PHILIPS

Xitanium

LED Xtreme driver

Design-in Guide

Reliable Xtreme technology for demanding LED applications

June 2015

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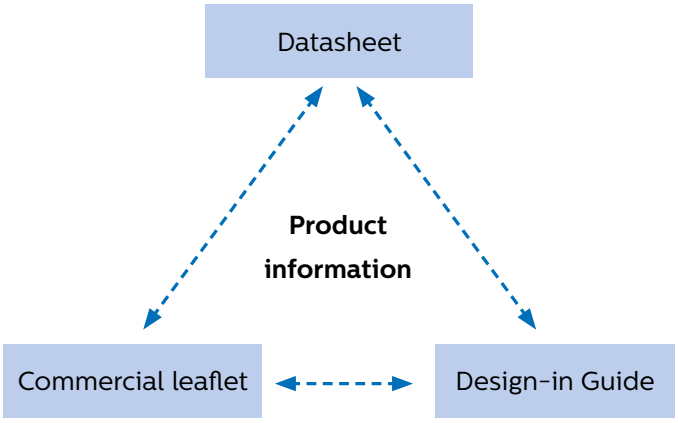


Thank you for choosing the Philips Xitanium Xtreme drivers. In this guide you will find the information needed to integrate these drivers into a LED luminaire or LED system.

This edition describes the Xitanium LED Xtreme drivers. We advise you to consult our websites for the latest up-to-date information.

Applications

The Xitanium LED Xtreme drivers are designed to operate LED solutions for outdoor and industrial lighting, like roads, streets and highbay applications. If you use Philips LED drivers in combination with Philips LED modules, specific design-in guides are available from the below mentioned technology websites.

Information and support

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

Design-in support

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

Document overview

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

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

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

Warnings and instructions

Warning:

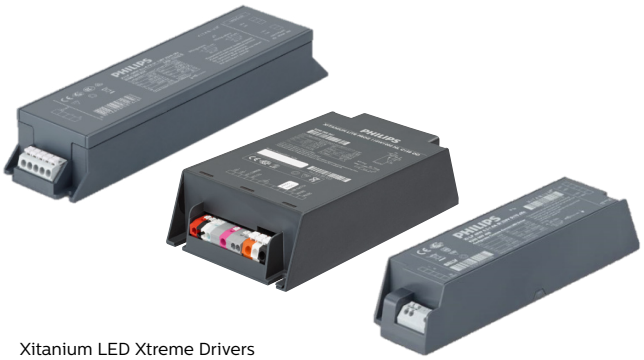
- Avoid touching live parts!
- Do not use drivers with damaged housing and/ or connectors!
- Do not use drivers with damaged wiring!

Safety warnings and installation instructions

- Do not use damaged products
- The luminaire manufacturer is responsible for his own luminaire design and has to comply with all relevant safety standards
- The Xitanium LED Xtreme drivers are for build-in use only and must not be exposed to the elements such as snow, water and ice. It is the luminaire manufacturer's responsibility to prevent exposure.
- Do not service the driver when the mains voltage is connected, this includes connecting or disconnecting the LED module.
- Please provide adequate earth or equipotential connections whenever possible or applicable.

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

Introduction to Xitanium LED Xtreme drivers



Xitanium LED Xtreme Drivers

Introduction

Xitanium LED Xtreme drivers are designed to operate LED solutions for general lighting applications such as street, road and highbay lighting.
In the coming years LEDs will continue to increase in efficiency, creating generation and complexity challenges for OEMs. With Xitanium LED Xtreme drivers, flexibility in luminaire design is assured thanks to an adjustable output current. Application-oriented operating windows offer the flexibility required to provide the stable lumen output and light quality levels that lighting specifiers and architects demand. The adjustable output current also enables operation of various LED PCB solutions from different manufacturers.

Xitanium LED Xtreme driver versions

The Xitanium LED Xtreme drivers described in this guide are available in two different versions: FULL Prog and LITE Prog. These drivers come in a wide range of power ratings that enable the most popular light output levels for general outdoor and highbayapplications. We recommend you always check our Xitanium LED Xtreme driver leaflet for the most up-to-date overview of our range. This leaflet can be found on the www.philips.com/technology website.

