100% 1 to 100% for the new digital Xitanium drivers (The diming range can be found in the datasheet)The control input complies with EN 60929 (Annex E) and is compatible with Philips Lighting control equipment
Standby power consumption	< 500 mW
Control input insulation, basic	≥ 1500 V AC

TD: DALI - Touch & Dim

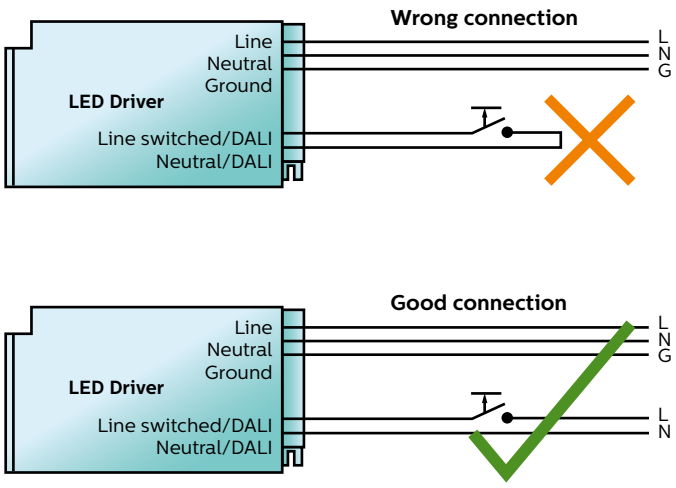
DALI

Digital Addressable Lighting Interface, or DALI, is a digital communication protocol popular in the lighting industry. It is an IEC standard and there are many control devices from Philips and other manufacturers that communicate using DALI. The voltage across DALI wires is typically 16 V (refer IEC specification for details) and it is polarity insensitive. Using DALI, it is possible to send dimming commands (1-254 levels), set fade rates and fade times, query driver or LED status, etc. The Xitanium LED drivers also respond to LED-specific DALI commands, for example:

- Query if the LED module is short circuit or open circuit
- Select between logarithmic or linear dimming curves
- ...

For more information on DALI, refer to the IEC specification for DALI protocol.

- IEC 62386: 102 – General requirements – Control gear
- IEC 62386: 207 – Particular requirements for control gear – LED modules.



Appropriate connection to the dimmable LED driver using the Touch and Dim protocol

Touch & Dim (TD)

For the Xitanium drivers with Touch and Dim function a switched mains is used to dim the light. The switching ON and OFF is also done via this control input. This means that it is no longer necessary to use a power switch to interrupt the mains circuit. The 230 V supply voltage is always available at the LED driver (even when switched OFF), and light can be switched or dimmed by momentarily connecting the mains to the dim input. A short push will switch the lighting on or off, depending on the previous situation. If the switch is held pushed in, the light will dim up or down, depending on what is opposite from the last dimming direction. The driver will count the number of mains cycles and act on that.

Touch and Dim function	Contact duration	Driver function
Ignore	< 40 ms	Disregard push
Short push	>=40 ms and <500 ms	Toggle the lamp ON/OFF
Long push	>=500 ms and <10,000 ms	Dim the lamp up or down
Reset push	>10,000 ms	Synchronize drivers
Corridor (if applicable)	>60,000 ms	Switch to Corridor mode

Special wiring, such as twisted pairs or special cables, is not required to install a Touch and Dim system. All wiring is standard mains wiring and the switch is a standard push-to-make switch. There is no limit to the length of the dim cable or the number of switches connected. The only limitation is the maximum number of drivers, which is 30 per dimming unit. If there is a power failure, the ballast will store the current light level. As soon as the mains power returns, the ballast will recall this stored light level. If it was dimmed to 38%, it will come back at 38%. If it was switched off, it will stay switched off.

If the installation has to be extended by one or more light points / drivers, the dimming direction of the newly connected modules may be different from that of those already connected. To solve this problem a synchronization possibility is built into the drivers and can be called upon at any time. If the switch is pressed for at least 10 seconds all drivers will go to 37% light level and the dimming direction will be set to downwards.

Light level for Upper and lower limits for dim direction.

Upper toggle limit: 70% (DALI arc level 241)
The lower toggle limit can be calculated as follows: lower toggle limit = physical minimum level + 10%
Some examples are given in the following Table:

	Dim range 1-100%		Dim range 5-100%		Dim range 10-100%	
Light level	DALI arc level	Light level	DALI arc level	Light level	DALI arc level	Light level
Lower toggle limit	11%	173	15%	185	20%	195

DALI driver used as fixed output

Trailing edge (TE)

Trailing edge dimmers control the power of the load by varying the duty cycle (ratio on vs. on+off time) of the mains voltage to the driver. Due to the complexity of the combination “TE dimmer + LED driver” and the various qualities of TE dimmers in the market, this way of dimming is not the preferred option. The TE compatible Xitanium LED drivers are tested during the development of the Xitanium LED drivers with below list of recommended TE dimmers.

- Busch-Jaeger: 6513U-102
- Jung Licht-Management: 225T DE

Non-Dimmable

The current of the non-dimmable Xitanium drivers can be set with Rset within the operating window. During normal operation, the set current cannot be changed.

