

**PHILIPS**

Xitanium

LED Xtreme drivers



**Design-in Guide**

# Reliable Xtreme technology for demanding LED applications

October 2023

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# Introduction to this guide



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Thank you for choosing programmable 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 these driver families:

- Xitanium FULL Prog (Xi FP sXt )
- Xitanium LITE Prog (Xi LP sXt)
- Xitanium BASIC Prog (Xi BP sXt)

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 general outdoor and industrial lighting like road, street, tunnel and highway applications. If you use Philips LED drivers in combination with Philips LED modules, specific design-in guides and driver datasheets are available from the below mentioned technology websites.

### Information and support

Please consult your local Signify office or visit:  
[www.philips.com/oem](http://www.philips.com/oem)  
[www.philips.com/multione](http://www.philips.com/multione)

### Design-in support

Dedicated design-in support from Signify is available on request. For this service please contact your local Signify representative.

### Document overview

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

- 7 ca a YfVU''YUZYhVcbUjogdfcXi VmZa j mjbZfa Uhcb/ 'gnhYa Vca VjbUhcbg
- 8 UhUjYYhVcbUjog hY' dfcXi VagVWVgdVWVWVhcbg
- 8 Yg[[b!]b [ i ]XYXYgVWVg\ck hY' dfcXi Vmust be used
- 8 f j Yf VfhZVhVg j ghi d!hc!XUHY Vca d jUbW k j h fYj Yb h dfcXi VmghbXUXg''

All these documents can be found on the download page of our OEM website [www.philips.com/oem](http://www.philips.com/oem). If you require any further information or support please contact your local Signify representative.

# Warnings and instructions



## Safety warnings:

### Safety warnings and installation instructions, to be taken into account during design-in and manufacturing

- Do not use damaged products.
- The luminaire manufacturer is responsible for its own luminaire design and compliance with all relevant safety standards including minimum required IP rating to protect the driver.
- The Xitanium LED Xtreme drivers are suitable for built-in use only and must be protected against ingress of and exposure to including but not limited to snow, water, ice, dust, insects or any other chemical agent - be it in the gaseous, vapor, liquid or solid form- which can be expected to have an adverse effect on the driver (e.g. use in wet /corrosive / dusty environments). It is the responsibility of both luminaire manufacturer and installer to prevent ingress and exposure. Any suggestion from Signify with reference to minimum required luminaire IP rating serves only as non-binding guidance; a higher IP rating may be required under certain application conditions to protect the driver. Common sense needs to be used in order to define the proper luminaire IP rating for the intended application.
- Do not service the driver when mains voltage is connected; this includes connecting or disconnecting the LED module. The driver generates an output voltage of the driver that may be lethal. Connecting a LED module to an energized driver may damage the LED module.
- Do not connect mains voltage to the driver DALI interface.
- No components are allowed to be connected between the LED driver and the LED module(s) other than connectors and wiring intended to connect the Xitanium driver to the LED module. Do not connect the outputs of multiple drivers in parallel.
- Adequate protective earth and/or equipotential connections needs to be provided whenever possible or applicable.
- Signify Design-in support is available; please contact your Signify sales representative.

### Disposal

Please, inform yourself about the local waste disposal, separation and collection system for electrical and electronic products and packaging. Please act according to your local rules and do not dispose of your packaging and old product with your normal household waste. The correct disposal of your product will help prevent potential negative consequences for the environment and human health.

# Xitanium LED Xtreme drivers



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## Xitanium LED Xtreme driver families: general feature overview

	Xi BP	Xi LP	Xi FP
Lifetime 100kHrs	•	•	•
Surge immunity medium / high	•/-	-/•	-/•
I-10V dimming (I-8 and I-9V linear curve)		•	
LineSwitch Single-Step & 3-Step			•
Adjustable Output Current (AOC)	•	•	•
Wireless driver configuration (SimpleSet)	•	•	•
Constant Light Output, full (CLO)			•
Constant Light Output, basic (CLO LITE)		•	
Dynadimmer 5-step (incl. light turn-off)			•
Dynadimmer 5-step (no light turn-off)		•	
Event-based diagnostics	•	•	•
Realtime diagnostics			•
Module Temperature Protection (MTP)		•	•
Driver thermal protection (ThermalGuard)		•	•
Adjustable Driver Temperature Limit (DTL)		•	•
DALI 2 control			•
Mains voltage amplitude dimming (AmpDim)			•
Undervoltage protection (MainsGuard)		•	•
Coded control via Mains (CM)			•
DC emergency dimming (DCemDim)			•
Adjustable Startup Time (AST)			•
Resettable LED module operating hours (LSO)			•
Visual LED module End Of Life indication (EOL)			•
OEM Write Protection (OWP)	•	•	•

**Note:** Please refer to the applicable driver datasheet for an exact feature overview; depending on driver type not all indicated features may be supported.

## Xitanium LED Xtreme drivers

Xitanium LED Xtreme drivers are designed to enable LED solution for general lighting applications. 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 adjustable output current flexibility. 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 overview on the left lists in more detail the general differences between available features of the different driver versions. These drivers come in a wide range of power ratings and sizes 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/oem](http://www.philips.com/oem).

Detailed technical specifications can be found in the Xitanium driver datasheets at [www.philips.com/oem](http://www.philips.com/oem).

## Configurability Interface (tooling)

The Xitanium FP/LP/BP LED Xtreme drivers are programmable. A tailored package of features and parameters in these drivers can be configured 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 interface (wired)
- SimpleSet (wireless, based on NFC)

## SimpleSet

Philips SimpleSet 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](http://www.philips.com/multione).

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### **Adjustable Output Current (AOC)**

Flexibility in luminaire design is ensured by the Adjustable Output Current feature (AOC). This feature 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 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 section Electrical design-in.

### **LED Module Temperature Protection (MTP)**

Adjustable limitation of thermal stress on the LED module is made possible by the Module Temperature Protection (MTP) feature combined with an NTC resistor integrated in the LED module. More details about MTP and the NTC resistor can be found in the Section Thermal design-in.

### **Driver Temperature Limit (DTL)**

Adjustable limitation of thermal stress on the driver is made possible by the DTL feature on select drivers by means of 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 section Thermal design-in.

### **Dimming interfaces**

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

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

Supported control interfaces can be found in the naming of the drivers (see section Driver naming).

### **Amplitude Modulation (AM) dimming**

Philips Xitanium LED Xtreme drivers dim the output to the LEDs by means of continuous Amplitude Modulation (AM) dimming of the DC output current. No Pulse Width Modulation (PWM) is applied across any part of the entire output current range. AM dimming guarantees the smoothest and flicker-free operation over the entire dimming range.

### **Temporal Light Artifacts (flicker & stroboscopic effects)**

A small inherent ripple is superimposed on the DC output current of Philips LED Xtreme drivers. This ripple consists of a low-frequency LF component (double the mains grid frequency) and a high-frequency HF component. This ripple current has such a low amplitude that Temporal Light Artifacts (flicker & stroboscopic effects) with camera systems other than possibly those for high-speed slow-motion HD recording are not be expected.

The ripple value of both LF and HF components as well as the values for TLA parameters short term flicker value ( $P_{st}^{LM}$ ) and Stroboscopic Visibility Measure (SVM) are specified in the driver datasheet.

### **Energy and luminaire data**

Select Xitanium LED Xtreme drivers support energy reporting in compliance with DALI part 252 (with limited accuracy) as well as storing of luminaire data in compliance with DALI part 251. Please refer to the driver datasheet for more details.

### Hot-wiring and output sharing



**Warning:** Philips LED Xtreme drivers do not support hot-wiring. In order to prevent damage to LEDs, no connection or disconnection should be made to the driver output when mains voltage is present. Please ensure that power is turned off before doing so.

Connecting driver outputs in parallel or the sharing of multiple LED+ or LED- connections in one wire is not supported either. Outputs of individual drivers must be kept fully separated.

### DC mains operation

Most Xitanium LED Xtreme drivers support use in 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 (CLO)

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 LED module. 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 a 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 at [www.philips.com/multione](http://www.philips.com/multione).

### OEM Write Protection (OWP)

OWP allows the OEM to protect crucial driver setting over the lifetime of the driver by using a password. Select drivers equipped with OWP will show this in the feature list if read out by the tool MultiOne. Specific features and also the OWP feature itself 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

Xitanium LED Xtreme drivers are equipped with a Diagnostics feature. The purpose of Diagnostics is based on the following:

- Readout of realtime driver diagnostic data (Xi FP drivers only)
- Readout of logged diagnostic data (event-based).

Both support the gathering of information and to 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 module, output current and voltages etc. When the driver is shutdown the diagnostics data is stored automatically in non-volatile memory.

The Diagnostics feature can be utilized programmed with the Philips MultiOne configurator tool. Select drivers also support diagnostics per DALI part 253. Both realtime and event-based diagnostic data can be obtained via the DALI interface of Xi FP drivers while SimpleSet supports reading out event-based diagnostic data. More information can be found at [www.philips.com/multione](http://www.philips.com/multione).

### Use in hazardous areas



**Warning:** the use of lighting control gear in hazardous areas is bound to very strict safety regulations. Xitanium LED Xtreme drivers are **not** certified per standard IEC/EN 60079 and latest EU directive ATEX for use in hazardous areas in which there is risk of explosion. Therefore, Xitanium LED Xtreme drivers do not directly support application in luminaires and lighting systems in such environments.

### Driver naming

Xitanium LED Xtreme drivers are part of a specific naming system. GY'H.Y example Velow.