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

Features

SimpleSet®

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

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

Adjustable Output Current (AOC)

Flexibility in luminaire design is ensured by the adjustable output current (AOC). The adjustable output current enables operation of various LED configurations from different LED manufacturers whilst also ensuring the solution remains “future proof” for new LED generations. The output current can configured with the Philips MultiOne Software and the SimpleSet® interface. More information about AOC and how to set the output current can be found in the chapter “Electrical design-in”. Information about configuring drivers with SimpleSet® can be found in the chapter “Configurability”.

Amplitude Modulation (AM) output dimming

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

Module Temperature Protection

Protection of LED modules is possible by integrating a NTC (negative thermal coefficient) component in the LED PCB. More details about the NTC resistor can be found in the Chapter “Thermal design-in”. Please check the datasheet at www.philips.com/technology to know more about the selected driver.

Controllability

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

- DALI
- 1-10V
- LineSwitch

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

Hot wiring

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

DC mains operation

It is possible to connect the mains side of the Xitanium LED Xtreme drivers to a DC power grid (e.g. central emergency system). The behaviour when switched to DC voltage can be programmed via SimpleSet

Constant Light Output (CLO, programmable drivers only)

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

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

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

Driver diagnostics

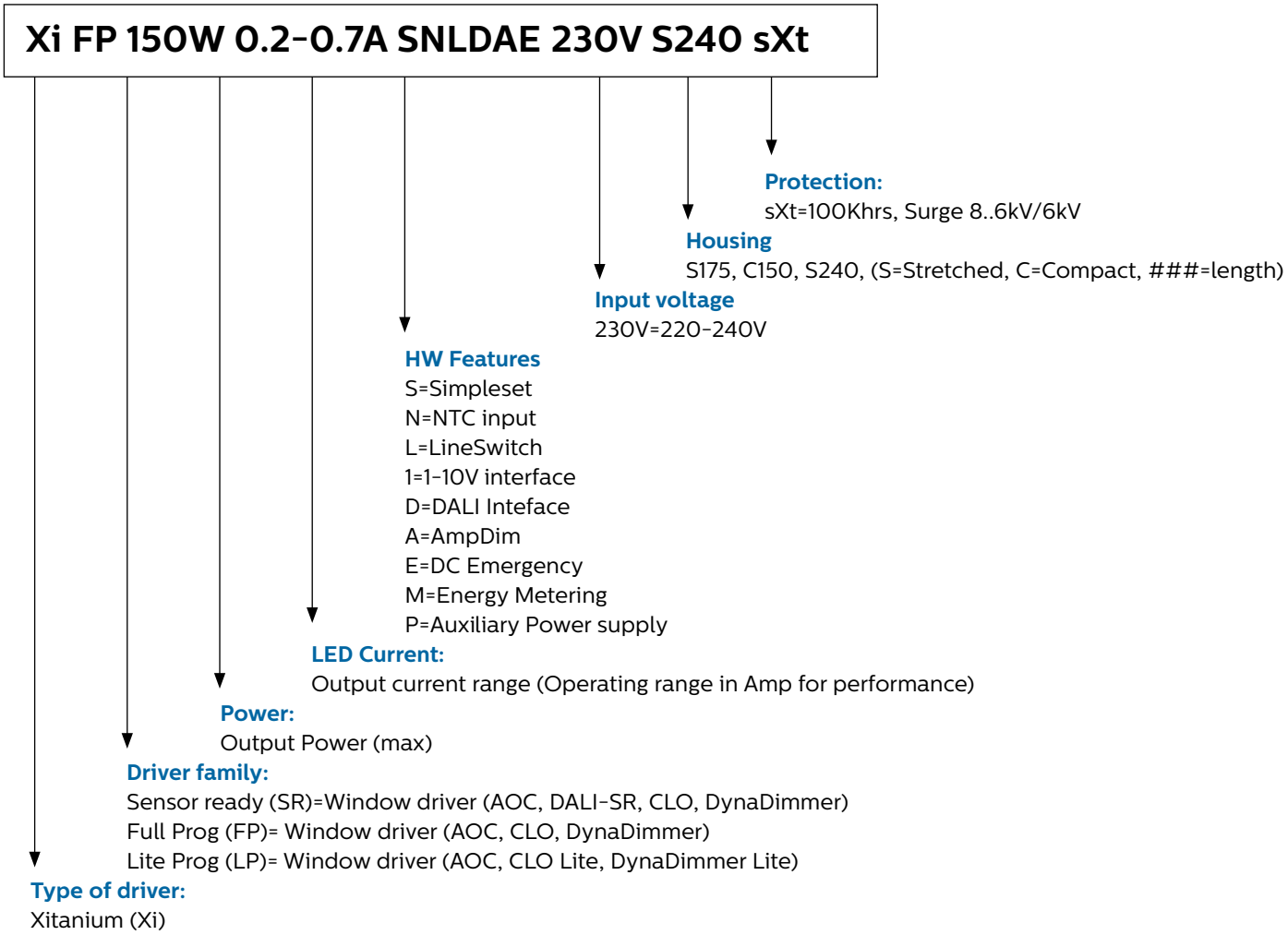
On selected Xitanium Xtreme drivers the diagnostics functionality is available. The purpose of Diagnostics is to gather information and help diagnose the history of the driver and connected LED module. The Diagnostics feature consist mainly of counters which keep track of specific variables like the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

