PHILIPS

Xitanium

LED Xtreme drivers

Design-in Guide

Reliable Xtreme technology for demanding LED applications

August 2017

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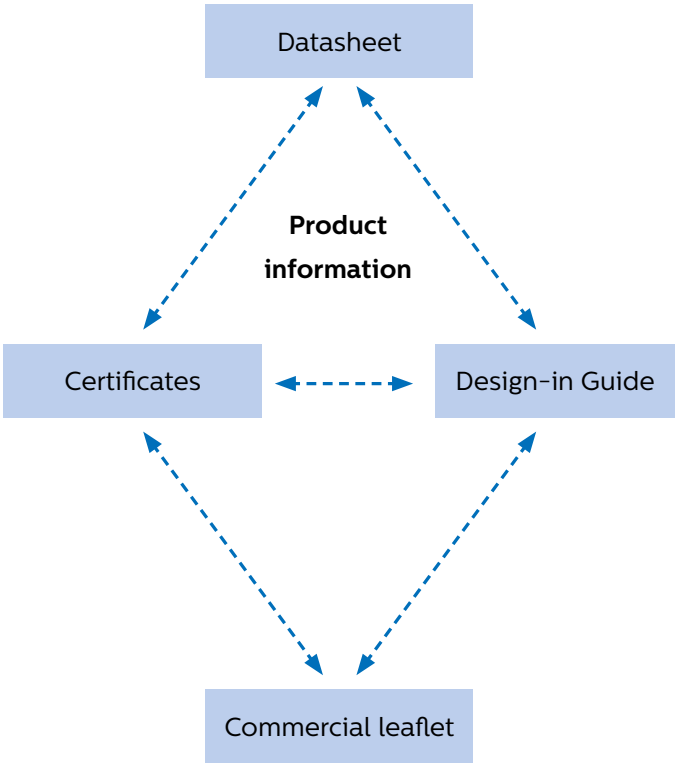
Examples of Xitanium LED Xtreme drivers



Thank you for choosing the Philips Xitanium LED Xtreme 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 configurable Xitanium FULL Prog (Xi FP) and LITE Prog (Xi LP) LED Xtreme drivers. We advise you to consult our websites for the latest up-to-date information.

Applications

The Xitanium LED Xtreme drivers are designed to operate LED solutions for outdoor and industrial lighting, like roads, streets and highbay applications. 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.

Document overview

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
- Driver certificates list up-to-date compliance with relevant product standards

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.

Warnings and instructions

Warning:

- Avoid touching live parts!
- Do not use drivers with damaged housing and/ or connectors!
- Do not use drivers with damaged wiring!

Safety warnings and installation instructions

- Do not use damaged products
- The luminaire manufacturer is responsible for his own luminaire design and has to comply with all relevant safety standards
- The Xitanium LED Xtreme drivers are suitable for built-in use only and must not be exposed to the elements such as snow, water and ice or to any other chemical agent which can be expected to have an adverse effect on the driver (e.g. corrosive environments). It is the responsibility of both luminaire manufacturer and installer to prevent exposure. The suggested minimum luminaire IP rating in the driver datasheet serves only as guidance and a higher IP rating may be required under certain application conditions. Common sense needs to be used in order to define the proper luminaire IP rating.
- Do not service the driver when the mains voltage is connected, this includes connecting or disconnecting the LED module.
- No components are allowed between the LED driver and the LED modules other than connectors and wiring intended to connect the LED driver to the module.
- Please provide adequate earth and/or equipotential connections whenever possible or applicable.

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

Xitanium LED Extreme drivers

Xitanium LED Xtreme Drivers

	Xitanium Single Current	Xitanium LITE Prog	Xitanium FULL Prog
Lifetime 100kHrs	•	•	•
Surge Protection 8kV/6kV	•	•	•
1-10V	•	•	
LineSwitch		•	•
Adjustable Output Current (AOC)		•	•
SimpleSet®		•	•
Constant Light Output		LITE	•
DynaDimmer		•	•
Diagnostics		•	•
Module Temperature Protection (MTP)			•
ThermalGuard			•
Driver Temperature Limit (DTL)			•
DALI			•
AmpDim			•
MainsGuard			•
DC-Emergency			•
Adjustable Startup Time			•
Reset LED module operating hours			•

Xitanium LED Xtreme drivers

Xitanium LED Xtreme drivers are designed to operate LED solutions for general lighting applications such as street, road and highbay lighting.
In the coming years LEDs will continue to increase in efficiency, creating generation and complexity challenges for OEMs. With Xitanium LED Xtreme 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 Xtreme driver versions

The Xitanium LED Xtreme drivers described in this guide are available in two different versions: FULL Prog and LITE Prog. These drivers come in a wide range of power ratings that enable the most popular light output levels for general outdoor and highbay applications. It is always highly recommended to check our latest Xitanium LED Xtreme driver leaflet for the most up-to-date overview of our range. This leaflet can be downloaded at www.philips.com/technology

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

Configurability Interface (tooling)

The FULL Prog and LITE Prog Xitanium LED Xtreme drivers are programmable. A large package of features and parameters in these drivers can be set via a specific tool and interface to the tool. This tool is the MultiOne Configurator. There are two types of interface technology used to communicate with this tool:

- DALI
- SimpleSet

SimpleSet

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

LED Module Temperature Protection (MTP)

Thermal protection of LED modules is possible by integrating a NTC (Negative Thermal Coefficient) resistor in the LED module. More details about the NTC resistor can be found in the Chapter “Thermal design-in”.

Driver Temperature Limit (DTL)

Thermal protection of the driver is possible by an NTC resistor, integrated in the driver. Depending on luminaire design, DTL can also be used as alternative for MTP. More details about DTL can be found in the Chapter “Thermal design-in”.

Dimming interfaces

Interfacing with the Xitanium LED Xtreme drivers can be done via below interfaces:

- DALI
- 1-10V
- LineSwitch
- Mains input (AmpDim)

Supported interfaces can be found in the naming of the drivers. (see chapter Naming)

Amplitude Modulation (AM) output dimming

Philips Xitanium LED Xtreme 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.

Hot wiring

Xitanium LED Xtreme drivers cannot be serviced, connected or disconnected from the LED module when the mains voltage is connected. Please make sure that power is turned off when working on a Xitanium driver.

DC mains operation

Certain Xitanium LED Xtreme drivers are allowed to be connected to a DC power grid (e.g. central emergency system). The driver behavior once switched to DC input voltage can be programmed via MultiOne software. More details about DC input voltage suitability can be found in the driver datasheet.

Constant Light Output

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, a correction of the lumen depreciation can be entered into the driver. The driver then counts the number of operating hours and will correct the output current based on this input.

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.

OEM Write Protection (OWP)

OWP allows the OEM to protect their driver setting over the lifetime of the driver by using a password.
Drivers equipped with OWP will show this in the feature list if read out by the tool MultiOne.
Specific feature and also the OWP can be enabled and protected with that password to prevent unauthorized changes.
The password management is under the responsibility of the company which is setting it.

Driver diagnostics

On selected Xitanium LED Xtreme 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 feature consist mainly of counters which keep track of specific variables like the number of startups of the driver, operating hours, temperature of driver and LED modules, current and voltages etc.

More information on the diagnostics see instruction manual of MultiOne Engineering at www.philips.com/multione

When the driver is shutdown the diagnostics data is stored automatically in non-volatile memory.

Naming of the drivers: example

Xitanium LED Xtreme drivers are now part of a new naming system. An example can be seen below.

Xi FP 150W 0.2-0.7A SNLDAE 230V S240 sXt

Protection:
sXt=100khrs, Surge immunity CM/DM = 8..6kV/6kV

Housing
S175, C150, S240, (S=Stretched, C=Compact, ###=length in mm)

Rated input voltage
230V=220-240V range

HW Features
S = SimpleSet
N = NTC input
L = LineSwitch
1 = 1-10V interface
D = DALI Interface
A = AmpDim
E = DC Emergency
M = EnergyMetering
P = Auxiliary Power supply

LED Current:
Output current range (Operating range in Amp for performance)

Power:
Output Power (max)

Driver family:
Sensor ready (SR)=Window driver (AOC, DALI-SR, CLO, DynaDimmer)
FULL Prog (FP)= Window driver (AOC, CLO, DynaDimmer)
LITE Prog (LP)= Window driver (AOC, CLO LITE, DynaDimmer LITE)

Type of driver:
Xitanium (Xi)

Mechanical Design-in

LCN9620 SimpleSet interface tool

Form factors

Xitanium LED Xtreme drivers are available in different housing dimensions. The specific dimensions can be found in the driver datasheet. 3D CAD files are available to verify fitment and can be found at www.philips.com/technlogy.

Drivers need to be built in such that the driver housing and the driver input and output connectors are not affected by potential water ingress in the luminaire (e.g. due to luminaire sealing malfunction or condensation).

It is highly recommended to mount the driver by using all available mounting feet in order to achieve maximum mechanical robustness against shocks and vibration. The recommended mounting torque is 1.5Nm. This value should not be exceeded in order to prevent deformation of the mounting feet. The use of rivets is not recommended since mounting torque cannot be controlled; damage to the mounting feet or loose mounting may result.

Mounting screw dimensions should be based on the specified fixing hole diameter in the driver datasheet. Oversized and undersized screws should not be used in order to prevent damage to the mounting feet or loose mounting.

Please allow for sufficient free space around the driver SimpleSet antenna if the driver is to be configured after mounting in the luminaire. The minimum recommended space is depending on the type of SimpleSet configuration tool. Using the tool as shown here (LCN9620), the minimum distance is 19 mm (+/-1mm).

Depending on the application and the use in development, factory or field, another configuration tool can be selected. Please check the website www.philips.com/multione to find the correct type.
Every published interface tool is officially approved for use with the MultiOne software. The tool type number can be found by checking the LCN label on the tool itself.

Note: the use of an unapproved tool may result in impaired driver-tool communication and configuration malfunctioning.

In order to familiarize oneself with SimpleSet a free SimpleSet engineering tool LCN9600 is available from our local Philips representative. This engineering tool is not intended for production or field service purposes but for engineering testing only.

Thermal Design-In

Introduction

This chapter describes the following aspects of the thermal design-in of the Xitanium LED Xtreme drivers:

1. The LED driver and the relationship between the Tc point temperature and lifetime of the LED driver.
2. The LED driver and its non-adjustable response to driver overheating (ThermalGuard).
3. The LED driver and configurable Driver Temperature Limit (DTL) to maximize driver and possibly LED module lifetime in the application.
4. Module Temperature Protection (MTP) function to safeguard the specified LED module lumen maintenance and lifetime.