**Xi FP 330W 2:0.2-0.75A SNLDAE 230V C240 sXt**

#### Protection suffix:

sXt = Xtreme technology; high robustness and lifetime  
No suffix = basic robustness and long lifetime

#### Housing

S###, C### (S=Stretched, C=Compact, ### = length in mm)

#### Rated AC input voltage

230Vac (= 220 ... 240Vac range)

#### Features

S = SimpleSet  
N = NTC interface  
L = LineSwitch interface  
1 = 1-10V interface  
D = DALI interface  
A = AmpDim interface  
E = DC Emergency  
M = Energy Metering  
P = Auxiliary Power supply  
F = FlexTune

(Note: Coded Mains feature is not reflected in naming)

#### Output current:

Adjustable min-max Output Current range (AOC) in A

#### Number of output channels:

None = single channel  
2 = dual channel

#### Output power:

Rated output power in Watt

#### LED driver family:

None = Single Current, no controllability  
Dim = 1-10V dimmable, non-programmable  
FP = FULL Prog  
LP = LITE Prog  
BP = BASIC Prog  
SR = Sensor Ready

#### Type of LED driver:

Xi = Xitanium



# Mechanical Design-in

## Dimensions

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 fit and can be found at [www.philips.com/oem](http://www.philips.com/oem).

It is recommended to build in drivers 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 for drivers with plastic mounting feet. This value should not be exceeded in order to prevent deformation of the mounting feet.



**Note:** The use of rivets is not recommended since mounting torque cannot be controlled. Damage to the mounting feet and 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.

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 go to [www.philips.com/multione](http://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.



LCN9620 SimpleSet interface tool

# Thermal Design-In

## Introduction

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

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

In order to facilitate thermal design-in of a LED driver, the critical thermal management points of the LED driver are set out in this section. Please familiarize yourself with the following key aspects to achieve optimal thermal design-in of the driver.

## 1: Driver case temperature point ( $t_c$ point)

The driver case point temperature ( $t_c$ ) is the only reference for the temperatures of the critical internal driver components. The location of the  $t_c$  point is identified on the driver type plate and is marked by a \* or  $\circ$  symbol. Please use **only** the  $t_c$  point as reference to define thermal suitability of a driver in the application. Its temperature can be measured using a thermocouple that is firmly glued to the  $t_c$  point surface on the driver housing. For a representative measurement the temperature of the  $t_c$  point must be stable before any reliable data can be obtained (typically > 3 hours or when the temperature difference is less than 1°C within one hour).

## 2: Driver $t_{c\_life}$ value

The specified full driver lifetime and corresponding failure rate will apply as long as the  $t_c$  point temperature remains between the lower  $t_{a\_min}$  and upper  $t_{c\_life}$  limits.

## 3: Driver $t_{c\_max}$ value

The driver supports running at a higher temperature than the specified  $t_{c\_life}$  temperature, up to the  $t_{c\_max}$  temperature. Keep in mind that doing so will be at the expense of the driver lifetime and failure rate. A graphical representation thereof can be found in the driver datasheet. Running the driver above the specified  $t_{c\_max}$  temperature is **not** supported and will negatively affect driver lifetime and void driver warranty. The **only** way to verify whether either  $t_{c\_life}$  or  $t_{c\_max}$  is exceeded in the application is by using a thermocouple.

## 4: Driver minimum ambient temperature ( $t_{a\_min}$ )

This lower limit value as specified in the driver datasheet stipulates the minimum **luminaire** ambient temperature at which the driver can be used, e.g. in frozen storage warehouses or (sub)arctic areas. Using the driver below its specified minimum  $t_{a\_min}$  value is not supported and will negatively affect driver performance and lifetime. Driver warranty will then be void.

## 5: Driver maximum ambient temperature ( $t_{a\_max}$ )

Typically, the driver  $t_c$  point will reach its specified  $t_{c\_max}$  value at the specified driver ambient  $t_{a\_max}$  temperature **inside** the luminaire. However, if the driver is not running at full output power then the actual  $t_c$  point temperature may be lower than the  $t_{c\_max}$  value. In that case a higher driver  $t_a$  is supported up to the point when the specified  $t_{c\_max}$  value is reached.



## 6: Driver temperature readout in MultiOne Diagnostics

The "Driver temperature" readout via the Diagnostics function in MultiOne software represents the temperature of a driver-internal thermal sensor. Please do **not** use this readout to define thermal suitability of a driver for a given luminaire; this temperature readout does not represent the  $t_c$  point temperature and does not correspond 1:1 with the  $t_c$  point temperature. It is therefore not suitable as a reference for thermal design-in.

The thermal design-in of the driver inside the luminaire also influences the relation between the driver  $t_a$  temperature and  $t_c$  temperature. E.g. mounting the driver on an effective heatsink or placing it further away from LED modules will lower the  $t_c$  value at a given  $t_a$ . The  $t_c$  point temperature is always leading with respect to  $t_{c\_life}$  or  $t_{c\_max}$ .

In general, lowering the overall driver temperature will increase the driver lifetime since the temperature of critical components inside the driver will be lower. However, applying only local heatsinking of the driver -e.g. to lower the  $t_c$  point temperature or any other surface hotspot- will not necessarily lower the temperature of critical components. Do not apply local heatsinking to improve intended thermal driver performance and/or to artificially lower the temperature of the  $t_c$  point.

### ThermalGuard

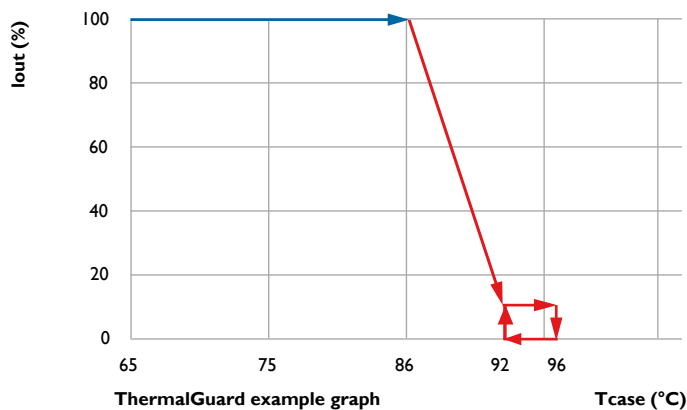
In a thermally well-designed luminaire the specified  $t_{c\_max}$  value will not be exceeded. However, under extremely hot atmospherical conditions the driver may occasionally overheat. In that case the driver will automatically start to reduce the output current as an emergency measure to reduce driver overheating. 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  $t_c$  point temperature starts dropping below a certain value the driver will automatically increase the output current up to the pre-set output current. If the output current reduction is not sufficient to counteract the  $t_c$  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 factory default overheating behavior and it can be found as a ThermalGuard graph in the driver datasheet.



**Warning:** the ThermalGuard feature is designed as a non-configurable emergency measure to protect the driver. It is **not intended** for structural activation to compensate for a poor thermal design of a luminaire. Structural activation will lead to premature driver failure and will void warranty.



**Note:** Xi LP drivers equipped with ThermalGuard do not support output shutdown in case of driver overheating; the output current will be reduced to min. 10% of the rated AOC value. ThermalGuard on the other hand does support output shutdown reg. select Xi FP drivers. Please refer to ThermalGuard graph in the driver datasheet for more details.



Shown on the left is an example graph of the ThermalGuard feature. In this example, the output current is reduced from  $t_c$  point temperature of 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  $t_c$  point temperature then the output current will be increased accordingly up to the pre-set 100% level.

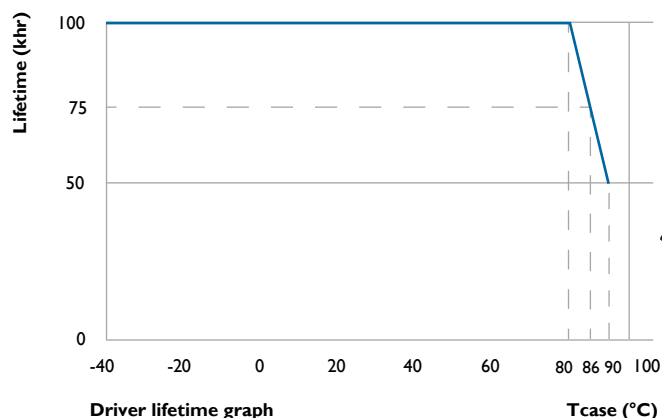
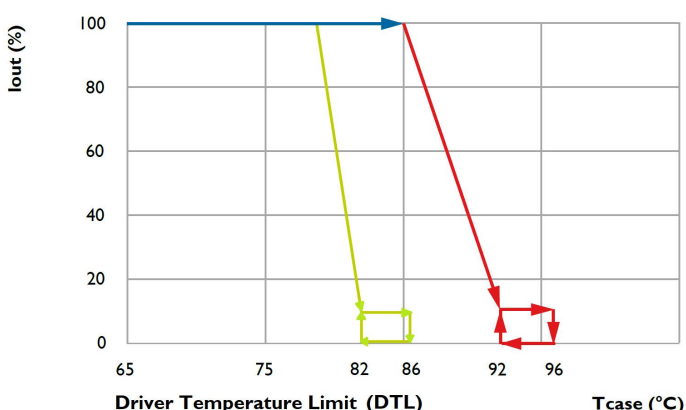
If the unlikely case when output current reduction is not sufficient to offset the  $t_c$  point temperature increase then the output current is eventually reduced to zero at 96°C and the driver output will be switched off. Normal operation will not resume until the  $t_c$  point temperature has cooled down to 92°C. A power cycle is not required to resume driver operation. The 4°C hysteresis will prevent the luminaire from blinking on and off.

**Note:** the ThermalGuard feature is **non-configurable**.

### Driver Temperature Limit (DTL)

Depending on commercial or application needs it may be required to optimize driver lifetime. This can be achieved by safeguarding that the maximum driver case point temperature in the application is not exceeding a predefined limit. A configurable feature called DTL (Driver Temperature Limit) enables this by offering an adjustable  $t_c$  point temperature threshold at which the output current is reduced (start dim value) and optionally be switched off (shutdown value). DTL configuration can be done by MultiOne software. By factory default, the DTL feature is configured per the specified ThermalGuard graph for a driver as specified in the driver datasheet.

Shown on the left is an example DTL and driver lifetime example graph. The green line represents the output current as function of the  $t_c$  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 ThermalGuard behavior. In this example, the output current is reduced from  $t_c$  point temperature of 80°C onwards (start dim value) and the  $t_c$  point will not exceed 86°C (shutdown value) whereas it would have been allowed to reach up to 96°C without this specific DTL profile.