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

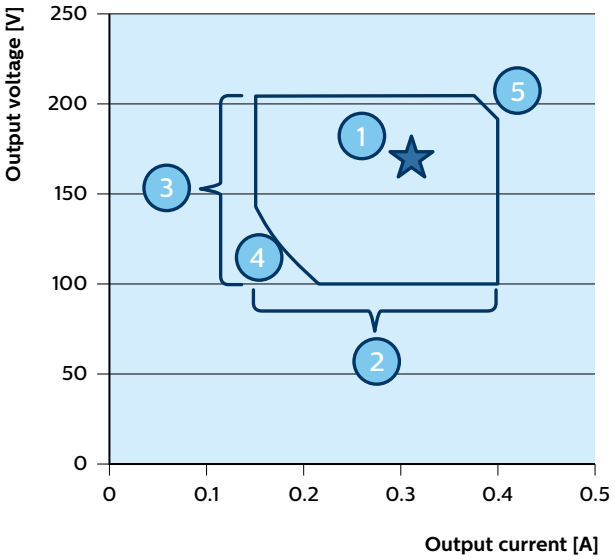
Form factors
Xitanium LED Xtreme drivers are available in several different housing dimensions. The specific dimensions can be found in the driver datasheet at www.philips.com/technology.

Naming of the drivers: example

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



Electrical design-in



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

Example Operating window of a Xitanium driver

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

Xitanium Driver Operating window

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

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

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

1. Drivers with SimpleSet® functionality can be configured using the Philips MultiOne software and SimpleSet® interface.
2. DALI driver versions can be programmed both via SimpleSet and DALI interface. More information can be obtained at www.philips.com/multiOne.

To Select an Appropriate Driver

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

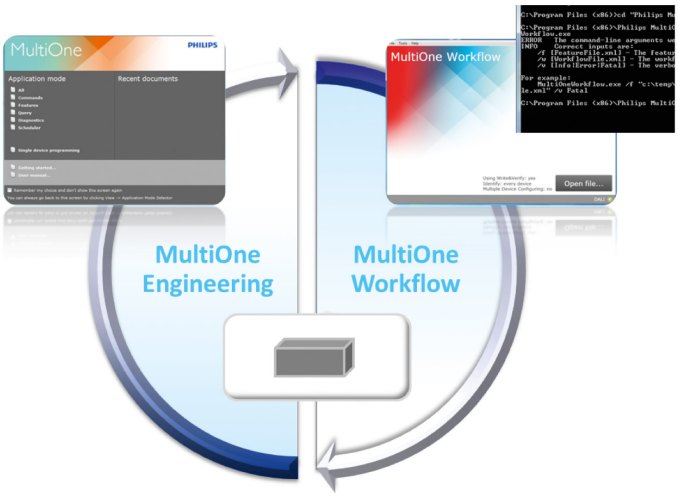
1. Determine your required driver current (Idrive) and voltage (Vf)
2. Calculate the required power (Pdrive) where Pdrive = Vf x Idrive (W)
3. Select the datasheets from the website mentioned above based on the driver having a higher power than required.
4. Does the required current fit the current range of the driver? The current range of the driver can be seen in the name itself. For example, for driver Xi 75W LP 0.2 – 0.7A S1 230V S240 sXt, the minimum programmable driver current is 0.2 A and maximum is 0.7 A.
   • Idriver min ≤ Idrive ≤ Idriver max?
5. Does the required voltage fit the voltage range of the driver? The exact value can be found in in the datasheet.
   • Vdriver min ≤ Vf ≤ Vdriver max?
6. Does the required power fit the power range of the driver? In the naming of the driver, you can see the maximum possible output power. For example, for driver Xi 150W LP 0.3-1.0A SL 230V S240 sXt, the maximum output power is 150W.
   • Pdriver min ≤ Pdrive ≤ Pdriver max?
7. Choose your preferred dimming. Please refer to the section about naming of the drivers to know what the naming tells you about the possibilities.