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.

Driver 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.

The driver 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 > 3 hours).

Note: Xitanium FULL Prog drivers allow for a driver-internal temperature readout through the MultiOne Diagnostics feature. This readout does not present the driver Tc point temperature and should not be used to define thermal suitability of the driver in the application.

Relation between Tc and ambient temperature

The Tc increases, by approximation, linearly with the driver ambient temperature (Tamb). The temperature offset between driver Tamb and Tc depends on the thermal design of the luminaire and the actual delivered output power relative to the specified nominal output power. A lower output power allows for a higher driver ambient temperature as long as the maximum specified driver Tc is not exceeded. For the approved driver ambient temperature range as well as specified Tc point values please check the specific driver datasheet.

ThermalGuard

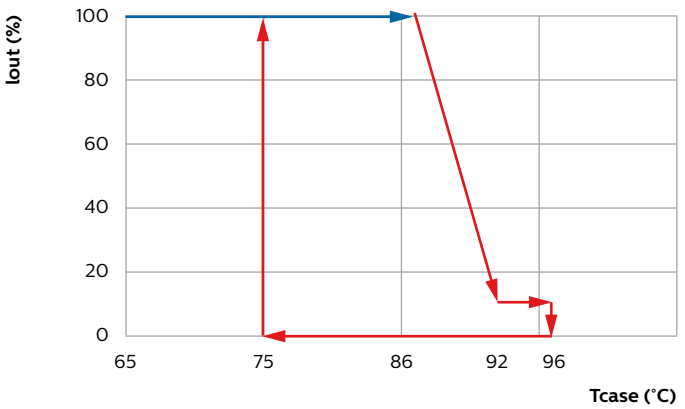
Applicable to: select Xi FP and Xi LP drivers
Factory default setting: enabled

In a thermally well-designed lighting system the specified maximum temperature of the driver Tc point is not exceeded. However, under extreme hot application conditions the driver may occasionally overheat and its specified maximum driver Tc point temperature may temporarily be exceeded. In that case the driver will automatically start to reduce the output current as an emergency measure in order to reduce excess heat generation in the LED module and in the driver itself. The result of the output current reduction will be a mitigation of the excess decrease of driver lifetime as a result of thermal overstress. Once the Tc point temperature starts dropping the driver will automatically increase the output current up to the pre-set output current.

If the output current reduction is not sufficient to offset the Tc point temperature increase then the output current may either stabilize at a lower value or –depending on driver type- even be reduced to zero in extreme cases.

This thermal driver protection feature is called ThermalGuard and its goal is to get the driver back in normal operating thermal conditions in which the specified driver lifetime can be met. Each driver type has its own specific overheating behavior and it can be found as a ThermalGuard graph in the driver datasheet. The ThermalGuard feature can neither be disabled nor reconfigured.

Note: the ThermalGuard feature is designed as an emergency measure to protect the driver; it is not intended for structural activation to compensate for a poor thermal design of a lighting system.



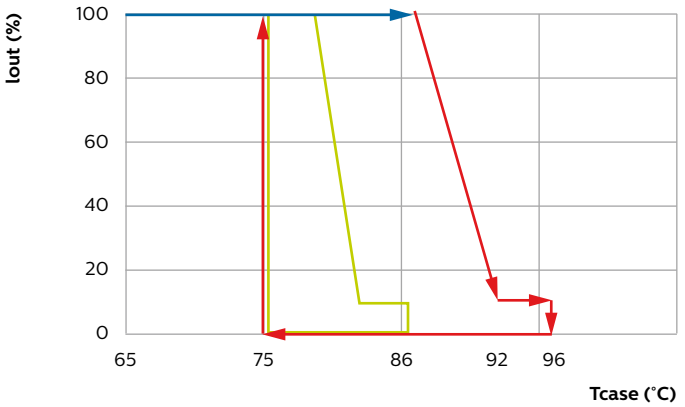
Shown on the left is an example graph of the ThermalGuard feature. In this example, the output current is reduced from Tc point temperature = 86°C onwards down to 10% at 92°C. Between 92°C and 96°C the output current will remain at 10%. If the output current reduction is sufficient to decrease the Tc point temperature then the output current will be increased accordingly up to the pre-set 100% level.

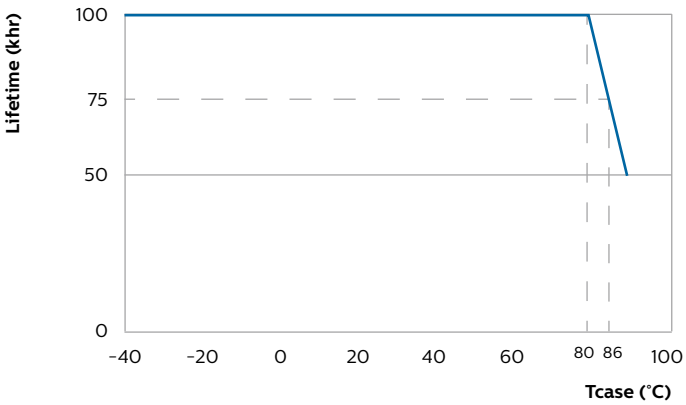
If the output current reduction is not sufficient to offset the Tc point temperature increase then the output current is eventually reduced to zero at 96°C and the driver output will be switched off. Normal operation will not resume until the Tc point temperature has cooled down to 75°C. A power cycle is not required to resume driver operation. The 21°C hysteresis will prevent the luminaire from blinking on and off.

Driver Temperature Limit (DTL)

Applicable to: select Xi FP and Xi LP drivers
Factory default setting: disabled

Depending on commercial or application needs it may be required to improve driver failure rate and/or optimize driver lifetime. This can be achieved by safeguarding that the maximum driver case point temperature in the application either remains between Tc life and Tc max or below Tc life. The configurable DTL feature enables this by offering an adjustable Tc point temperature threshold at which the output current is reduced and switched off not until ThermalGuard becomes active but already at a lower Tc point temperature. DTL configuration can be done by MultiOne software.





Shown on the left are a DTL and driver lifetime example graph. The green line represents the output current as function of the Tc point temperature with DTL activated through a custom profile based on the requirement that the driver lifetime be at least 75khrs.. The red line represent (non-configurable) ThermalGuard behavior. In this example, the output current is reduced from Tc point temperature of 80°C onwards and the Tc point will not exceed 86°C whereas it would have been allowed to reach up to 96°C without DTL enabled as defined by the ThermalGuard feature.

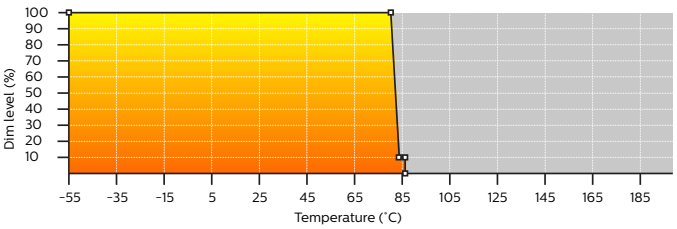
Warning: the Tc point threshold temperature at which the output current should be reduced must not be set too low. Otherwise, undesired light output reduction may result during normal operating conditions. A meticulous thermal investigation of the driver application by the customer is required to ensure that the configured DTL threshold occurs neither at too low nor at too high driver operating temperature conditions!

The DTL feature can also be applied as a substitute for Module Temperature Protection (MTP) in order to protect the LED module against overheating and to maintain a certain lumen maintenance. The advantage of using DTL for this purpose is that the additional NTC on the LED module plus required wiring can be omitted. However, DTL can only be used as such if the thermal relation between the driver Tc point and LED module temperature is well-defined. Therefore a meticulous thermal investigation of the driver - LED module driver application is required as well to prevent DTL from being activated at a too low or too high LED module temperature!

Driver temperature protection

Product group

LED



Start dim: 80 %

Stop dim: 84 %

Shut Down: 86 %

Dim level: 10 %

Description

Use the Driver temperature protection feature to determine the temperature protection settings for the device.

Usage

Slect the **Enable** check box to use this feature. Use the sliders to changes the values for this feature.

Enable: Select the **Enable** check box to use this feature.
Start dim: Set the temperature at which dimming start.
Stop dim: Set the temperature at which the dimming stops.
Shut down: Set the temperature at which the dim level will. be set to zero. When selecting the N/A/ checkbox, the shutdown temperature is not applied.
Dim level: Set the dim level for the Stop dim temperature.

Module Temperature Protection (MTP)

NTC and thermal design

This feature helps to protect the LEDs when operated during abnormal thermal application conditions. The thermal design of an LED module should be designed in such a way that the temperature of the LED module (Tc-life) is not exceeded under normal application conditions. The utilization of an NTC (Negative Temperature Coefficient resistor) serves the purpose to help achieve the lifetime of the LED module if external thermal influences result in the temperature for lifetime (Tlife) being exceeded. When this occurs the light output will be regulated down to remain below the critical temperature of the LEDs.
The following three NTC part numbers are supported in combination with Philips FULL Prog drivers:

1. 10k NTC - Murata, part number NCP18XH103J03R
2. 15 k NTC - Vishay 15 kOhm, part number NTCS0805E3153GMT (previous p/n: 2381 615 54153)
3. 15 k NTC - Murata, part number NCP15XW153E03RC (with a separate 390 ohms fixed-value resistor in series with the NTC)

Setting MTP behavior (programmable drivers only)