**Warning:** thermal luminaire properties will influence the DTL activation points. Therefore, the configured DTL start dim and shutdown values must be verified **case-by-case** per driver-luminaire combination to ensure that the driver does dim and shut down at the correct  $t_c$  point temperature in relation to the configured MultiOne start dim and shutdown values. Otherwise, DTL will act either at a too low or too high  $t_c$  point temperature!

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  $t_c$  point and LED module  $t_c$  point temperature is well-defined. Therefore a meticulous thermal investigation of the driver - LED module driver application is required to prevent DTL from being activated at a too low or too high LED module temperature.



**Note:** the DTL feature does not support output shutdown in case of driver overheating of Xi LP drivers; the output current will be reduced to min. 10% of the rated AOC value. Output shutdown is only supported by select Xi FP drivers. Please refer to the datasheet for more details.

### LED Module Temperature Protection (MTP)

This feature helps to protect the LED module when operated during abnormal thermal application conditions. The thermal design of a LED module should be designed in such a way that the specified temperature of the LED module ( $t_c(\text{life})$  or  $t_c(\text{max})$ ) is not exceeded under normal application conditions. The utilization of an NTC resistor interface (Negative Temperature Coefficient resistor) serves the purpose to help achieve the useful lifetime of the LED module if external thermal influences result in the temperature for lifetime  $t_c(\text{life})$  being exceeded. If this occurs then the light output will be reduced to keep the temperature of the LED module below a predefined critical temperature.

Philips Xi FP and Xi LP SN drivers are by default configured for the following three standard NTC types:

1. 10 kilo Ohm NTC - Murata, p/n NCPI8XH103J03R
2. 15 kilo Ohm NTC - Vishay, p/n NTCS0805E3153GMT (previous p/n: 2381 615 54153)
3. 15 kilo Ohm NTC - Murata, p/n NCPI5XW153E03RC (+ separate 390 ohms resistor in series with the NTC)

Other NTC types are supported as long as they fall within a 5,000 ... 25,000 Ohm resistance range. The applicable values for  $R(25^\circ\text{C})$  and  $\beta$  however need to be specified separately during MTP configuration in MultiOne for proper MTP behavior.

#### MTP behavior setting

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.



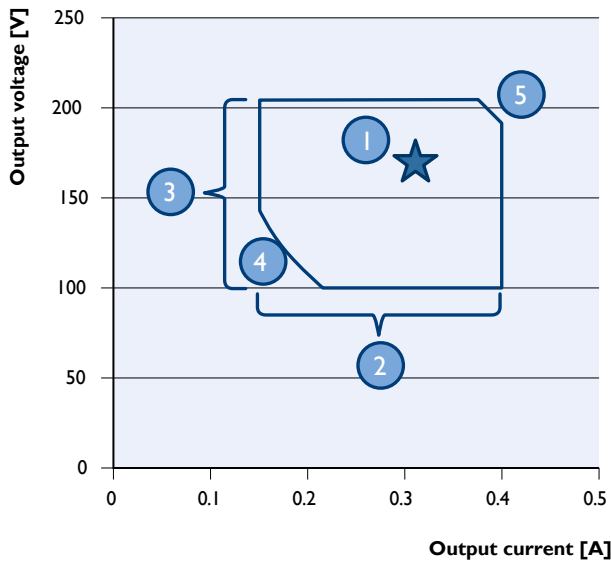
**Note:** Please take into account when verifying MTP performance in the application that MTP behavior will correspond with the configured MTP profile only when the driver  $t_c$  point has reached at least its specified  $t_c(\text{life})$  temperature. At lower  $t_c$  point temperatures the MTP may become active up to  $10^\circ\text{C}$  below the configured start dim temperature.



**Warning:** follow the instructions below for reliable MTP behavior and to prevent damage to the driver NTC interface.

- Do not combine the NTC ground connection (NTC COM) with the LED -connection. These two connections must be kept separate.
- The length of each wire between the NTC 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 NTC inputs from multiple drivers in parallel nor to have multiple NTC interfaces share a common connection. Always keep multiple NTC interfaces fully separated from each other.

# 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 LED module voltage  $V_f$ , given it fits range
4. Driver minimum power limit
5. Driver maximum power limit

## Xitanium driver operating window

LED technology is rapidly evolving. The use of 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, 700 or 1050 mA. It is often necessary to replace a driver when more efficient LEDs or different LED modules become available.

One of the key features of the Xitanium LED Xtreme drivers is the adjustable output current (AOC) feature, 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 string  $V_f$ ) and dependent on LED drive current and temperature. The operating window of every driver can be found in the driver datasheet.

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

- SimpleSet: output current can be set using the Philips MultiOne software and SimpleSet interface.
- DALI interface: output current can be set using the DALI-USB interface.



**Warning:** the forward voltage  $V_f$  of the connected LED module **must** remain within the specified driver operating window voltage boundaries under all application conditions. Otherwise, reliable luminaire operation cannot be guaranteed.

## Dual-channel operation:

Drivers with a dual-channel output enable higher output current by connecting the two separate outputs in parallel. The actual output current will then be twice the configured value for AOC.

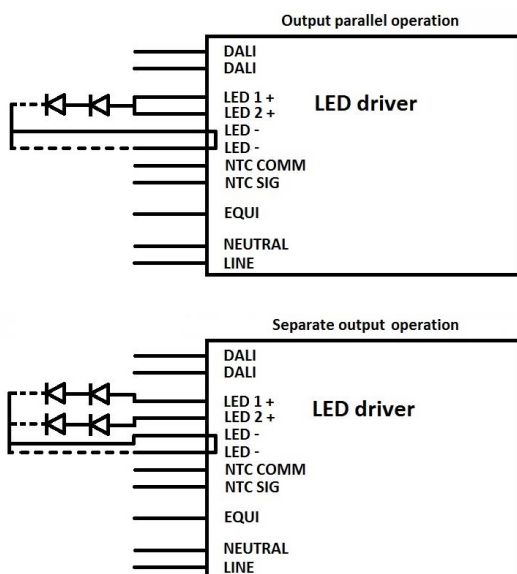
The outputs may also be connected separate from each other. The LED module voltage of the two channels is then allowed to be different from each other. The configured AOC value always applies to both outputs simultaneously.

See the connection diagrams on the left for more details.

## Notes:



- The two outputs of a dual-channel driver share a common minus terminal inside the driver. Therefore, the two outputs **cannot** be put in series.
- Always load both driver outputs. Do not leave either output unloaded to prevent DALI light source error messages.



Dual-channel output connection overview

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### How to select the appropriate driver

Depending on application requirements, several drivers may fit a specific application. The following steps will help in selecting the appropriate driver(s). For a complete overview of suitable driver(s) for your application, please use the Easy Design-in Tool (EDIT) at [www.easydesignintool.philips.com](http://www.easydesignintool.philips.com) as starting point.

1. Determine the required driver current ( $I_{\text{drive}}$ ) and voltage ( $V_f$ )
2. Calculate the required power ( $P_{\text{drive}}$ ) where  $P_{\text{drive}} = V_f \times I_{\text{drive}}$  (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 SL 230 V S240 sXt, the minimum programmable driver current is 0.2A and maximum is 0.7A.
5. Does the required LED voltage fit the voltage range of the driver? The exact values can be found in the datasheet.
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.
7. Choose the preferred dimming method. Please refer to the section about naming of the drivers to know what the naming indicates about dimming options.

### Programming the output current

The Xitanium LED Xtreme drivers offer an extensive 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 a versatile 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 and SimpleSet. The driver name indicates which interface is supported.

For more information on MultiOne please refer to the section Driver Configuration or visit [www.philips.com/multione](http://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 push-in type connectors. Connectivity specifications (wiring connection diagram, supported wire cross section range in mm<sup>2</sup>, strip length range in mm and wire type) can be found in the driver datasheet.



### Notes:

- For currents between 1.0 and 1.5A (rms/DC) per connector, a minimum cross section of 0.75mm<sup>2</sup> is recommended.

- In certain luminaire wiring scenarios two wires may have to be connected to one connector terminal. In that 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 for operation and performance by power sources or grids providing a clean and symmetric sinusoidal voltage wave form and do not support operation on power sources including but not limited to having e.g. a square-wave voltage or a "modified sine wave" form.

Xitanium LED Xtreme drivers are able 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 a 3-phase grid.

### Low and high mains voltage

Xitanium LED Xtreme drivers are designed to be operated at mains under- and overvoltage conditions per IEC requirements for specified performance and operational safety. The applicable voltage ranges can be found in the driver datasheet.

The applicable lower limit for driver performance is lowest rated voltage -8% while -10% applies for driver operational safety. For drivers equipped with MainsGuard a lower limit applies for operational safety.

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

For optimal driver 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 safety and performance mains voltage that would otherwise apply. Low mains voltage can be used for dimming in combination with the AmpDim feature. This feature can be programmed to regulate the output power when the input voltage drops below a programmed level.



### Excessive low mains voltage (MainsGuard)

Previously, 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 ... 180Vac.

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 full output power. This would exacerbate the undervoltage condition further. Consequently, mains cables and relays may be overloaded and melting 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 total loss of lighting.

Xitanium LED Xtreme drivers now have a new feature incorporated to protect luminaire and mains grid against overcurrent conditions without loss of lighting. This smart feature is called MainsGuard. Its function is to proportionally decrease input current 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 of 5 ... 10Vac against on/off nuisance cycling is implemented before the driver output becomes automatically active again once the mains voltage starts to recover (no mains power cycle required).

A general graphical representation of MainsGuard can be seen in the illustration on the left. Exact 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
- No current overloading of MCBs, fuses and relays

The MainsGuard feature is properly coordinated with the AmpDim feature in order to prevent interference between these two features.