Connectors

Push-in connectors are used on the Philips Xitanium Xtreme drivers. More info about connectivity (wiring diagram, wire diameters, strip length) can be found in the driver datasheet. The datasheets of each driver can be downloaded via www.philips.com/technology.

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

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



Programming the output current

The Xitanium Xtreme drivers offer a full range of controls, enabling customizable luminaire design and performance. It is possible to control light output levels, preset dimming protocols and set system specifications in the factory and even in the complete installations.
This can be done with the Philips MultiOne configurator. The MultiOne configurator is an intuitive tool that unlocks the full potential of all programmable drivers from Philips, ensuring that the driver performance matches the needs of the lighting solution. It offers unprecedented flexibility, before, during and after the product installation.
Programming of new Xitanium Xtreme drivers can be done by both the DALI interface (when present) or via the SimpleSet. In the name of the driver you can see which interface is supported.
For more information on MultiOne go to the chapter Configurability or visit:
www.philips.com/multiOne
This site contains detailed information on how to install the software and how to program the driver.

Mains voltage fluctuations

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

This includes overvoltage due to malfunction such as loose Neutral wire.

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

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

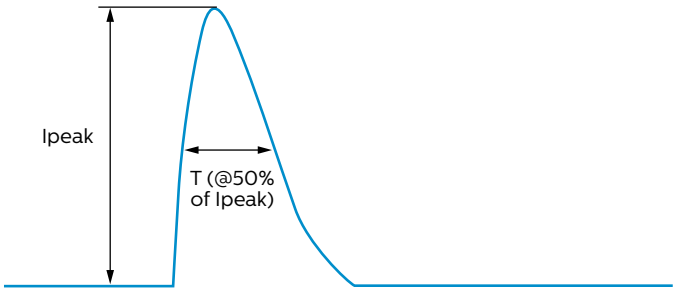
The LineSwitch input is designed to be controlled via the same phase as the input voltage but also a different phase can be used.

Low mains voltage

Xitanium Xtreme drivers are designed to operate within the normal voltage input down to 198V.
When lower input voltage can be expected it is advised to enable AmpDim. This feature in the Full Prog drivers can be programmed to limit the output power when the input voltage drops below this lower limit and protects the driver against overheating.

High mains voltage

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



Graphical representation of inrush current

DC, DCemDIM and Emergency operation

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

When operated on DC input voltage, an external EMI filter may be required, depending on the actual input voltage and output loading in order to achieve CISPR15 EMC compliance. Use of an external DC rated fuse inside the luminaire will be required.

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

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

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

Inrush current

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

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

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

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

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

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

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

To Determine the Number of Drivers on a MCB

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

Notes:

1. Data is based on a mains supply with an impedance of 200 mΩ + 400uH (equal to 15 m of 2.5mm^2 cables and another 20 m to the middle of the power distribution) in the worst-case scenario. With an impedance of 800 mΩ the number of drivers can be increased by 10%.
2. Measurements will be verified in real installations; data is therefore subject to change.
3. In some cases the maximum number of drivers is not determined by the MCB but by the maximum electrical load of the installation.
4. Note that the maximum number of drivers is given when these are all switched on at the same time, e.g. by a central relay.
5. Measurements have been carried out on a single-pole MCB. For multiple MCBs it is advisable to reduce the number of drivers by 20%.
6. The maximum number of drivers that can be connected to one 30 mA Residential Current Detector is 30.