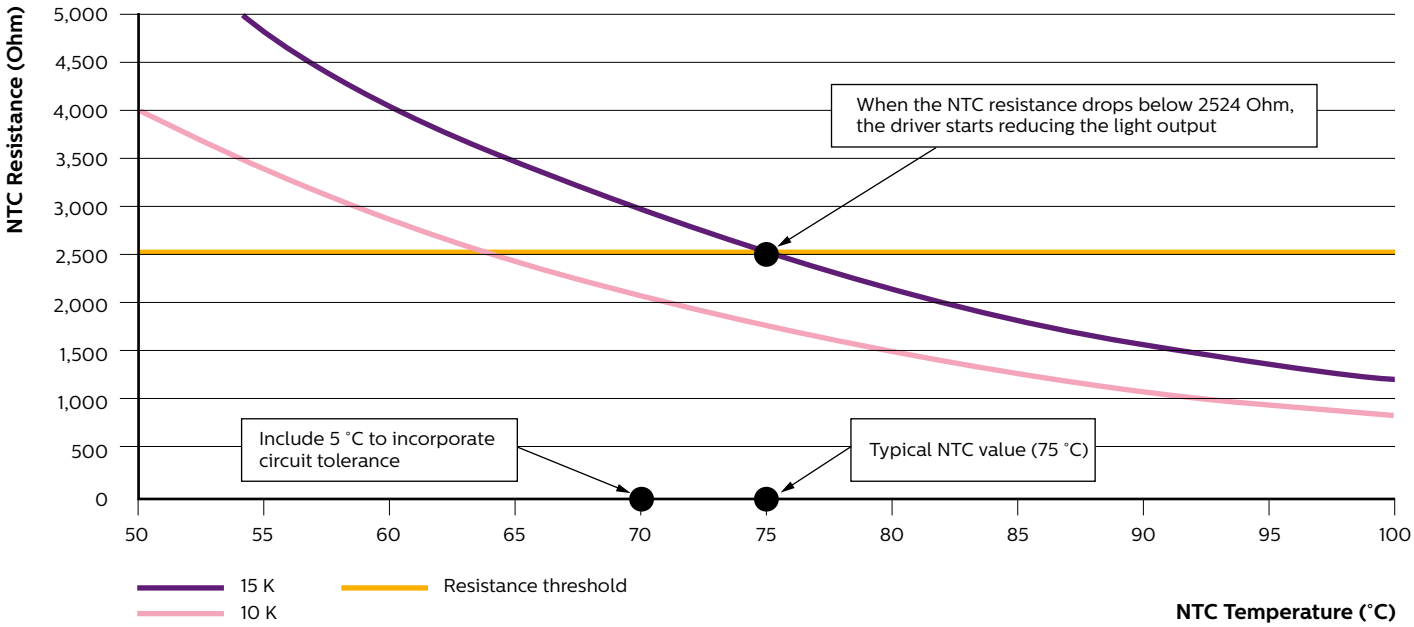
It is possible to set the temperature at which the MTP feature is activated, defined by “MTP warn” and the slope, defined by “MTP max”. Using the MultiOne Configurator software these settings can be changed.

Setting the thermal de-rating point via NTC

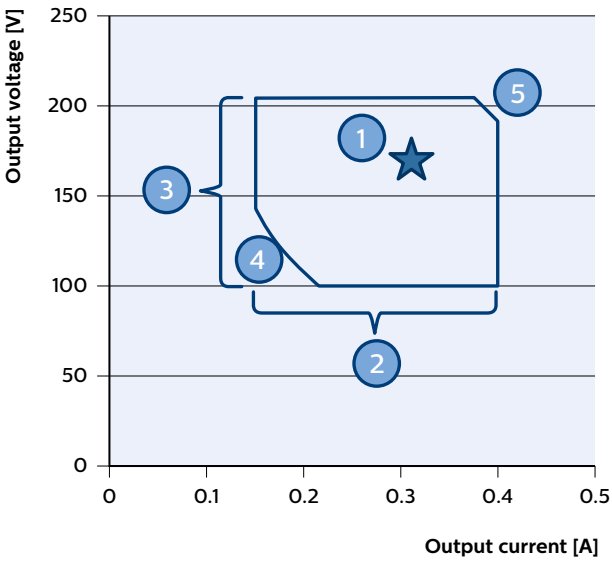
The driver will start reducing the light output when the NTC reaches a value of 2524 Ohm. The NTC should be selected such that 2524 Ohm represents the critical temperature of the LED module in the application.
For example: An LED module has a defined Tc life at 70 ˚C. Taking into account the typical tolerances of the NTC of ±5 ˚C, this gives a typical value for the NTC of 75 ±5 ˚C. By choosing this setting of 75 ˚C, we ensure that the driver will not dim the output, due to a too high temperature, before the module reaches 70 ˚C. The following graph shows a typical R vs. T curve of an NTC resistor. To match 2524 Ohm at this temperature, the NTC of 15 kilo-Ohm has been selected.

Note:

- It is not allowed to combine the NTC ground connection with the LED - connection. These two connections must be kept separated.
- The length of each wire between the MTP driver interface and the NTC on the LED module is not allowed to exceed 60cm. Do not use shielded wiring.
- It is neither allowed to connect multiple MTP inputs from multiple drivers in parallel nor to have multiple MTP interfaces share a common connection. Always keep multiple MTP interfaces fully separated.



Electrical Design-In



Example Operating window of a Xitanium driver

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

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 Xtreme 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 deliver. 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 driver datasheet which can be downloaded at www.philips.com/technology.

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

1. Drivers with SimpleSet functionality can be configured using the Philips MultiOne software and SimpleSet interface.
2. DALI driver versions can be programmed both via SimpleSet and DALI interface. 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, for driver Xi 75W LP 0.2 – 0.7A S1 230 V S240 sXt, the minimum programmable driver current is 0.2 A and maximum is 0.7 A.
   • Idriver min ≤ Idrive ≤ Idriver max?
5. Does the required voltage fit the voltage range of the driver? The exact value can be found in in the datasheet.
   • 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, for driver Xi 150W LP 0.3-1.0A SL 230V S240 sXt, the maximum output power is 150W.
   • 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.

Programming the output current

The Xitanium LED Xtreme 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.
Programming of new Xitanium LED Xtreme drivers can be done by both the DALI interface (when present) or via the SimpleSet. In the name of the driver you can see which interface is supported.
For more information on MultiOne go to the chapter Configuring Your Driver or visit:
www.philips.com/multione. This site contains detailed information on how to install the software and how to program the driver.

Connectors

Philips Xitanium LED Xtreme drivers are equipped with Wago push-in connectors. The mains, LineSwitch and Equipotential connectors are -depending on driver type - Wago type 804 or 250 while the DALI, 1-10V and LED output connectors are Wago type 805 or 250. All connectors accept stranded, solid core and crimped wires. More info about connectivity (wiring diagram, wire diameters, strip length) can be found in the driver datasheet.

Note: although the driver connectors allow for quite small wire cross section areas (down to 0.2mm^2) it is recommended for optimal connectivity to use mains and LED output wires having at least 0.5mm^2 cross section area.

For currents between 1.0 and 1.5A (rms/DC) per connector, a minimum cross section of 0.75mm^2 is advised.

In some scenarios two wires need to be connected to one connector terminal. In this case, the pairing has to be done outside the driver, resulting in only one wire going into the connector terminal. Two wires into one connector terminal are not supported.

The reliability of twin-wire ferrules (or wire end stop), accepting the wires intended to use, should be checked with the supplier of these ferrules.

Mains operating conditions

Xitanium LED Xtreme drivers are designed to withstand high and low mains voltages for a limited period of time.

This includes under- and overvoltage due to malfunction such as a loose neutral wire in the grid.

Low and high mains voltage

Xitanium LED Xtreme drivers are designed to be operated at mains under- and overvoltage per IEC requirements for performance and operation with respect to specified rated input voltage range.

The applicable lower limit for driver performance is lowest rated voltage - 8 % while -10 % applies to driver operation.

The applicable upper limit for driver performance is highest rated voltage +6 % while +10 % applies to driver operation.

The actual limit values can be found in the driver datasheet.

For optimal luminaire performance it is always recommended to operate drivers within the specified voltage performance range.

Low mains voltage for dimming (AmpDim)

With AmpDim enabled, the drivers are designed to perform below the specified minimum values for operational and performance mains voltage that would otherwise apply. Low mains voltage can be used for dimming in combination with the AmpDim feature. This feature in FULL Prog drivers can be programmed to regulate the output power when the input voltage drops below a programmed level.

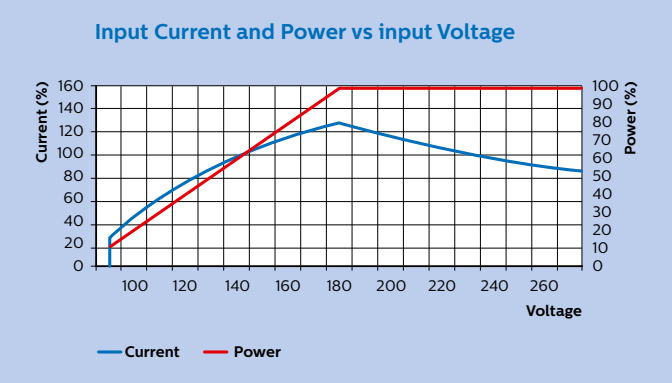
Excessive low mains voltage (MainsGuard)

Previously, 220-240 VAC rated Xitanium FULL Prog LED Xtreme drivers would turn off the output in case of excessive low mains voltage. Depending on the exact driver type a shutdown would occur between 150 ... 180 VAC.

This shutdown functionality was intended to prevent overcurrent conditions in the mains grid. Without shutdown the driver input current would increase (up to 2.5 times) with decreasing mains voltage since the driver is designed to maintain full light output of the luminaire and thus output power. This would exacerbate the undervoltage condition further. Consequently, mains cables may be overloaded and fuses and/or MCBs may trip.

In order to prevent overcurrent conditions a shutdown mechanism had been implemented in the driver. However, the main disadvantage of this shutdown is loss of lighting.

Xitanium FULL Prog LED Xtreme drivers have now built in a new feature to protect luminaire and mains grid without loss of lighting or the occurence of overcurrent conditions. This smart feature is called MainsGuard. Its function is to proportionally decrease output power as function of decreasing mains voltage and to keep doing so all the way down to a much lower mains voltage before the driver output eventually is shut down. A small hysteresis (5 ... 10 V) is added before the driver output becomes automatically active again once the mains voltage starts to increase (no mains power cycle required).



MainsGuard feature Xitanium FULL Prog LED Xtreme drivers. Shown values are example values. Please refer to the driver datasheet for actual values.

A general graphical representation of MainsGuard can be seen in the illustration on the left while exact (fixed) values can be found in the MainsGuard graph in the driver datasheet.

Main benefits of MainsGuard are:

- Light will remain on, even at excessive low mains voltage
- Luminaire and grid are protected against undervoltage and overcurrent
- The maximum input current is limited to prevent overcurrent in the mains grid and tripping of MCBs and/or fuses

Note: the MainsGuard feature is properly coordinated with the AmpDim feature in order to prevent interference.

All Xitanium FULL Prog LED Xtreme drivers made after week 36 of the year 2016 (label date code 1636) have the MainsGuard feature on-board.

Note: the voltage levels at which output power is reduced and the output is eventually shut down and re-activated are fixed and cannot be reprogrammed.