**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 modified.

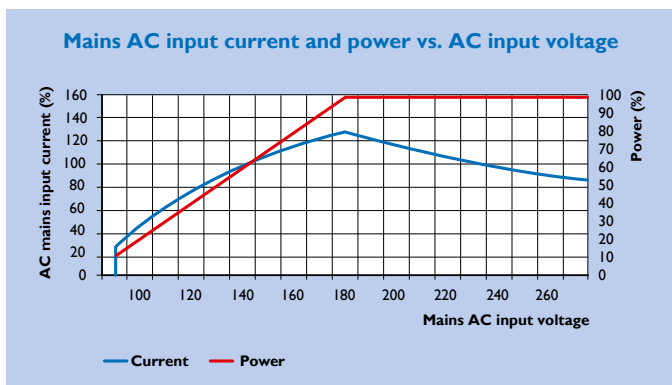


**Warning:** the MainsGuard feature is designed as an emergency measure to protect the driver. It is not intended for structural activation to compensate for poor grid conditions.

### Excessive high mains voltage

Xitanium LED Xtreme drivers will survive an input overvoltage of 265 ... 320Vac for a period of max. 48 hours and 320 ... 350Vac for a period of max. 2 hours. However, running drivers at excessive high mains voltage will result in electrical overstress and will have an adverse effect on the lifetime.

A loose neutral condition in a 3-phase grid has to be avoided as this may reduce the lifetime dramatically. Immediate driver failure may occur if the driver is connected to 400Vac as a result of a connection error or loose neutral in a 3-phase 230/400Vac grid.



Illustrative graph of the MainsGuard feature. Shown values are example values. Please refer to the driver datasheet for exact values.

### Output open-load and short-circuit conditions

Xitanium Xtreme drivers can withstand output open-load and short-circuit conditions. These are to be considered abnormal driver conditions. Consequently, it is not recommended to use drivers as such. Neither is it recommended to switch the driver output by means of e.g. relays ("hot switching") to connect or disconnect LED modules.

### Use of LineSwitch in a 3-phase 230/400Vac grid

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

### Power grids

Xitanium Xtreme LED drivers are suitable for direct connection to an AC or DC grid in TN, TT and IT configuration. Depending on driver type, a luminaire-based fuse in the driver neutral connection may be required in case both feeding phases are "hot".



**Warning:** certain restrictions apply for use in an AC IT grid. Direct connection of Xitanium LED Xtreme drivers is only permitted in delta connection with a phase to-phase voltage of 230Vac. In case the drivers are connected in star connection in a 230V/400Vac 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 must be connected to earth. There are no particular restrictions when using these drivers in a DC IT grid.

### Power Factor

Xitanium Xtreme LED drivers have a high power factor (PF) which is inherently capacitive. Its capacitive nature cannot be compensated for. The output power dependent PF graph can be found in the driver datasheet. By design, the driver will maintain a high power factor also under dimming conditions.

### DC emergency operation (DCemDim) and fusing

Depending on driver type, the driver may be certified acc. IEC 61347-2-13 Part J for operation on a DC input voltage. As a result, the driver enables application in emergency luminaires in compliance with IEC 60598-2-22 *excluding high-risk task areas*. These drivers support operation both a flat DC input voltage as well as operation on rectified sinewave "joker" input voltage.

On most Xi FP 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 will switch over automatically once connected to a DC input voltage. Please note that the output current cannot reach more than 60% of the configured AOC value during DC operation.

The mains input of DC-rated drivers is not polarity-sensitive for DC input voltage and the driver is fully CISPR15 EMC-compliant when operated on a DC grid. Specific DC input voltage values can be found in the driver datasheet. The DC input is allowed to be a "joker voltage" (inverted sine wave). Depending on driver type, EL marking may apply. For those drivers the corresponding Emergency Output Factor EOFx range can be found in the driver datasheet.



### Notes:

- The allowed DC input voltage range for safety and performance are listed in the driver datasheet. Values outside the performance range will have an adverse effect on the driver performance and reliability.
- During DC input voltage operation the output power of the driver is limited to max. 60% of the output power at AC input voltage operation.

Xitanium LED Xtreme drivers are equipped with an internal fuse rated for AC and DC voltage operation. Therefore, an external DC voltage rated fuse is not required when the driver is connected to DC input voltage.

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



**Note:** The allowed DC input voltage ranges for safety and performance are listed in the driver datasheet. Values outside that range will have an adverse effect on the driver performance and reliability.

### 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 a Miniature Circuit Breaker (MCB) to trip or a fuse to melt. In such a case, either one or a combination of the following measures need to be taken to prevent nuisance tripping:

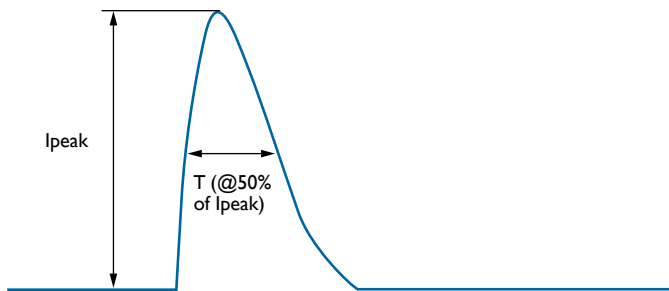
- Replace existing MCB for a less sensitive type (e.g. exchange B type for C type).
- Distribute the group of drivers over multiple MCB groups or phases.
- Power up drivers sequentially instead of simultaneously.

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



### Notes:

- The amplitude and pulse width time of the inrush current are not in any way affected by the driver feature Adjustable Startup Time (AST, see section Control Features).
- The use of an external inrush limiting device (e.g. EBN-OS or Camtec ESB) or a zero-voltage switching relay (e.g. Finder 77 series) may enable a larger amount of drivers to be connected to a MCB or fuse. Signify has not tested the compatibility or effectiveness of such third-party devices in the actual application. It is the responsibility of both luminaire manufacturer and installer to ensure compliance with national electrical codes when either device is used in the application.



Graphical representation of inrush current

MCB type	Rating (A)	Relative number of LED drivers (%)
B	4	25
B	6	40
B	10	63
B	13	81
B	16	100 (reference)
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
D	4	80
D	6	130
D	10	210
D	13	280
D	16	350
D	20	470
D	25	550
D	32	700
D	40	940
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 is based on inrush current and only serves as guidance. The actual maximum amount in the application may differ; it is dependent on steady-state current, MCB brand/type and inherent MCB tolerances.

### How to Determine the Number of Drivers on a MCB

The maximum recommended amount of drivers connected to a Miniature Circuit Breaker (MCB) can be calculated with the help of the conversion table shown on the left. In this table the stated amount for a 16A B type MCB is used as reference (100%). The maximum recommended amount of drivers for different types of MCB can be calculated by this formula:

Max. amount of drivers = reference x relative number in %

#### Example:

If the datasheet states a max. amount of 20 drivers on a 16A B type then for a 13A C type the max. amount is  $20 \times 135\% = 27$  drivers.

#### Notes:



-Keep in mind that in case a D type MCB is used that the steady-state current may be the limiting factor instead!

-The conversion table on the left does not apply to the following drivers:

-Xi FP 220W 0.2-0.7A SNLDAE 230V C170 sXt

-Xi FP 330W 2:0.2-0.75A SNDAE 230V C240 sXt

These two drivers as mentioned above are equipped with the inrush-limiting feature called SoftStart. As a result, the aggregate steady-state driver input current at total rated output power may limit the maximum amount of drivers that can be connected to a MCB. If the set output power however is set significantly below the rated output power then the max. amount of drivers may be increased until the limit defined by the inrush characteristics is reached.

Therefore, the datasheet for drivers equipped with SoftStart will specify different recommended maximum amounts per MCB: one amount is based on steady-state input current at rated output power (irrespective of MCB type) while a higher amount is based on inrush current characteristics (MCB type-dependent).

### 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 in the datasheet of the maximum input current and inrush current ( $I_{peak}$  and  $T_{width}$ ) 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:

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

**Example:**

A group of drivers is connected to a 16A gG melting fuse with a melting integral value of  $350A^2s$ . Specified driver inrush current peak and width is 65A and  $330\mu s$ . Steady-state input current is 0.8A 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  $(65)^2 \times (0.8 \times 330 \times 10^{-6}) = 1.12A^2s$  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  $\sqrt{(175A^2s/1.12A^2s)} = 12$  drivers.

The steady-state input current per driver is 0.8A. Taking into account a max. allowed steady-state current loading of  $16A \times 80\% = 12.8A$ , this would allow for max.  $12.8A / 0.8A = 16$  drivers.

Therefore, the maximum recommended amount of drivers is = **12** drivers.

In this example, the maximum recommended number of drivers is defined thus by inrush current.

**Mix of drivers on an MCB or fuse**

If a mix of different drivers is connected to an MCB then the aggregate  $I^2t$  of the inrush current of all drivers need to be added. The aggregate shall remain below the  $I^2t$  value of the driver having the highest  $I^2t$  value multiplied with the max. recommended amount of that driver per MCB.

If melting fuses are used then the  $I^2t$  calculation method shall be used as explained above.



**Notes:**

- Specified maximum number of drivers is based on simultaneous switch-on, e.g. by a central switch or relay.
- For multiple MCBs in one cabinet the de-rating of the MCB manufacturer for steady-state load needs to be followed. If the actual de-rating is unknown then it is recommended to use a steady-state current de-rating of 0.8 by default. No de-rating is needed in respect to inrush current as this is not part of the thermal properties of the cabinet.
- The maximum number of drivers that can be connected to one 30mA Residential Current Device (RCD) is typically 30. However, the actual maximum amount depends on RCD brand and type so the actual number may vary and will have to be defined on-site.

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### Surge immunity

Xitanium LED Xtreme drivers have elevated differential-mode and common-mode surge immunity levels which by far surpass the limits as defined by IEC. By design, the high immunity levels do not only safeguard reliable driver operation in the field but also provide high immunity for the connected LED modules, thus enabling a high surge immunity on system level. The driver immunity levels can be found in the driver datasheet.

In order to achieve these high immunity levels the driver EQUI terminal must be connected to the metal parts of the luminaire and LED module heatsink in all cases (Insulation Class I: also to earth). Doing so will guarantee the specified surge immunity levels and will protect the driver and LED module 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 (column/distribution cabinet).



**Note:** the specified common-mode immunity levels apply with open I-10V or DALI control interface. Reduced driver/system immunity may result when connecting external control systems. Please check the driver datasheets for details or contact your local Signify representative for further specific technical support.