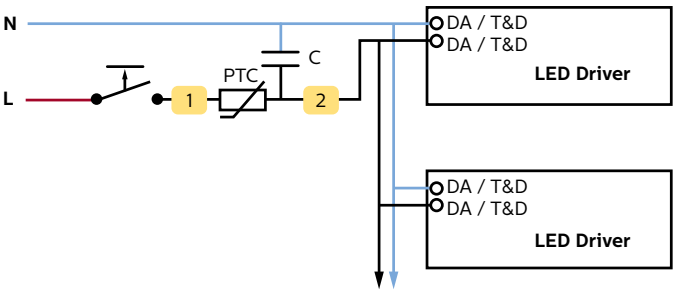
Application guidelines

TD as fixed output

When a TD driver is used without any controls, it operates as a fixed output driver. However, fluctuations on the power line or other similar interferences might trigger a Touch & Dim lamp OFF command (this issue does not exist in the latest drivers). Due to the fact that no control interface is connected, the system cannot be switched on again. To prevent this, Philips recommends to shortcut the DALI interface. The DALI interface is also used for connecting the Touch & Dim controls and by shortcutting this interface, accidental triggering of OFF commands is prevented. DALI shortcutting is required for the following drivers:

Driver	12nc Code
Xitanium 50W 0.3-1A 62V TD/TE 230V	9290 006 61203
Xitanium 50W SH 0.3-1A 62V TD/TE/I 230V	9290 006 17203
Xitanium 50W LH 0.3-1A 62V TD/TE/I 230V	9290 006 17103
Xitanium 25W 0.3-1A 36V TD/Is 230V	9290 004 85803
Xitanium 25W 0.3-1A 36V TD/I 230V	9290 006 00403
Fortimo LED driver 1100-3000 TD	9290 004 65003
Fortimo LED driver 1100-3000 TD/I	9290 004 65203

For all other drivers, this is not necessary.
If control cables are already connected to the control input of the LED-driver but are not yet in use, its advised to short-circuit these cables.



Circuit diagram of a Touch & Dim system with RC filter

RC filter for Touch & Dim interfaces

When a Touch & Dim interface is used that works with the mains AC voltage (Touch & Dim can work with several voltages) and in combination with long cable lengths, big voltage peaks might occur. These voltage peaks can have an unwanted effect on the performance of some of the Xitanium LED drivers.
To prevent this, Philips strongly advises to add a simple RC (using a positive temperature coefficient thermistor) filter in the system for every Touch & Dim interface that is used for the selected drivers listed below.
The picture on the left shows the diagram of a Touch & Dim controlled system with the extra RC-filter. The RC filter consists of following components:

- PTC Resistor: R = 80-150 Ohm Max Voltage Rating >250 V
- Capacitor: C = 330 nF Type X2 275 V

The following drivers need an RC filter for the Touch & Dim interfaces:

Driver	12nc Code
Xitanium 50W 0.3-1A 62V TD/TE 230V	9290 006 61203
Xitanium 50W SH 0.3-1A 62V TD/TE/I 230V	9290 006 17203
Xitanium 50W LH 0.3-1A 62V TD/TE/I 230V	9290 006 17103
Xitanium 25W 0.3-1A 36V TD/Is 230V	9290 004 85803
Xitanium 25W 0.3-1A 36V TD/I 230V	9290 006 00403
Fortimo LED driver 1100-3000 TD	9290 004 65003
Fortimo LED driver 1100-3000 TD/I	9290 004 65203

To Connect to and program a TD driver

Connecting to a programmable driver

Xitanium Indoor Down- and Spotlight LED drivers are programmed via the Philips MultiOne configurator software. To do so, the driver must be connected to the computer via the MultiOne hardware interface.

This can be done with TD drivers only. Check the datasheet for the driver's ability on www.philips.com/technology.

For the latest version of the MultiOne configurator software and detailed description on the possibilities, please check www.philips.com/multione.

To see the programming taking effect

Programming time

Depending on the selected features to program, the programming time varies between 2 - 15 seconds. It is possible to program up to 64 drivers at the same time. In case of group programming there is no individual confirmation (verification) from each driver.

In order to have the programmed values take effect for Xitanium Indoor Spot & Downlight LED drivers, the mains power needs to be cycled. For newer drivers (1% minimum dim level) On/Off via standby is also sufficient.

Quality

Compliance and approval	Generated disturbances, EMI and EMC
EN 55015 A2/CISPR15	Conducted EMI 9 kHz-30 MHz
EN 55015 A2/CISPR15	Radiated EMI 30 MHz-300 MHz
IEC 61000-3-2 A1 + A2	Limits for harmonic current emissions
IEC 61000-3-3	EMC – Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment rated up to 16 A
Immunity	
IEC / EN 61547, A12000	Equipment for general lighting purposes – EMC immunity requirements
IEC / EN 61000-4-2	Electrostatic Discharge
IEC / EN 61000-4-3 A1	Radiated radio frequency, electromagnetic field immunity
IEC / EN 61000-4-4	Electrical fast transient/burst immunity
IEC / EN 61000-4-5	Surge immunity
IEC / EN 61000-4-6	Conducted disturbances induced by RF fields
IEC / EN 61000-4-11	Voltage dips, short interrupts, voltage variations
Performance	
IEC 62384	DC or AC supplied electronic control gear for LED modules - Performance requirements
IEC 62386	Digital Addressable Lighting Interface (DALI)
Safety standards	
IEC 61347-1	General and safety requirements
IEC 61347-2-13	LED Particular requirements for DC or AC supplied electronic control gears for LED modules
Emergency standards	
IEC 61347-2-3	Particular additional safety requirement for AC/DC supplied electronic ballasts for emergency lighting
IEC 61347-2-7	Particular requirements for DC supplied electronic ballasts for emergency lighting

10/2015
Data is subject to change.

www.philips.com/technology
www.philips.com/multione
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