Excessive high mains voltage

An excessive high mains voltage will stress the driver and have an adverse effect on the lifetime. Xitanium Xtreme drivers will survive an input overvoltage of 264 ... 320VAC for a period of max. 48 hours and 320 ... 350VAC for a period of max. 2 hours. A loose neutral condition has to be avoided as this will reduce the lifetime dramatically.

Use of LineSwitch in three-phase power 230/400 V grids

The Xitanium LED Xtreme drivers allow supplying power from another phase than the one controlling the LineSwitch interface.

The LineSwitch input is designed to be controlled via the same phase as the input voltage but also a different phase can be used.

Power grids

Xitanium Xtreme LED drivers are suitable for direct connection to TN, TT and IT grids. An external luminaire-based fuse in the driver neutral connection is required in case both feeding phases are “hot”.

Note: certain restrictions apply for use in IT grids. Direct connection of Xitanium LED Xtreme drivers is only permitted in delta connection with a phase-to-phase voltage of 230 V. In case the drivers are connected in star connection in a 230V/400 V IT grid, the use of a separate 1:1 insulation transformer with sufficient power rating is required to power the drivers. The secondary output of the transformer needs to be connected to earth.

DC Emergency operation (DCemDim)

Depending on driver type, the driver is released in compliance with lamp control gear standard IEC 61347-2-13 Part J. for operation on a DC input voltage. As a result, the driver is suitable for emergency luminaires in compliance with IEC 60598-2-22, excluding high-risk task areas.

On selected drivers, the DC Emergency Dim feature named DCemDim is available. This feature allows a pre-defined dim level of the driver output to which the driver switches over automatically once connected to a DC input voltage.

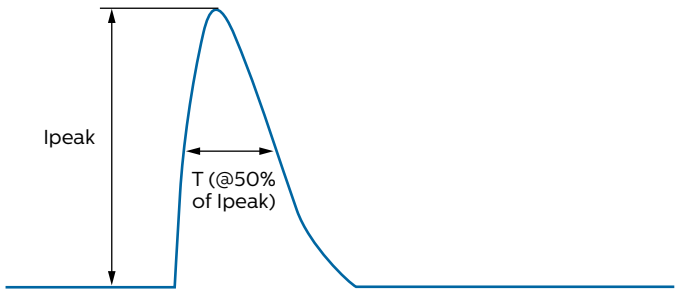
The mains input of DC-rated drivers is not polarity-sensitive for DC input voltage and the driver is fully CISPR15 compliant when operated on a DC grid. Specific DC input voltage values can be found in the driver datasheet.

The use of an external, luminaire-based DC rated fuse with sufficient DC voltage rating and breaking capacity is required.
Suggested fuses (per each driver):

- 3.15A 400VDC 1.5kA BC, 5x20mm Slo-Blo® 477 series from Littelfuse
- 3.15A 250VDC 10kA BC, 5x20mm Fast 7008913,3.15 from Siba
- 3.15A 400VDC 30kA BC, 6.3x32mm gPV 7006526,3.15 from Siba

More on setting parameters of DCemDim can be found in the section for Controllability. Specific DC input requirements can be found in the driver datasheet.

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



Graphical representation of inrush current

Inrush current

The term '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 Miniature 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) if in accordance with electrical national standards.
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.
5: Install a zero crossing relay to power up the drivers.

Inrush parameters are driver-specific and can be found in the driver datasheet.

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

MCB type	Rating (A)	Relative number of LED drivers (%)
B	4	25
B	6	40
B	10	63
B	13	81
B	16	100 (stated in datasheet)
B	20	125
B	25	156
B	32	200
B	40	250
C	4	42
C	6	63
C	10	104
C	13	135
C	16	170
C	20	208
C	25	260
C	32	340
C	40	415
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

The max. recommended amount of drivers in the table above only serve as guidance. The actual maximum amount in the application may differ due to local grid conditions and is also dependent on MCB brand/type and inherent MCB tolerances.

How 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 datasheet.
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).

Note: this conversion table does not apply to the following drivers:

Xi FP 35-70-110W 0.3-1.0A NLD 230V C150 sXt
Xitanium FULL PROG 35-70-110W NLD C150 Xt
Xitanium FULL PROG 35-70-110W NL1 C150 Xt
Xi FP 330W 2:0.2-0.75A SNDAE 230V C240 sXt

These drivers are equipped with the inrush-limiting feature called SoftStart. As a result, the rated steady-state driver input current limits the maximum amount of drivers that can be connected to an MCB. The maximum amount of these drivers per MCB can be found in the driver datasheet.

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

How to determine the Number of Drivers on a melting fuse

The maximum recommended amount of drivers on a melting fuse is defined either by the aggregate inrush current or the aggregate steady-state input current.

The amount of drivers can be calculated, using the specified values of the maximum input current and inrush current (I_{peak} and T_{width}) as specified in the driver datasheet as well as the melting integral I^2t value of the applied fuse as specified by the fuse manufacturer.

The melting integral value I^2t of the aggregate inrush current must be 50% below the specified melting integral value I^2t of the fuse in order to prevent melting of the fuse when the drivers are connected to mains voltage simultaneously. And the aggregate steady-state input current shall remain below 80% of the fuse rating to prevent overheating of the fuse.

The following formula can be applied to calculate the I^2t value of the driver inrush current:

$I^2t = (I_{peak})^2 \times (0.8 \times T_{width})$

Example:
A group of drivers is connected to a 16A type gG melting fuse with a melting integral value of $350A^2s$. Specified driver inrush current peak and width is 53A and 300µs . Steady-state input current is 0.9A per driver.

Question: what is the recommended maximum amount of drivers in this group connected to this fuse from inrush current and steady-state input current perspective?

Answer: the corresponding I^2t value of the inrush current is $(53)^2 \times (0.8 \times 300 \times 10^{-6}) = 0.68A^2s$ per driver. The aggregate value of the driver inrush current must remain below $0.5 \times 350A^2s = 175A^2s$. This translates in a maximum of $\sqrt{(175A^2s/0.68A^2s)} = 16$ drivers.

The corresponding steady-state input current is 16 x 0.9 = 14.4A. This is above the 80% rating of the 16A fuse. Therefore, the maximum recommended amount of drivers is (16A x 0,8) /0.9 = 14 drivers.

In this example, the maximum recommended number of drivers is defined by the steady-state input current.

Notes:
1. Data is based on a average mains supply with an impedance of 400 mΩ + 800µH. This is in most cases equal to a prospective short circuit current of 500A. Deviating mains impedance is of minor importance regarding the maximum amount of drivers per MCB.
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 central relay.
5. For multiple MCBs in one cabinet use the derating tool of the manufacturer of the MCB's for steady- state load. If the actual derating is unknown then it is recommended to use a steady-state current derating of 0.8 by default. No derating is needed in respect to inrush current as this is not part of the thermal properties of the cabinet.
6. The maximum number of drivers that can be connected to one 30 mA Residential Current Device (RCD) is typically 30.

Surge immunity

The Xitanium LED Xtreme drivers have increased differential-mode and common-mode surge immunity levels which by far surpass the limits as defined by IEC. The driver EQUI terminal must be connected to the metal parts of the luminaire and LED module heatsink in all cases (Class I: also to earth) to safeguard the specified immunity levels. Doing so will guarantee the specified driver surge immunity levels and will protect the LEDs against surge damage. Depending on the local conditions, additional protection against excessive high surge voltages may be required by adding an external Surge Protection Device in the luminaire and/or at installation level. The actual driver immunity level can differ per driver and can be found in the driver datasheet.

Note: the specified immunity levels apply with open 1-10V or DALI control interface. Reduced driver/system immunity may result when connecting external control systems. Please contact your local Philips representative for further specific technical support.

Touch current

The Xitanium LED Xtreme drivers are designed to meet touch current requirements for insulation class II applications per lighting control gear standard IEC 61347-1. The specified peak values can be found in the driver datasheet and refer to single-driver only level.

The insulation of the wiring to and from the drivers needs to be in compliance with IEC60598. Taking into account the double insulation of the driver between mains input and LED output, the (supplementary) output wiring insulation rating needs to be based on the maximum open-load voltage of the driver. See the driver datasheet for the specific value.

Note: In a luminaire, the cumulative touch current may be higher, since the LED module may introduce additional touch current. Precautions may be required on the luminaire level if multiple drivers are used in a single luminaire.

Note: do not leave the EQUI terminal open in order to lower the luminaire touch current. Impaired EMC performance and reduced surge immunity will result!

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 LED Xtreme drivers meet EMC requirements per CISPR15. This test is conducted with a reference setup that includes a driver and an LED load/heat sink combination mounted on a metal plate.

Note: the driver EQUI terminal must be connected to the luminaire chassis (Class I and II) as well as to Protective Earth (Class I) for optimal EMC performance.
Doing so for Class II luminaires/systems is in safety compliance with IEC61347-1, IEC60598-1 and IEC61140 regarding the relation between the driver EQUI terminal and live parts with respect to:

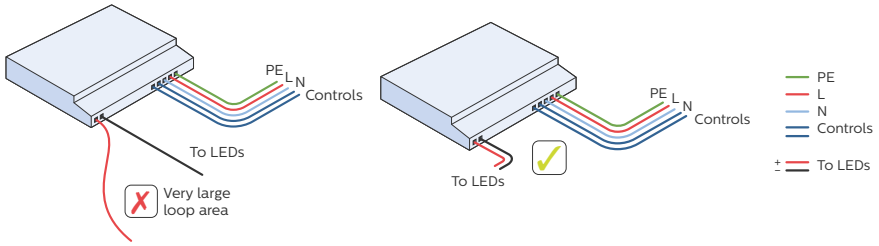
- Maximum allowable touch current
- Minimum required insulation resistance
- Minimum required creepage distances & clearances
- Minimum required electric strength

Note: The driver EQUI terminal does not have a safety function.