### Touch current

Xitanium LED Xtreme drivers are designed to meet touch current requirements for insulation class II applications per lighting control gear standard IEC 61347-1 in order to enable an easy design-in in Insulation Class II luminaires per IEC60598-1. 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 of this voltage.



**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. Do not leave the EQUI terminal disconnected to lower the luminaire touch current; impaired EMC and surge performance will result.

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### Electro-Magnetic Compatibility (EMC)

Electromagnetic compatibility (EMC) is the ability of a device or system to operate satisfactorily in its electromagnetic environment without causing unacceptable interference with other systems or being too susceptible for external emissions from other systems. Xitanium LED Xtreme drivers meet EMC requirements per CISPR15 for conducted and radiated emissions. This test is conducted with a reference setup that includes a driver and an LED module + heat sink combination mounted on a metal plate and is verified in Insulation Class I and II configurations.

### 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.

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

If a longer distance beyond the maximum specified distance is required then the EMC performance needs to be verified separately. The use of shielded LED output wires is not recommended.



**Warning:** the length of the two NTC wires between driver and LED module is not allowed to exceed 60cm; otherwise reliable operation of the MTP feature is not guaranteed.



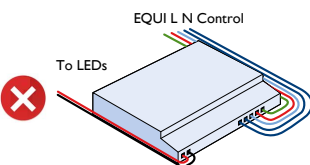
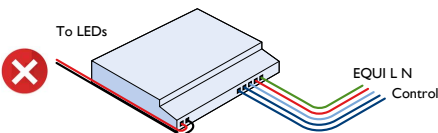
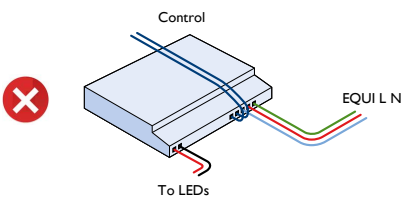
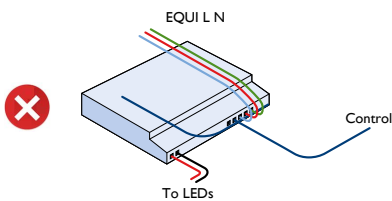
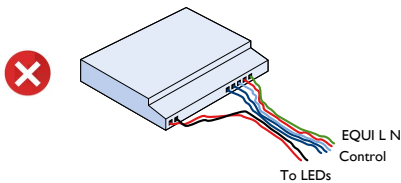
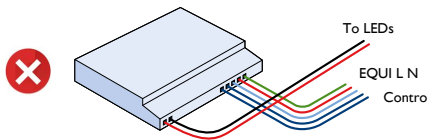
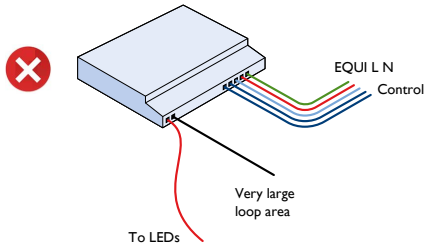
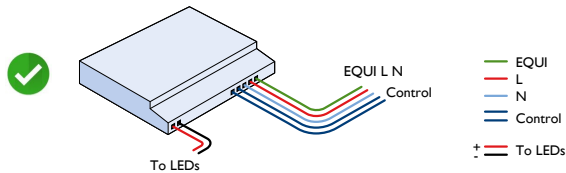
**Note:** For optimal EMC performance and surge immunity the driver EQUI terminal must be connected to the luminaire chassis and, in case of Class I, to protective earth as well. This can be achieved by use of a wire to an earthing terminal or via the luminaire chassis which is connected to the mains input connector. Doing so for Insulation Class II luminaires 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

The purpose of the driver EQUI terminal is purely for functional performance reasons by establishing equipotential bonding; the EQUI terminal does **not** have a safety function.

### Electrical insulation

Driver insulation classifications between the several inputs and outputs can be found in the driver datasheet. Insulation classifications of Xitanium LED Xtreme drivers are optimized for design-in in Insulation Class II luminaires as a built-in component by offering double or reinforced insulation between live and accessible parts. The insulation between the EQUI terminal and the mains input is classified as **double or reinforced** for all Xitanium LED Xtreme drivers.



## EMC performance precautions

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

- Minimize the loop area of the LED output wires going from the driver to the LED module by keeping the output wires close together (bundling).
- Minimize the parasitic capacitive coupling of the LED output wiring towards earth by keeping the wiring length as short as possible.
- Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and control wires separated from the LED output wires. Do not bundle or cross the wires.
- Do not route any wiring over and/or along the driver enclosure to avoid any noise coupling/crosstalk with internal driver circuitry



**Insulation Class I application:** ground the luminaire chassis and other large internal metal luminaire parts (driver mounting plate, reflector, canopy, heat sink etc.) to Protective Earth. **Always** connect the driver equipotential connector (EQUI) to Protective Earth.



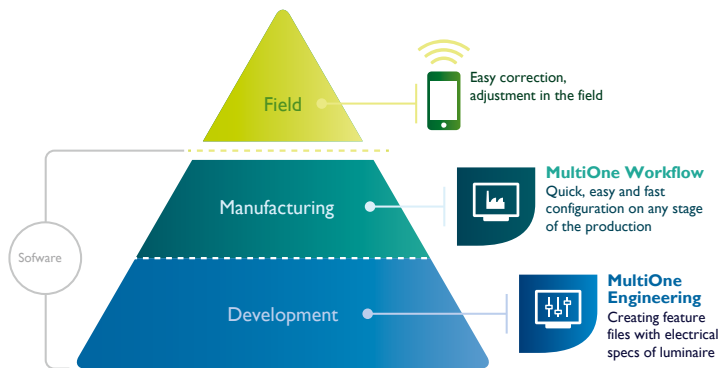
**Insulation Class II application:** use equipotential bonding wires between all large metal luminaire parts (driver mounting plate, canopy, heat sink etc.) Do not keep large metal parts electrically insulated. **Always** connect the driver equipotential connector (EQUI) for equipotential bonding.

- 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 mounting torque.

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



# Driver configuration



## Introduction

Xitanium LED Xtreme drivers offer a extensive 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 Signify, 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 SimpleSet. In the name of the driver you can see which interface is supported.

For more information on MultiOne installation – software and programming: go to [www.philips.com/multione](http://www.philips.com/multione).

# Controllability

How to configure 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](http://www.philips.com/multione). Factory default settings of driver features can be found in the driver datasheet. In this section the features will be explained in more detail.

## **Adjustable output current (AOC)**

Applicable to: Xi FP / Xi LP / Xi BP 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, ALO min.)**

Applicable to : Xi FP drivers

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 minimum 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 at 80%.

Depending on driver type, there are two ALO versions available: one version with and one without the option to set the ALO minimum level. Please check the driver datasheet to find out which ALO version is supported.

### LED Module Temperature Protection (MTP)

Applicable to: Xi FP drivers

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 section Thermal Design-In for more details on NTC type.

### Driver Temperature Limit (DTL)

Applicable to: select Xi FP and select Xi LP SI drivers

DTL supports thermal finetuning of a lighting system via configurable parameters. See section Thermal Design-in for more details. Please check the driver datasheet to check whether DTL is supported.

### Constant Light Output (CLO, CLO LITE)

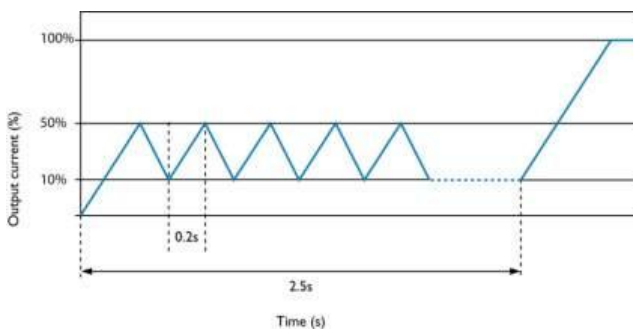
CLO: applicable to Xi FP drivers

CLO LITE: applicable to Xi LP drivers

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.



EOL flashing output current waveform

### End Of Life (EOL)

Applicable to: Xi FP drivers

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

Once active, a visual 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. See the illustration on the left.

### Adjustable Start-up Time (AST)

Applicable to: Xi FP drivers

The AST feature enables a time-adjustable gradual increase of the light level after powering up the driver, ensuring a smooth and comfortable transition from a low light level to the full light level. This ramp-up time is configurable via MultiOne software.

The initial low light level is fixed and will be either 10% of the configured AOC value or the absolute minimum output current of the driver, depending on which lower limit is reached first.



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

### DC emergency dimming operation (DCemDim)

Applicable to: Xi FP drivers

Xi FP drivers are equipped with an auto-detect DC voltage feature. As soon as a DC input voltage is detected, the driver will automatically set the output current to a predefined configurable emergency dimming level.



**Note:** during DC operation the output current cannot be set higher than 60 % of the programmed AOC value applicable during AC operation.

The driver will ignore all DALI dimming and on/off commands when operated at DC input voltage unless the checkbox "allow dimming" in the DC Emergency tab is selected. Please refer to the datasheet to find out whether the "allow dimming" feature is supported.

### Light Source Operating Hours (LSO)

Applicable to Xi FP drivers

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.

### Control interface I-10V

Applicable to: Xi LP SI drivers

I-10V dimming provides a traditional way to control the driver output current down to 10% by means of an analog current-controlled voltage source (see graph on the left). The interface is designed to comply with IEC60929 Annex E. The driver dimming interface sources a current of 150µA. The applied I-10V controller should therefore be able to sink the cumulative current sourced by the dimming interfaces of a group of connected drivers and must be of the two-quadrant type.

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

#### 0-10V linear curve:

- minimum light output at **1V**, max. light output at **8V** and above.
- minimum dim level can be set at 10 % and up in 1% increments.

#### 1-9V linear curve:

- minimum light output at **1V**, max. light output at **9V** and above.
- minimum dim level has a fixed value of 10% and cannot be modified.