Surge immunity

The Xitanium Xtreme drivers have increased differential mode and common mode surge immunity levels which by far surpass the limits as defined by IEC. Depending on the local conditions, additional protection against excessive high surge voltages may be required by adding an external Surge Protection Device in the luminaire and/or at installation level. The actual immunity level can differ per driver and can be found in the driver's datasheet in the download section on www.philips.com/technology.

Touch current

The Xitanium LED Xtreme drivers are designed to meet touch current requirements per IEC 61347-1 standard. The specified maximum values are < 0.7 mA peak. The test is done on driver-only level.

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.

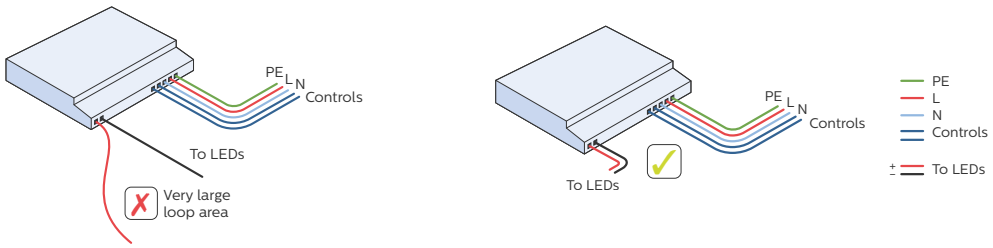
Electromagnetic compatibility (EMC)

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

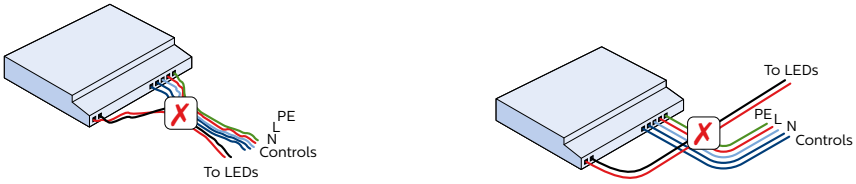
Improvement in EMC Performance

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

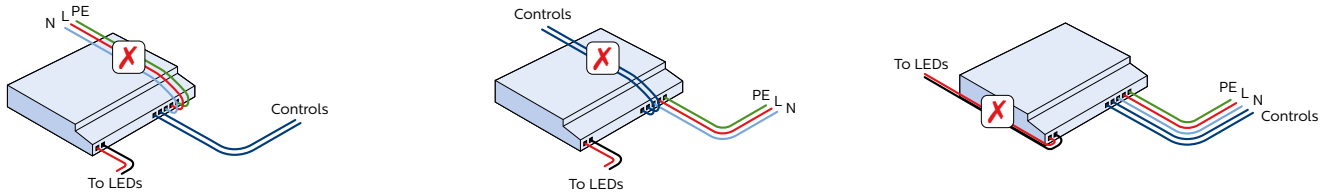
- Minimize the differential mode loop area of the lamp wires going from the driver to the light source by keeping the wires close together (bundling). This will minimize the magnetic field and reduce the radiated EMI.



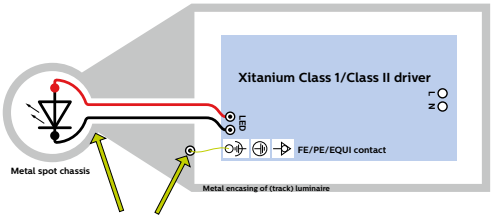
- Minimize the common mode parasitic capacitance of the output wiring + light source to earth by keeping the length of the wires between driver and LED module as short as possible. Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and control wires(DALI,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



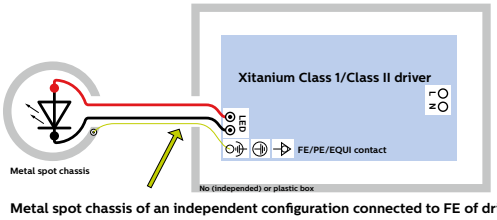
- Do not route any wiring over and/or along the driver enclosure to avoid any coupling/crosstalk with internal components of the driver.