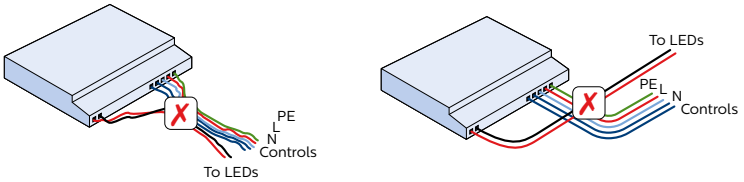
Improvement in EMC Performance

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

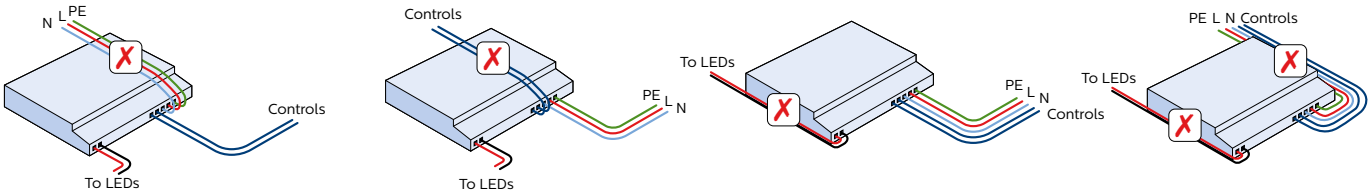
- Minimize the differential mode loop area of the lamp wires going from the driver to the light source by keeping the wires close together (bundling). This will minimize the magnetic field and reduce the radiated EMI.



- Minimize the common mode parasitic capacitance of the output wiring + light source to earth by keeping the length of the wires between driver and LED module 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 (mounting plate, heatsink) to protective earth (class I luminaires). Do not keep large metal parts electrically insulated from the driver equipotential connector.
- **Always** connect the driver equipotential terminal (EQUI) and use equipotential bonding wires for all large unconnected metal luminaire parts like luminaire housing, driver mounting plate, reflector, heatsink etc.
- Keep the 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.

Remote mounting and EMC

Remote mounting of Xitanium LED Xtreme drivers is allowed as long as the additional summarized voltage drop as function of output current along the LED + and LED – wires is accounted for.

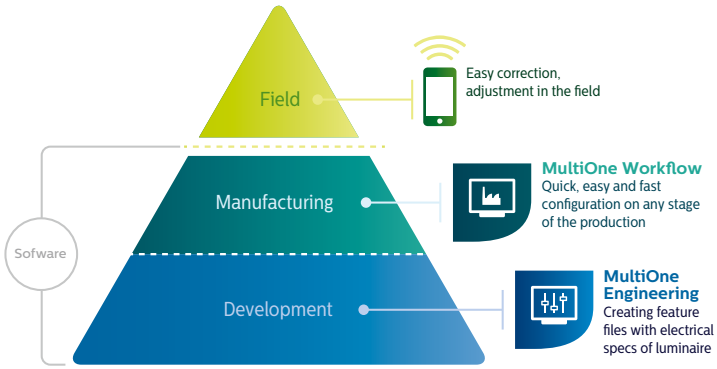
Philips has successfully performed CISPR15 compliance EMC tests on systems with a standard output cable length of 60cm as reference. For longer CISPR15-compliant cable lengths please check the driver datasheet for the maximum specified length.

Note: the length of the two NTC wires between driver and LED module is not allowed to exceed 60cm due to EMC and noise immunity reasons.

Electrical insulation

Driver insulation classifications between the several inputs and output can be found in the driver datasheet.
The insulation between the EQUI terminal and the mains input is classified as double for all Xitanium LED Xtreme drivers.

Configure Your Driver



Introduction

The Xitanium LED Xtreme 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.
Programming of new Xitanium LED Xtreme drivers can be done by both the DALI interface (when present) or via the SimpleSet. In the name of the driver you can see which interface is supported.

For more information on:

- MultiOne- installation – software and programming: www.philips.com/multione
- Driver - feature set and default settings: datasheets www.philips.com/oem
- Specific features: design in guide of that driver www.philips.com/oem

This chapter describes the way drivers can be configured using the MultiOne Configurator.

Please check the datasheet of the driver on www.philips.com/technology to verify if the selected driver supports specific configurability.

MultiOne Interface DALI LCN8600

MultiOne SimpleSet interface LCN9610

MultiOne SimpleSet interface LCN9620

MultiOne SimpleSet interface LCN9630

MultiOne characteristics

The characteristics of the MultiOne configurator are:

- One tool for all Philips configurable drivers: Xitanium LED Indoor and Outdoor drivers; HF-R Indoor fluorescent 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.
- Settings of the drivers can be changed at any point in the product lifecycle (if allowed- see OWP feature).

Basis blocks

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 different 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. LCN9610/9620/9630 SimpleSet interfaces

These interfaces that can be used with the MultiOne PC software to configure drivers wirelessly using SimpleSet technology.

3. More interfaces are coming up ...

Note: SimpleSet

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

When powering up the driver – during first use after configuration - apply the specified mains voltage for at least 1 second.
If the applied mains voltage is below the specified minimum value of the driver and/or the duration is less than 1 second then the desired configuration changes may not become effective.

Note: DALI

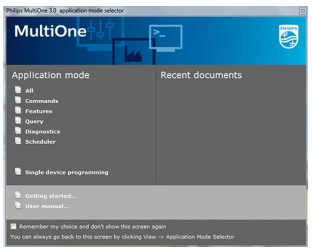
Only for Xi FP 35/70/110W NLD C150 sXt/Xt drivers:
After reconfiguration with DALI, an additional power cycle of the driver (off-on for at least 5 seconds) is required before changes become effective.

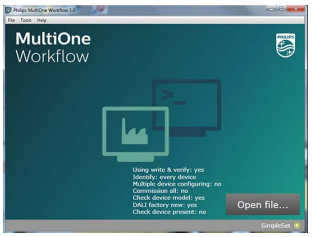
Philips MultiOne Interface tool

When ordering the MultiOne Interface, the correct USB cable will be supplied with the interface tool.

Each interface tool has its own cable.
Check if USB ports of the PC are able to power the interfaces .

When ordering the MultiOne Interface, the correct USB cable will be supplied with the interface tool.





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. Workflow exists of 2 packages:

- Worfklow GUI (direct use)
- CommandLine (integration in test bench, robot,automation,...)

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

System requirements

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

- Windows PC or Laptop.
- Microsoft Windows 7, 8.0, 8.1 and 10.
- USB 2.0 or 3.0 ports (minimum two free ports).
- Min 45 MB of free disk space.

Note: The software may work well with Windows 10 but possible Windows bugs can affect the good functionality of the MultiOne software. USB ports of the newest PCs and laptops may have the problem of not delivering enough power to the interfaces. Please check this before supplying new systems.

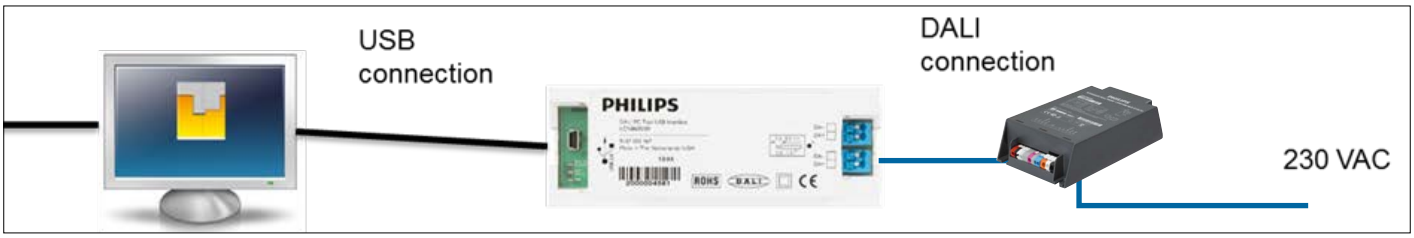
Getting Started

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.

A User Software key is required to install MultiOne Engineering (available at no charge).
This key can be requested here:
www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator/multione-configurator-form.html

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

MultiOne System



Settings

The Xitanium LED Xtreme 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.

More information of using Multione

On our up to date website www.philips.com/multione you can find:

- All interface tools with order codes.
- Software free to download.
- All manuals; getting started; SimpleSet explained; instructions manuals.

Request User software key:

- www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator/multione-configurator-form.html

Control features

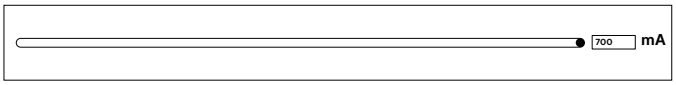
How to program the features is explained in the User Manual guide of MultiOne; see the Help function of MultiOne or download it from www.philips.com/multione. In this chapter the features will be explained in more detail.

Adjustable output current (AOC)

Applicable to: Xi FP and LP drivers.

AOC limits the driver output current to match the application requirement.
The limited output current is then dimmable over the full user controllable dim range; the AOC level [mA] being the 100% light level.

The default AOC value can be found in the driver datasheet.



Adjustable Light Output (ALO)

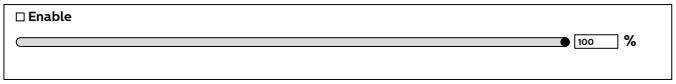
Applicable to : Xi FP drivers only.
Factory default setting: disabled.

ALO limits the light output of the driver to match the application requirement. The limited light output is then dimmable over the full user controllable dim range; the ALO level [%] being the 100% light level. Setting an ALO min level prevents the light from dropping below the set level during dimming conditions. This is a useful feature if a minimum light level needs to be maintained under all conditions.

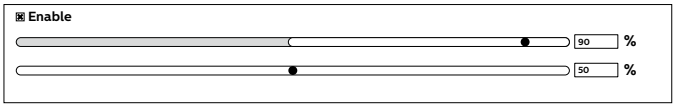
ALO can also be used to permanently set the AOC value at a level below the minimum programmable AOC level. E.g. if the min. programmable AOC value of a driver is 200mA while the required AOC value is 160mA then the ALO feature must be enabled and set a 80%.

There are 2 versions depending on driver type:

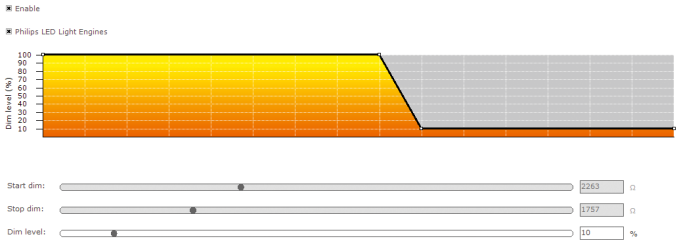
- ALO.