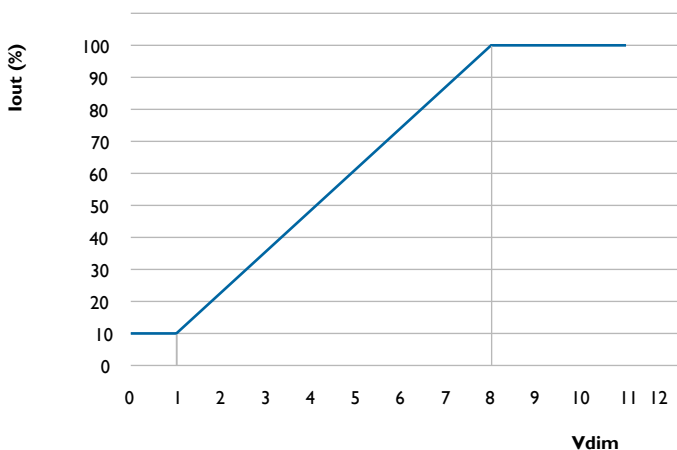
In applications with long I-10V cables there will be a voltage drop which depends on the cable length, number of connected drivers and the wire cross section in mm<sup>2</sup>. The maximum recommended voltage drop on the I-10V dimming wires is 100mV to prevent differences in light level.



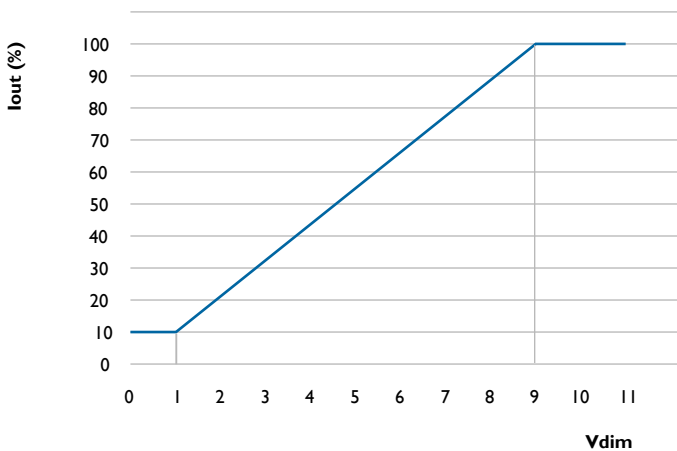
**Note:** the driver output cannot be turned off by pulling down the I-10V interface to 0V. Between 0 and 1V, the minimum light output will be maintained.



**Warning:** the driver I-10V control interface is classified as FELV and is not safe to touch! See the illustration on the next page for more details.



Output Current versus Voltage 0-10V linear dimming curve



Output Current versus Voltage 1-9V linear dimming curve

**WARNING:** FELV terminals marked “Risk of electric shock” are not safe to touch



Danger: electricity

WARNING: Circuits connected to any FELV control terminal shall be insulated for the LV supply voltage of the control gear and terminals connected to the FELV circuit shall be protected against accidental contact.

## Control interface DALI

Applicable to: Xi FP drivers

Digital Addressable Lighting Interface (DALI) is a digital communication protocol commonly used in lighting systems. This protocol is standardized by IEC and there are many control devices from Signify and other manufacturers that communicate using DALI. The voltage across DALI wires is typically 16V 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 public LED-specific DALI commands, for example: Query if the LED module is short- circuit or open-circuit.

For more information on DALI, refer to IEC62386 for more details. Specific driver DALI compliance can be looked up at the DIIA site: [www.digitalilluminationinterface.org/products](http://www.digitalilluminationinterface.org/products).



**Warning:** the driver DALI control interface is classified as FELV and is not safe to touch! See the illustration on the left for more details.



### Notes:

- 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.

- The DALI interface of the driver is not designed to handle differential-mode mains voltage. Driver damage may result if mains voltage is applied to both DALI terminals.

## DALI curve setting

The DALI dimming curve can be set to linear via MultiOne software by using the Commands tab > Commander > Configuration > Device\_Type\_6 \_Select\_Dimming\_Curve and setting DTR0 at value 1. Value 0 can be chosen for DTR0 to revert to the logarithmic dimming curve.

## LineSwitch

Applicable to: Xi FP drivers (except driver Xi FP 330W SNDAE C170)

The LineSwitch feature requires the use of an extra mains pilot line. This feature offers a dimming 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 (incl. output turn-off) can be achieved by either applying or disconnecting mains voltage to the LineSwitch driver interface. Connecting mains voltage to the LineSwitch interface will lead to a ‘High’ level (>176VAC). A ‘Low’ level (<110VAC) is obtained by disconnecting the LineSwitch interface 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.

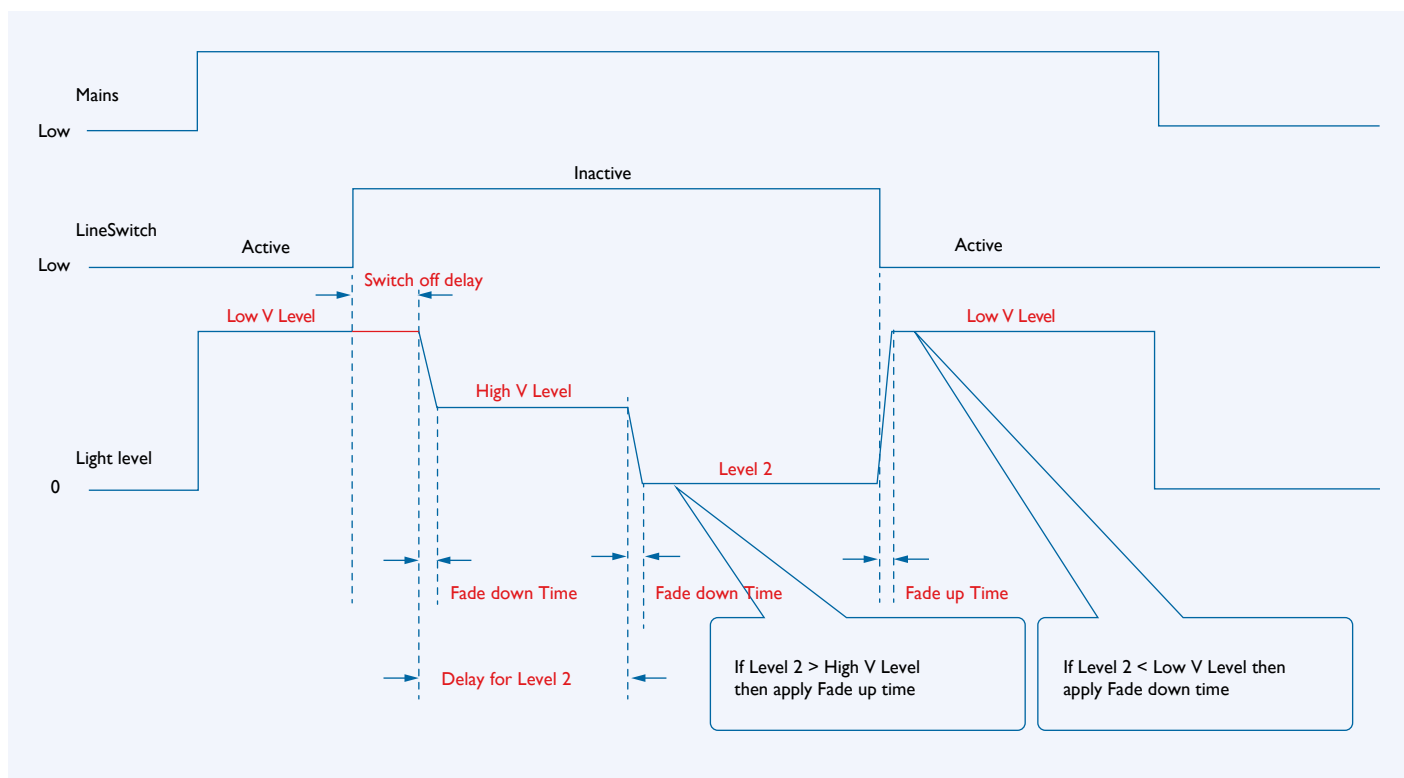
Two versions of LineSwitch are offered: single-step and 3-step.

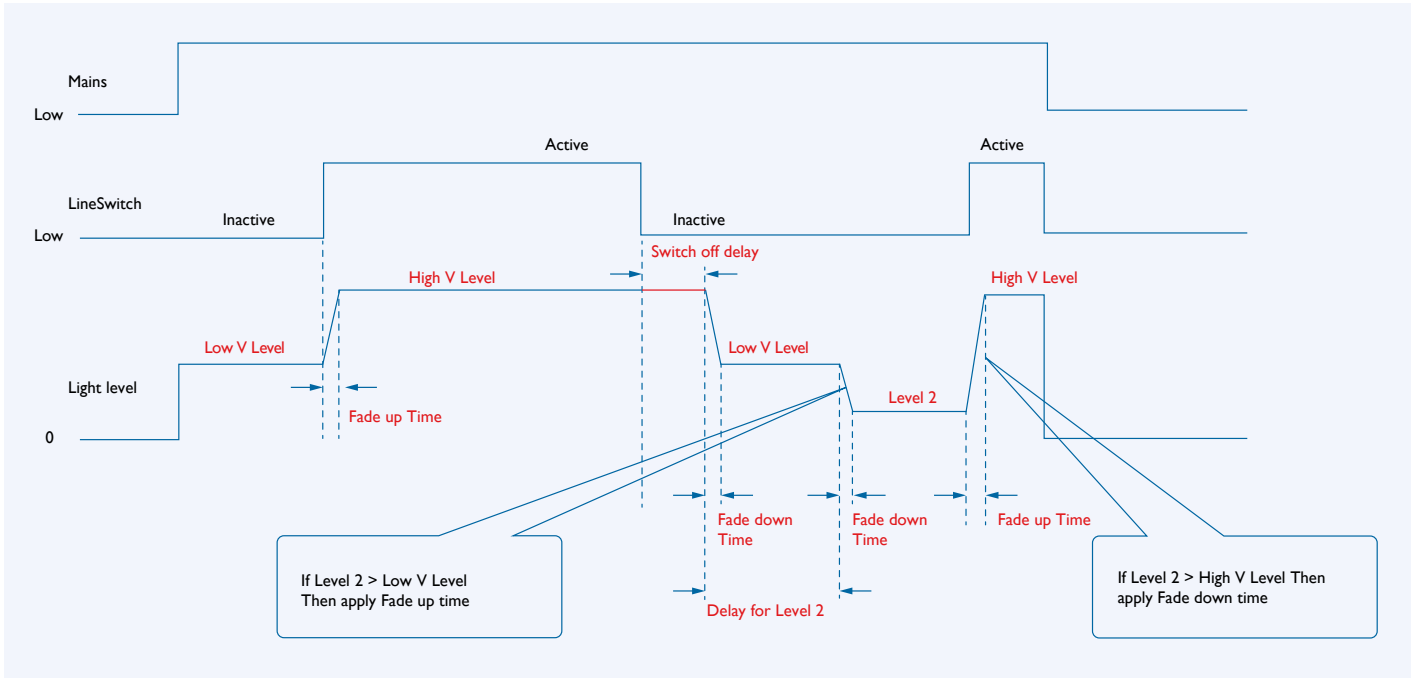
Single-step LineSwitch can provide one dimming level while the 3-step LineSwitch offers the configuration of two additional optional dimming levels plus configurable delay times. See the illustrations below for further details.