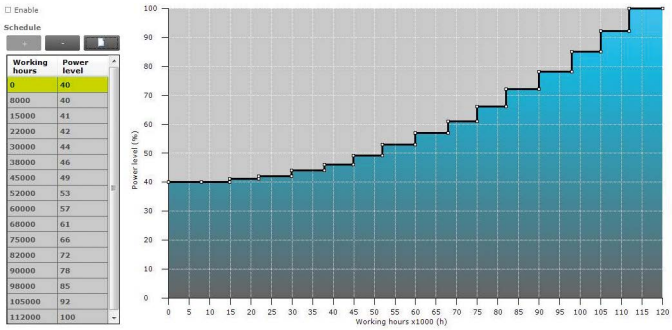
- ALO and ALO min.



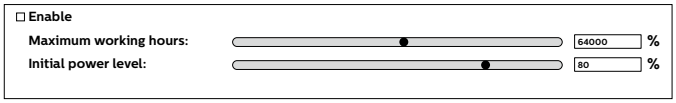
Check the driver datasheet to verify which ALO type is available.



MTP



CLO



CLO LITE

LED Module Temperature Protection (MTP)

Applicable to: Xi FP and Xi LP SN drivers only.
Factory default setting: enabled (Philips LED Light Engines).

MTP is the method in which a thermal sensor (NTC resistor) implemented on the LED module is sensed by the driver, which will cut back output current when a predefined (temperature) limit is exceeded in order to protect the LED module from thermal overstress.

The driver accommodates for three NTC resistor choices. See the chapter Thermal Design-In for more details on NTC type.

Constant Light Output (CLO, CLO LITE)

CLO: Applicable to Xi FP drivers only.
Factory default setting: disabled.

CLO LITE: applicable to Xi LP drivers only.
Factory default setting: disabled.

CLO will gradually increase the light level over time from an initial lower light level up to 100% light level in order to compensate for LED module depreciation over life. It can also serve as a means to reduce energy consumption.

CLO settings includes enabling disabling and redefining the CLO dimming curve. Changes are effective immediately.
The allowed range for CLO is 0-100% with 1% increments (note that 0% results in the LEDs being switched off). The 100% level corresponds with the configured AOC value or AOC + ALO values.

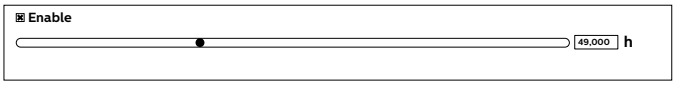
CLO LITE can be configured by setting a start point (at 0 hours only) and an end point. The light level between these point will linearly increase.

End of Life (EOL)

Applicable to: Xi FP drivers only.
Factory default setting: disabled.

EOL is providing a visual notification to a customer that the LED module has reached the end of manufacturer- specified life and that replacement is recommended.

Once active, an indication is given at each power-up of the driver, after which the LEDs will flash for 2.5 seconds before normal operation is continued.

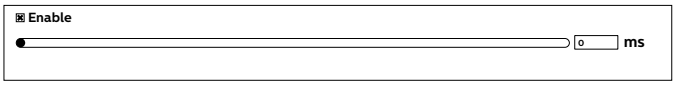


Adjustable Start up Time (AST)

Applicable to: Xi FP drivers only.

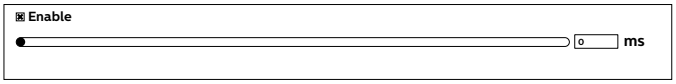
AST enables gradual increase of light level at power-up of the driver, ensuring a smooth and comfortable transition from daytime to evening illumination.
AST can be programmed to a value between 0 s and 30s, in increments of 1ms.

Note: this feature does not in any way influence the driver inrush current at mains turn-on.



Light Source Operating Hours

Light Source Operating: set a specific time or reset the operating hours, e.g. after replacing a LED module or driver with another (new) one.
When CLO resp. CLO LITE is enabled it is recommended to set the correct light source age.

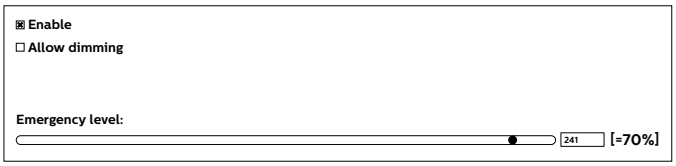


DC emergency dimming operation (DCemDIM)

Applicable to: selected Xi FP drivers only.
Factory default setting: enabled.

The Xitanium FULL Prog drivers are equipped with a auto-detect DC voltage feature. As soon as a DC input voltage is detected by these drivers, it will automatically set the output current to a predefined configurable emergency dim level. Depending on driver type, EL marking may apply. For those drivers the corresponding Emergency Output Factor EOF_x range can be found in the driver datasheet.

Note: during DC operation the output current cannot be set higher than 60 % of the programmed AOC value applicable during AC operation and the driver will ignore all DALI commands unless the optional checkbox “Allow dimming” in the DC Emergency tab is selected.



Control Input 1-10 V

Applicable to: Xi LP S1 drivers only.
Factory default setting: enabled (0-10V/1-10V curve).

This is the traditional way of dimming a driver, based on dimming voltage. The driver dimming interface sources a current of 150µA as a current-controlled voltage source. Note that the 100% light level is determined by the max output current level. The minimum output current that can be supplied by the driver is specified in the datasheet. The 1-10 V interface is enabled by default.

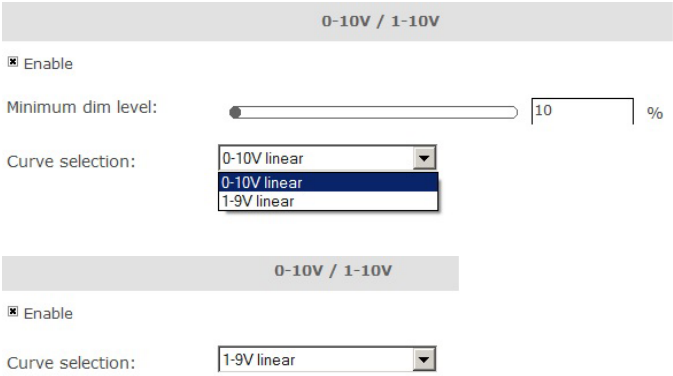
1-10 V dimming provides a way to control the output by means of an analog current-controlled voltage source. The interface is designed to comply with IEC60929 Annex ‘Control by DC Voltage’ (1-10 V). The applied 1-10 V controller should be of the two-quadrant type and be able to sink the cumulative current sourced by the dimming interfaces of all connected drivers.

Depending on driver type, there are multiple linear dimming curves available that can be selected:

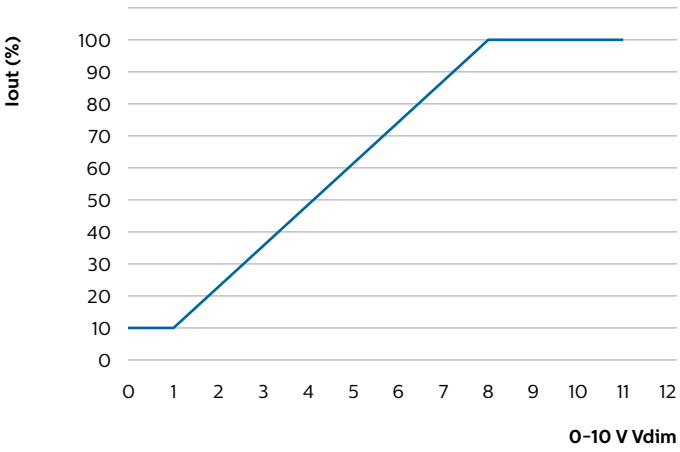
0-10 V / 1-10 V curve:
- minimum light output at 1 V, maximum light output at 8 V and above
- minimum dim level can be set at 10 % and up in 1% increments

1-9V curve:
- minimum light output at 1 V, maximum light output at 9 V and above
- minimum dim level has a fixed value of 10 % and cannot be modified

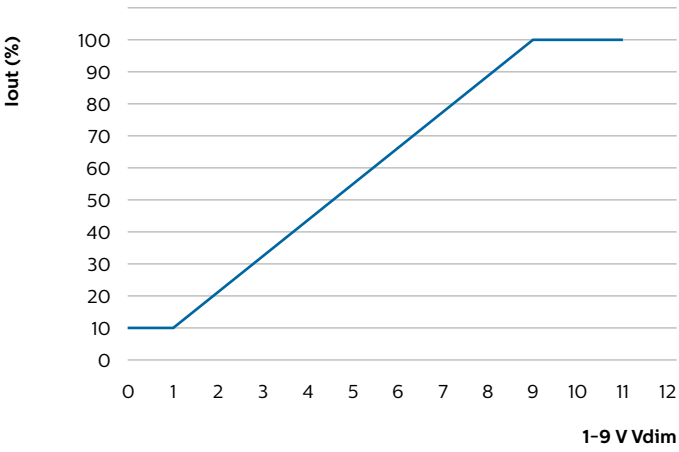
Note: the driver output cannot be turned off by pulling down the 1-10 V interface to 0V. Between 0 and 1 V, the minimum light output will be maintained.



Output Current versus Voltage



Output Current versus Voltage



DALI

Applicable to: Xi FP drivers only.
Factory default setting: enabled.

- 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.

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.

Note: By default, both the DALI interface and LineSwitch interface are enabled with LineSwitch being set as primary interface. On reception of a DALI frame, the driver will switch over to DALI mode and all other interfaces will be ignored until the next mains cycle. If LineSwitch is enabled then the DALI System Fail Level and Power On Level will be inactive. In order to obtain full DALI compatibility in DALI-only applications it is therefore highly recommended to disable the LineSwitch feature via the MultiOne configurator.

Warning: The DALI interface of the driver is not designed to handle mains voltage. Driver damage may result if mains voltage is applied to the DALI interface!

LineSwitch

Applicable to: Xi FP SNLDAE and Xi LP SL drivers only.
Factory default setting single-step: enabled
Factory default setting 3-step: disabled

The LineSwitch feature requires the use of an extra mains pilot line. This offers a single-step dim solution which enables dimming of groups of luminaires to a predefined level with only a simple switch controlled by a timer, presence detector etc. Dimming to the desired level can be achieved by either applying or disconnecting mains voltage to the LineSwitch driver input. Connecting mains voltage to the LineSwitch input will lead to a ‘High’ level. A ‘Low’ level is obtained by disconnecting the LineSwitch input from mains voltage.

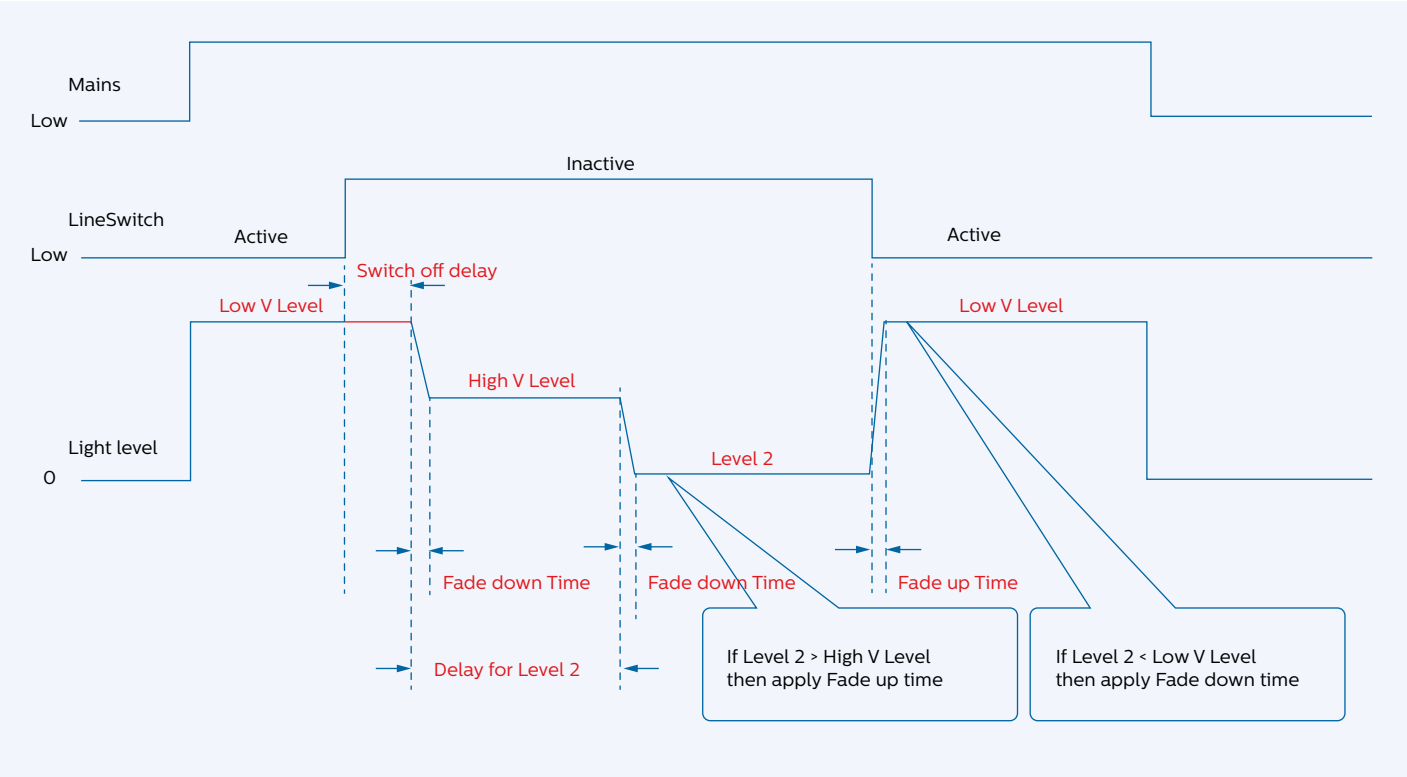
Xitanium LED Xtreme drivers are by default programmed with single-step LineSwitch enabled for which the 'Low' level is defined as active (i.e. no dimming when the LineSwitch input is left open). Just like the driver mains input, the LineSwitch interface also has high surge immunity. The immunity level can be found in the driver datasheet.

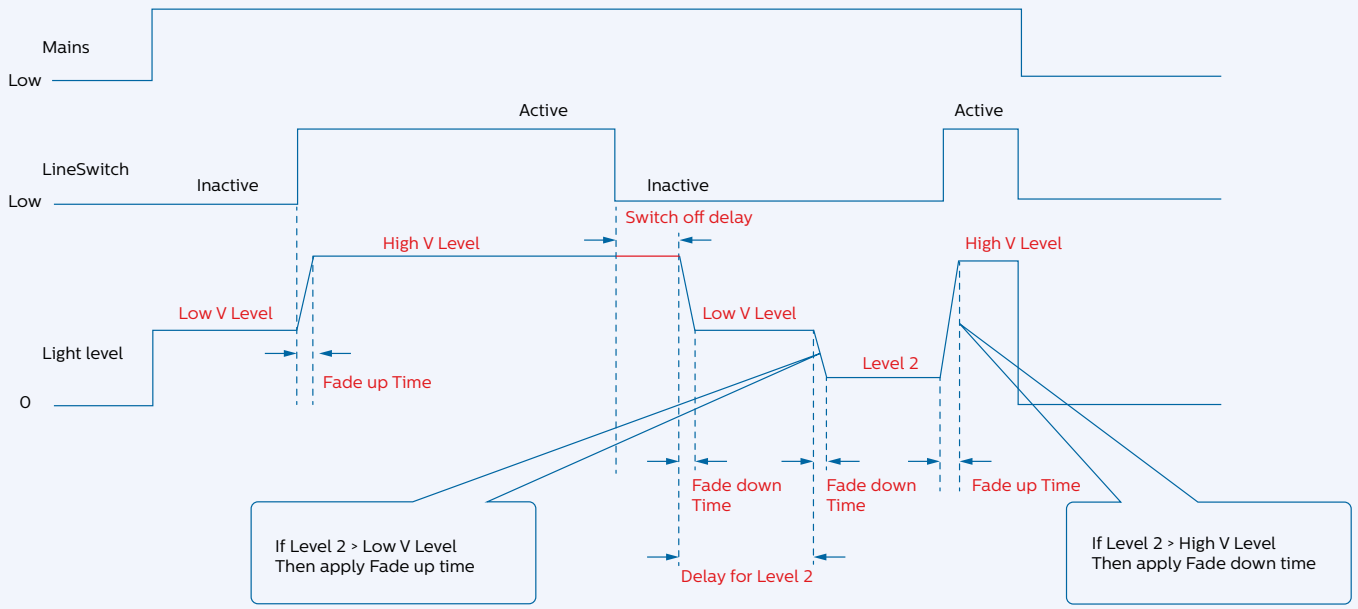
All parameters of LineSwitch including ramp-up and fade-down times can be programmed via the MultiOne configurator.

Note: LineSwitch is able to 'override' the Dynadimmer/ Dynadimmer LITE profile to temporarily set the light output to 100% (only), e.g. in case of emergencies.

Two versions of LineSwitch are offered: single-step and 3-step. The 3-step option is currently available only on select Xi FP drivers. Please refer to the driver datasheet for more details.

Single-step LineSwitch can provide one dimming level while the 3-step LineSwitch offers the configuration of two additional optional dimming levels plus configurable delay times. See the illustrations below for further details.





High V level:		100	%
Low V level:		50	%
Fade up time:		0	s
Switch off delay time:		0	s
Fade down time:		0	s

Note 1: Low V = 0 V on the mains, High V = 208-277 on the mains

Note 2: When Dynadimmer is scheduled, LineSwitch can not be used standalone. It can only be used to override Dynadimmer.

Single-step LineSwitch

High V level:		100	%
Low V level:		50	%
Fade up time:		0	s
Switch off delay time:		0	s
Fade down time:		0	s
Enable level 2	☐		
Delay for level 2:		0	min
Level 2:		0	%

Note 1: High V level = 220-240 V on LineSwitch input, Low V level V = open or on LineSwitch input.

Note 2: When Dynadimmer is scheduled, LineSwitch can not be used standalone. It can only be used to override Dynadimmer.

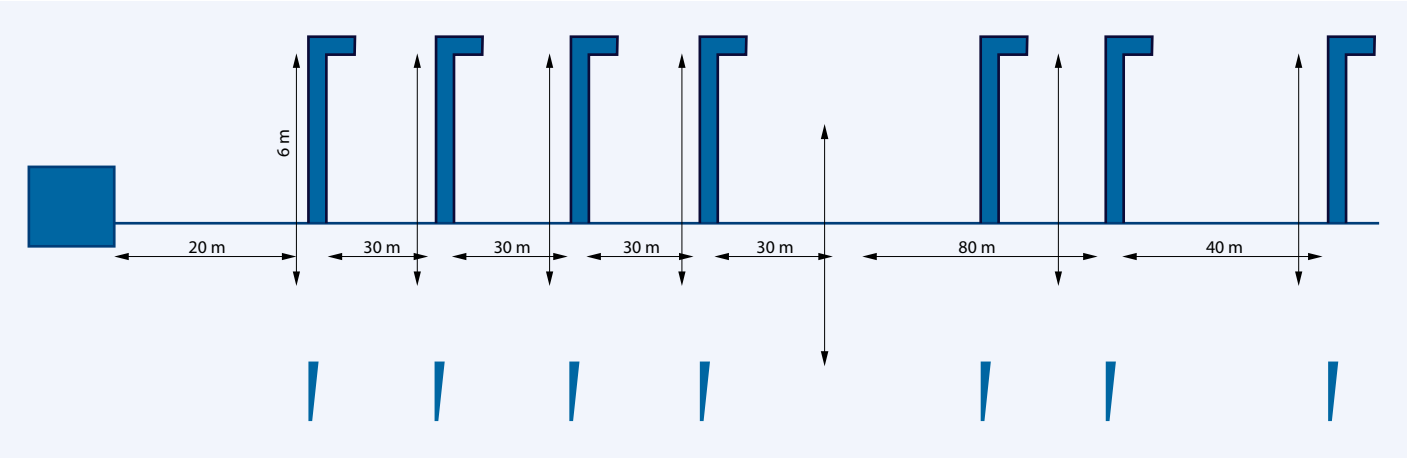
3-step LineSwitch

Note: For proper functionality of the LineSwitch function the length of the LineSwitch pilot line from one luminaire to the next has a restriction. The restriction is given in the below formula:

$$\frac{(\sum L)}{\#D} \leq 56$$

In this formula:
L= length of the cable from cabinet to the LED driver in m
#D= number of connected drivers