**Note:** LineSwitch is -optionally- able to override Dynadimmer operation to temporarily set the light output to another light level, e.g. in case of emergencies or other special conditions that require a different illumination level. Once the override is deactivated Dynadimmer operation will be resumed.

Please refer to the MultiOne software user manual for more details regarding the override function.





**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:

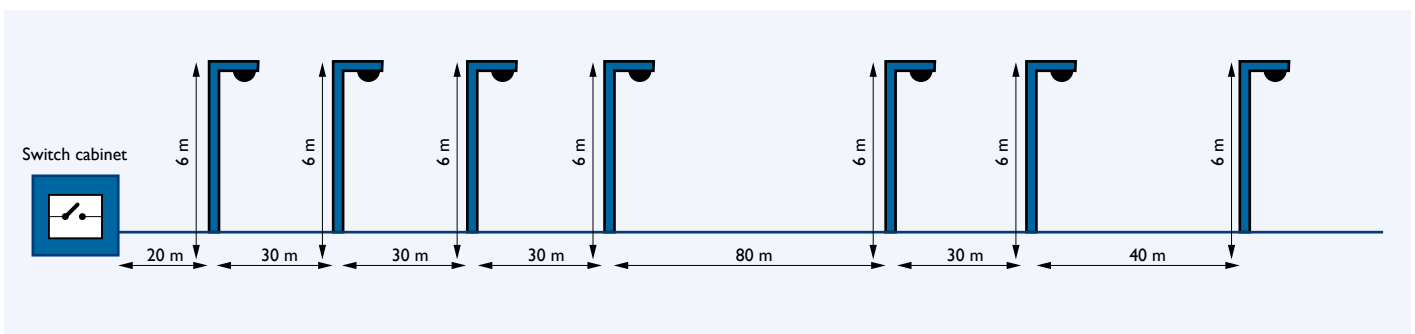
$$\frac{\sum L}{\#D} \leq 56$$

In this formula:

L = length of the cable from cabinet to the LED driver in metres

#D = number of connected drivers

Example:



$$\frac{\sum(L)}{\#D} = \frac{26 + 4(36) + 86 + 46}{7} = 43.1 < 56\text{m} : \text{OK}$$

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If the distance conditions shown above cannot be met then longer driver-to-driver distances can be realized by adding an external capacitor between the switched pilot line and neutral. This capacitor needs to have a 275VAC voltage rating or more and XI classification and should be added either in the luminaire or centrally in the switching cabinet. A capacitance value of 10nF allows for 60m extra pilot line length while a 100nF value allows for an additional 600m of length. Additional reactive power loading as a result of adding this capacitor is negligible.

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 are allowed. In general this will increase the maximum acceptable cable length.



**Warning:** LineSwitch operation is **not** supported when drivers are connected in line-line connection in a 3-phase or 2-phase grid.



## Mains voltage dimming (AmpDim)

Applicable to: Xi FP

Historically, mains voltage dimming was used on magnetic ballasts to dim conventional HPS 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 other infrastructure changes.

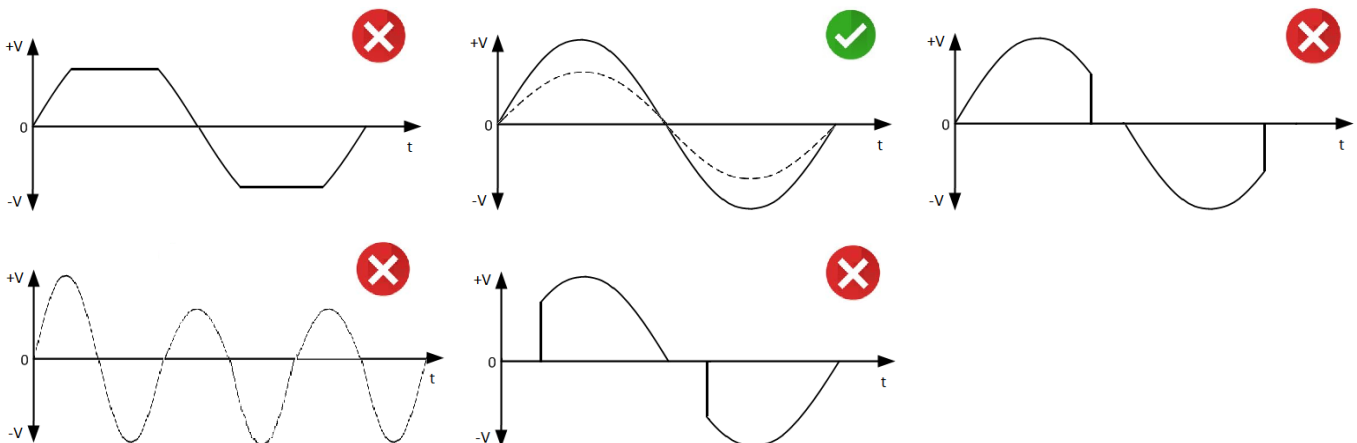
A cabinet controller signals to the driver to lower the light output via a reduction in the amplitude of the mains voltage. The intelligence embedded in the LED driver allows for a configuration of a dimming level based on the amplitude of the mains voltage.

The configurable voltage range of AmpDim is 170 ... 250VAC while the configurable light level range is 30 ... 100%. Both can be set in increments of 1V and 1% respectively.



### Notes:

- There must be a minimum of 20V difference between the mains voltage corresponding with 100% light output and the lower mains voltage corresponding with the configured minimum light output.
- The AmpDim feature only supports dimming methods based on amplitude dimming with constant amplitude reduction without sinewave waveshape modification. Phase-cut dimming and frequency modulation is not supported. See the illustrations below for details.



## Coded Mains control (CM)

Applicable to: select Xi FP drivers

The feature Coded Mains (CM) supports the acceptance of dimming as well as on/off commands by the driver sent via the power grid. The commands are transmitted by an external cabinet CM controller and sent via the grid to the drivers. The CM feature supports controlling of road & street lighting applications only; the tunnel lighting application is excluded.

The cabinet controller signals to the drivers to change the light output via special commands superimposed on mains voltage. The intelligence embedded in the LED driver allows for a configuration of multiple dimming levels as well as on/off commands based on the specific command being transmitted.

The CM feature is -just like the LineSwitch feature- able to override Dynadimmer operation, provided the checkbox named Coded Mains Scene Settings is selected (see picture on the top left). Once override has taken place the driver will remain in CM mode until the next power cycle; Dynadimmer operation will then resume until the next CM command is detected.

If communications between CM controller and drivers is lost for more than 5 minutes then the drivers will change over to 100% light level by default (fallback level). This fallback level will be maintained until a CM command is detected or until a mains power cycle occurs. After a mains cycle, the driver will resume Dynadimmer operation until a CM command is detected.

In turn, DALI is able to override the CM feature at all times. The driver will then remain in DALI mode until the next power cycle; Dynadimmer operation will then resume until the next DALI command is detected.



**Note:** Coded Mains override by LineSwitch is not supported.



**Warning:** The Coded Mains configuration shows several editable parametric fields as shown in the bottom left picture. All values in these fields are NOT to be modified and must be left alone; otherwise CM malfunctioning may result!

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## Dynadimmer

Dynadimmer: applicable to Xi FP / Xi LP drivers

The Integrated Dynadimmer is an autonomous dimming control developed by Signify that enables simple, pre-programmed customized multistep dimming. Its main function is energy reduction by reducing light levels during the night when it is not required to have full light output.

The Dynadimmer is integrated in Xitanium LED Xtreme drivers as follows:

**Xi FP:** Dynadimmer, up to five configurable steps, incl. light turn-off

**Xi LP SI:** Dynadimmer, up to five configurable steps, no light turn-off

## Override

During Dynadimmer operation the dimming interface functionalities LineSwitch / AmpDim / I-10V are ignored as far as dimming is concerned. However, override is possible in the following ways.

**Xi FP:** Dynadimmer operation is by default overruled (“override”) by DALI. 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. This kind of override allows an external luminaire controller to take over control.

LineSwitch is -optionally- able to override Dynadimmer operation to temporarily set the light output to another light level, e.g. in case of emergencies or other special conditions that require a different illumination level. Once the override is deactivated Dynadimmer operation will be resumed.

The override does not interfere with the Dynadimmer learning algorithm (see next section).

**Xi LP SI:** The Dynadimmer can be overruled to change over to full light output only by the I-10V interface as described below.

Override by the I-10V interface is possible by shorting the + and – terminals of I-10V interface by means of either an external relay contact or by pulling it down below 2V by an external controller. As soon as either the contact is opened or when the interface voltage is raised above 3.2V, the Dynadimmer will resume operation.

The override does not interfere with the Dynadimmer learning algorithm (see next section).



**Note:** simultaneous use of Dynadimmer and I-10V dimming is **not** possible. These two dimming features are mutually exclusive.

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### Dynadimmer working principle

Dynadimmer offers two options: time-based and location-based.

The time-based option does not compensate for seasonal changes and starts executing the Dynadimmer profile as soon as power is applied to the driver: after powering up the driver, the light will be dimmed after a configured time has expired. This option is best suited for applications with fixed power-on/off timing.

However, in most outdoor applications the timing will vary per season and the dimming schedule should thus be adapted accordingly. For this Signify has introduced the programmable Dynadimmer feature which simply uses the driver power-on time duration as reference (midnight based).

Based on the average power-on time of the previous periods, the driver is able to estimate the current time of day and uses this as a virtual clock time which serves as reference for the dimming schedule programmed by the user. I.e.: based on the timing that switching on the lights will happen at sunset and switching off at sunrise, the driver calculates after every night the midnight moment of the next night and sets the light level according the configured DynaDimmer scheme.

The Dynadimmer feature relies on a regular power-on time from one night to the next. Typically, the power-on time is based on sunset and sunrise and its duration will vary gradually throughout the seasons. The Dynadimmer therefore calculates the power-on time average of the five last preceding stable nights. A stable night is regarded as a night with a power-on time of at least four hours within a tolerance of one hour that equals the latest calculated average power-on time. This implies that after first installation the Dynadimmer will need three stable nights to be able to calculate the virtual clock time required for the programmed dimming schedule (learning period). During this period the Dynadimmer will not dim the light output for the first three nights.

Depending on geographical location or on the application, the switch-on time is not always evenly distributed around midnight. To be able compensate for the difference in sunrise and sunset over a time zone, the user can set his geographical location in both western or eastern direction.

The midnight shift is needed to indicate the position of the light point in the time zone; this is related that over a time zone the sunrise will be earlier in the East and later in the West. To synchronize with the time in the time zone it is needed to determine the offset in minutes. In the MultiOne program a calculator is included to calculate the offset.

Example:

Warsaw 52.2297° N, 21.0122°E -46 minutes (- is earlier)

Berlin 52.5200° N, 13.4050°E -20 minutes

Madrid 52.5200° N, 13.4050°E +19 minutes

The midnight shift option is of course not available when the Time based option has been selected.

Since the frequency of the power grid is used the accuracy of timing is very high and is typically far within 1%. Nearby luminaires connected on the same on/off cycle and programmed with the same Dynadimmer schedule will dim down and up simultaneously.

In normal operation mode (after the learning phase) the Dynadimmer will handle maintenance or short power interruption in correct ways, thus preventing dimming schedule disruptions.

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### Dynadimmer attention points

If after the learning period the change in power-on time is more than one hour then the driver does not need three new power-on cycles for re-learning. Instead, the driver looks further back in the history of previous power-on cycles to calculate the virtual clock time. As long as there are three stable power-on cycles in the history of the last five power-on cycles, with all three three having the same duration (i.e. less than one hour difference) the driver will still dim as scheduled. This mechanism will prevent disruption of the Dynadimmer dimming behavior due to occasional mains black- and brownouts.

If the difference in power-on time duration is less than one hour then this will represent normal operation in which the driver will average the last three power-on times as reference to calculate the virtual clock time. The dimming schedule will stay active while gradually adapting to the new power-on time. Below examples show the sequence of events as the on-time changes.

#### Influence of mains interruption (blackout):

If the mains voltage drops to zero for more than one second then the driver will record this as a power-off event and will try to re-calculate the virtual clock time again when power is restored. This only means that the driver will need to synchronize to the regular power-on time duration (see previous section). If the duration of a mains voltage drop to 0V is less than one second then the Dynadimmer operation will continue and the Dynadimmer dimming cycle remains unaffected.

#### Influence of mains voltage dip (brownout):

The driver is robust enough to handle a mains voltage dip down to 25VAC for one minute without disruption of the Dynadimmer timing. Light output will be less and may even drop to zero for the duration of the mains dip but the dimming schedule will not be affected.

#### Temporary mains power-off (maintenance at night, blackout):

If the power outage occurs within the first 4 hours of the night then a new night will be calculated on the remaining on-time. For the next night, the average on-time before the outage will be used as reference. Hence, it won't affect the dimming duration of the next night and regular dimming will result. If the power outage takes place after more than four hours and not closer than at least one hour before the expected end of the night then this deviating on-time will be taken into account to calculate the average power-on time of the five preceding nights. However, it won't affect the dimming duration of the next night. If the outage takes place within one hour before the expected end of the night then this deviating power-on time will be taken into account as a valid night to calculate the average power-on time of the three preceding nights. This will then temporarily affect the dimming behavior.

#### Temporary mains power-on (maintenance during the day):

If the power-on time is less than four hours then this deviating power-on time will be ignored and the average power-on time before the deviation will be used as reference. Hence, it won't affect the dimming duration of the next night. If the power-on time is more than four hours and at least one hour less than the average power-on time of the three preceding nights then this deviating power-on time will be taken into account to calculate the average on-time of the five preceding nights. However, it won't affect the dimming duration of the next night.

### Frequently asked questions:

Q: When should a customer choose the time-based Dynadimmer and when the location-based Dynadimmer?

A: The time-based version is the best choice for tropical regions (limited seasonal differences). This version offers the possibility to directly set the dimming scene without the need for a three-night learning period.

Q: Does the Dynadimmer “know” when daylight savings time is started in the fall and ended in spring?

A: No, the driver doesn't include a DST feature, therefore timing will be an average over summer/winter time.

Q: What exactly does the Daylight Saving checkbox do in the MultiOne Dynadimmer screen?

A: This box allows the user to calculate offset in summer and winter in order to find a good compromise based on that offset.

Q: What is the accuracy of the Dynadimmer in relation to the programmed dimming times?

A: Between poles the difference is limited ( $< 1s$ ). Because timing is a compromise over summer and wintertime, the so-called analemma and the accuracy of the geographical position, the accuracy over the year is typically  $\pm 45$  minutes related to actual local clock. If accurate timing is needed then it is recommended to use our EasyAir SNO sensor which is based on Astroclock via GPS satellites. Achieved accuracy will then be  $< 5s$ .

Q: When in learning mode: what will be the light level?

A: In learning mode (3 nights) the light output will be 100%.

Q: Can the Dynadimmer function be reset to factory defaults?

A: No, there is no such reset option. However, the Dynadimmer will adapt itself based on changes in power-on time.

Q: Is it possible to program a dimming level in % not supported by the driver without getting a warning?

A: If the light level in the dimming schedule is below the physical minimum level of the selected system then the physical minimum level will be used. When configured to 0% however, the light will go off.

Q: Does the Dynadimmer provide time-editable fade-up and fade-down transitions?

A: Yes, the maximum time is 180 sec and the minimum time is 0 sec.

Q: How does the Dynadimmer respond when there is a power outage during the night?

A: Depending on the outage duration the Dynadimmer learning algorithm will try to continue with the dimming scheme.

Q: How does the Dynadimmer respond when the drivers are powered up during the day for servicing?

A: When powering at daytime it will follow the configured dimming scheme but will be recognized this as an unstable night and ignored by the algorithm for upcoming nights. See further above.



- **Notes:**

The Dynadimmer feature does **not** support 24h applications (e.g. tunnels, warehouses). A power off/on cycle is required every 24 hours.

- Dynadimmer operation is **not** supported when the driver is operated on a DC grid.

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### Output current dependencies

The actual output current in the application depends on configuration of those driver features which influence output current and which are enabled or activated, like ALO, CLO, DALI level, MTP, DTL, Dynadimmer, DCemDim and LineSwitch.

The reference for output current is defined by the configured AOC value in mA. The actual output current then follows the values as configured for the several enabled features.

In formula, the actual output current is:

$AOC \times ALO \times CLO \times \text{Dynadimmer} \times (\text{MTP and/or DTL})$

$AOC \times ALO \times CLO \times \text{DALI level} \times (\text{MTP and/or DTL})$

$AOC \times ALO \times CLO \times \text{LineSwitch} \times (\text{MTP and/or DTL})$

#### Example 1:

Driver AOC = 700mA, CLO = 70%, Dynadimmer level = 50% and ALO = 80% and driver Tc is such that DTL dictates 50% dimming. Actual output current is then 98mA or minimum specified driver output current, whichever value is reached first.

#### Example 2:

Driver AOC = 500mA, CLO = 80%, DALI command = 242 (70%). Actual output current is then 280mA.

#### Example 3:

Driver AOC = 1000mA. ALO = 70%, LineSwitch High V level = 50%. Actual output current is then 350mA.

The following applies for DCemDim-equipped drivers while running on DC input voltage:

Actual output current = rated AOC x 0.6 (max).

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### **OEM Write Protection (OWP)**

Applicable to: Xi BP and select Xi FP / Xi LP drivers

By enabling the OWP feature the OEM can prevent unauthorized changes of crucial driver settings. The OWP feature is based on password protection that will be set in the driver so the preconfigured data of OEM write-protected driver features can only be modified by providing the correct password. Depending on the type of driver the OEM can protect the following:

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

How to program this feature is described in the user manual of MultiOne Engineering at [www.philips.com/multione](http://www.philips.com/multione).

The password is needed to change the protected features of this driver. Without the password these features cannot be modified.

Encrypted in the feature file, the password can be easily 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 a lost password, the OEM is advised to contact the local Signify representative.

Please consult the driver datasheet whether OWP is supported.



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# 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 [www.philips.com/technology](http://www.philips.com/technology). For further questions please contact your local Signify sales representative.

## System Disposal

We recommend that the Xitanium LED drivers and its components are disposed of in an appropriate way at the end of their (economic) lifetime. The drivers are in effect normal pieces of electronic equipment containing components that are currently not considered to be harmful to the environment. We therefore recommend that these parts are disposed of as normal electronic waste, in accordance with local regulations.

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# Disclaimer

Note that the information provided in this document is subject to change at any time without prior notice.

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