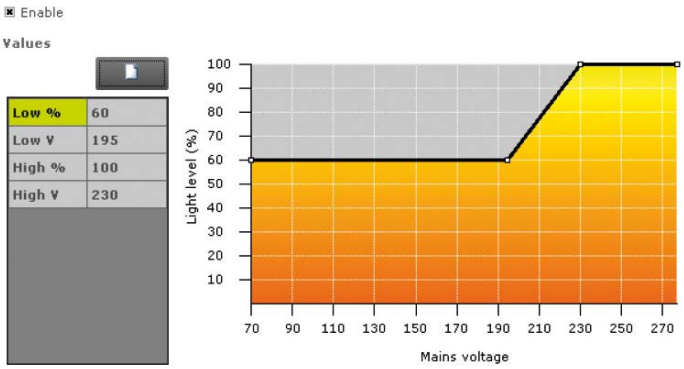
Example:



$$\frac{(\sum 6+4(36)+86+46)}{7} 43 \leq 56 \rightarrow \text{OK}$$

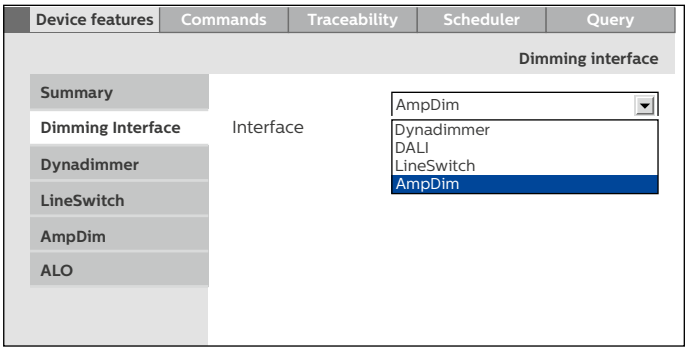
In this example the following assumptions have been made:

1. Luminaires are used in a TN or TT power grid.
2. The parasitic capacitance in the mains cabling between the floating pilot line and the live phase is 100pF/meter.
3. No other loads are connected between the pilot line and other phases.
4. Other loads between the pilot line and neutral can be accepted. In almost all cases this will increase the maximum acceptable cable length.



AmpDim

Parameter	Min	Max	Increments
Start Voltage	170 V	240 V	1 V
Stop Voltage	150 V	220 V	1 V
Start Percent	30%	100%	1%
Stop Percent	30%	100%	1%
Start Voltage - Stop Voltage	20 V	100 V	



AmpDim

Applicable to: select Xi FP drivers only.
Factory default setting: disabled.

Historically mains dimming was used on magnetic ballasts to dim conventional lamps. By lowering the mains voltage, a proportionate reduction in light output was achieved. Until now electronic ballasts were not able to replicate this function. AmpDim enables cabinet-based dimming without the need for additional control wires or infrastructure changes.

A cabinet controller signals to the driver to lower the light output via a reduction in the amplitude of the mains voltage. The intelligence embedded in the LED driver allows for a pre-programming of multiple dimming levels based on the amplitude of the mains voltage.

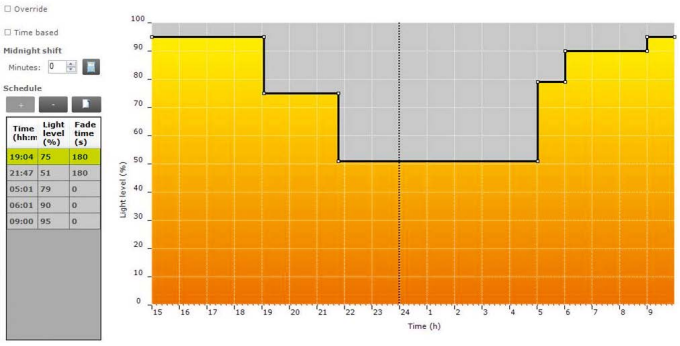
The total range of AmpDim is 170 V – 250 V. The range can be customized via the programming interface. It is possible to set the Start Voltage, Start Percent, Stop Voltage, and Stop Percent. The figure on the left shows an example of the AmpDim programming interface.

Programming note

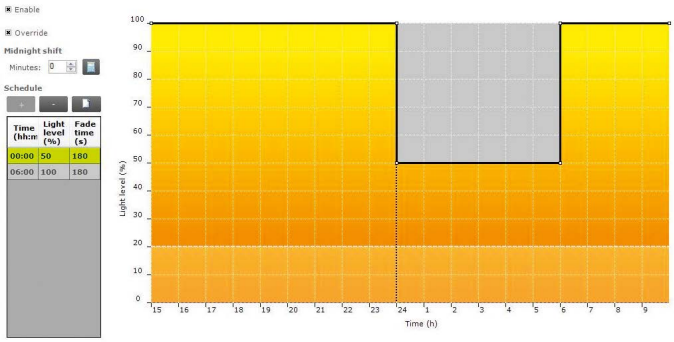
- AmpDim first needs to be selected first in the Dimming Interface selection for activation.
- There needs to be a minimum of 20 V difference between Start and Stop Voltage settings when programming the driver. Please refer to the AmpDim parametric table for complete parameters.

Application note

- The AmpDim feature only supports dimming methods based on amplitude dimming. Phase modulation is not supported.
- Leading-edge and trailing-edge dimming is not supported by Xitanium LED Xtreme drivers.



Dynadimmer (multistep, Xi FP and Xi LP)



Dynadimmer LITE (single step, select Xi LP models only)

Dynadimmer and Dynadimmer LITE

Dynadimmer: applicable to Xi FP/LP drivers
Dynadimmer LITE: applicable to select Xi LP drivers.
Factory default setting: disabled

The Integrated Dynadimmer is a dimming control developed by Philips that enables a simple, pre-programmed multistep dimming. Main function is energy reduction by reducing light (**Xi FP only**: turn off also) during the night when it is not required to have full light output. This function is integrated in the features of Xitanium LED Xtreme drivers.

During Dynadimmer operation the other dimming interface functionalities –except DALI- will be ignored.

Dynadimmer can be overruled ("Override") by DALI to change over to a different light level. Override can also be accomplished by the use of LineSwitch (change over to full light output only).

Override of the Dynadimmer by DALI is implemented by default: as soon as the driver detects a DALI frame it will change over from Dynadimmer mode to DALI mode and remain in DALI mode until the next mains power cycle.

LineSwitch also offers the possibility to overrule the Dynadimmer by applying mains voltage to the LineSwitch input ('high' input), albeit to change over to full light output only. As soon as the LineSwitch input is changed back to 'low', the Dynadimmer will resume operation.

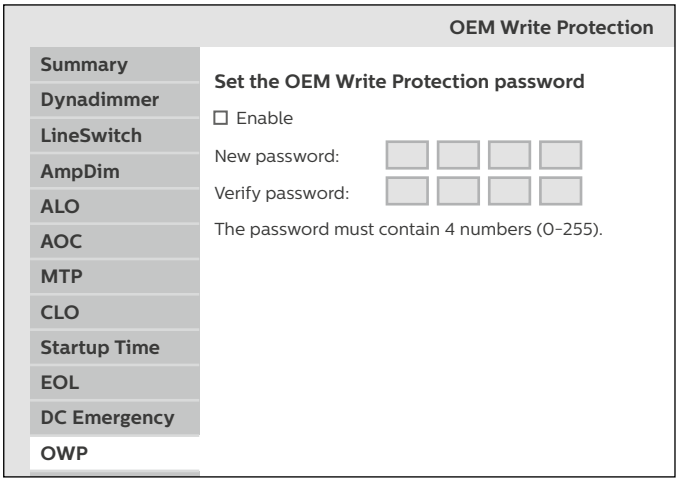
These kinds of override do not interfere with the Dynadimmer synchronization algorithm.

The Dynadimmer / Dynadimmer LITE can be overruled in two ways to change over to full light output (only): either by LineSwitch as described above or by the 1-10 V interface. Please check the driver datasheet to verify if a selected Xi LP driver is equipped with either Dynadimmer or Dynadimmer LITE.

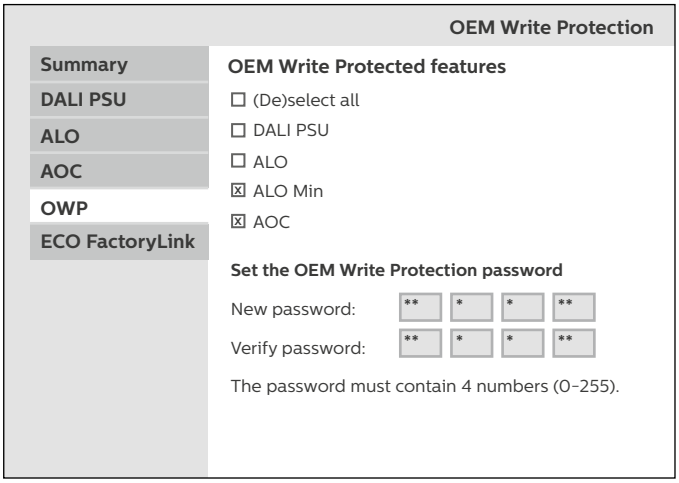
Override by the 1-10 V interface is possible by shorting the + and – terminals of 1-10 V interface by means of an external relay contact or by pulling it down below 2 V by an external controller. As soon as the short is removed or when the input is raised above 3.2V, the Dynadimmer will resume operation. Please note that simultaneous use of Dynadimmer and 1-10V dimming is not possible. These dimming features are mutually exclusive.

These kinds of override do not interfere with the with the Dynadimmer LITE synchronization algorithm.

Group of features - OEM protection



Individual features - OEM protection



OEM Write Protection (OWP)

OWP can be used by the OEM to protect the change of setting of the Philips programmable driver.
Philips Drivers equipped with the feature OWP will show this in their feature list, if read out via the MultiOne Engineering Software.
The feature OWP defines a password that will be set in the driver so the data of OEM Write-protected features can only be written to the driver by providing this configured password.
Depending on the type of driver OEM can protect

- a set of features (fixed)
- a selection of individual features (free selection)

To know which features are locked you see a small lock symbol on each feature while trying to write the driver.

How to program this feature is described in the user manual of MultiOne Engineering at www.philips.com/multione.

The password is needed to change the protected features of this driver. Without the password these features are not changeable.

Encrypted in the feature file, the password can be easy programmed in production via the MultiOne workflow software. New drivers or replacement drivers can be programmed on this way. Already programmed drivers with password are protected and will give an error. They can only be changed using the correct password.

It is important for the OEM to set up a password management system, keeping feature file and password together in the BoM of the luminaire. The password management is under the responsibility of the OEM who sets it.
In case of losing the password, the customer can take contact with the local sales department to discuss a possible solution.

Compliance and approval

Driver compliances and approvals can be found in the published driver Declarations of Conformity (DoC) and ENEC/CB certificates as published on the OEM Technical Download webpage. For further questions please contact your local Philips sales representative.

Disclaimer

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