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



Luminaire housing connected to FE/PE/EQUI contact of driver



Metal spot chassis of an independent configuration connected to FE of driver

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

Remote mounting and EMC

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

Philips has successfully performed EMC tests for systems with a output cable length of 60cm. For longer cables (e.g. in case of remote mounting) it is advised to repeat these tests.

Electrical insulation

Driver insulation classifications between the several inputs and output can be found in the driver datasheet.

Configurability

MultiOne Interface USB2DALI

MultiOne SimpleSet® interface

Introduction

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

The characteristics of the MultiOne configurator are:

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

This configurator consists of:

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

Philips MultiOne Interface tool

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

1. LCN8600/00 MultiOne Interface USB2DALI

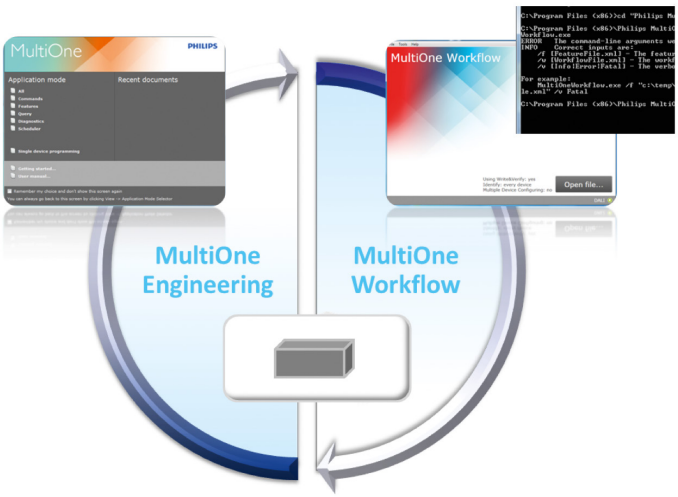
The interface that can be used with the MultiOne PC software to commission, configure, diagnose drivers via the DALI interface

2. LCN9600 MultiOne SimpleSet® interface

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

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

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



Philips MultiOne Software

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

1. MultiOne Engineering

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

- DALI commands, scheduler.
- SimpleSet®.

2. MultiOne Workflow

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

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

System requirements

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

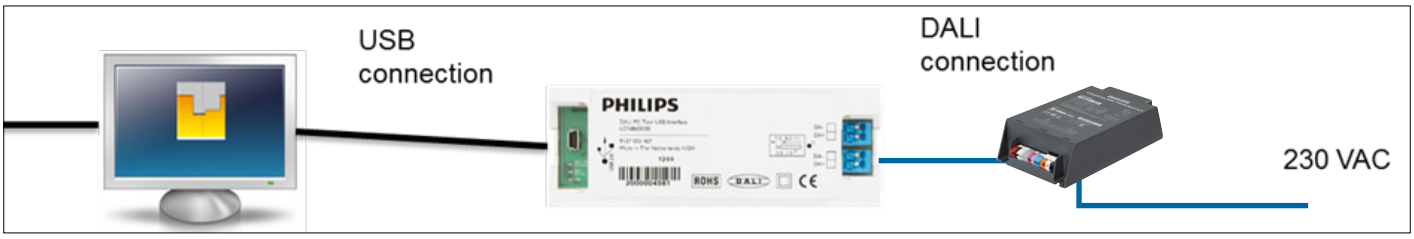
- Windows PC or Laptop
- Microsoft Windows XP + SP3 or Windows 7, Windows 8.0, Windows 8.1
- USB 2.0 ports (preferable two free ports)
- Min 35 MB of free disk space
- Microsoft.NET Framework 3.5 SP1 (!)

Getting Started

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

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

MultiOne System



Settings

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

More information of using Multione

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

- All interface tools with order codes
- Software free to download
- All manuals; getting started; Simpleset explained; intructions manuals

Thermal design-in

Introduction

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

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

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

Case Temperature Point (Tc point)

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the driver remains within its rating.

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

To measure Tc at the Tc point

The temperature can be measured using a thermocouple that is firmly glued to the driver housing. For a representative measurement the temperature must be stable before any reliable data can be obtained (typically > 3 hours).

Relation between Tc and ambient temperature

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

Module Temperature Protection (MTP)

NTC and thermal design

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

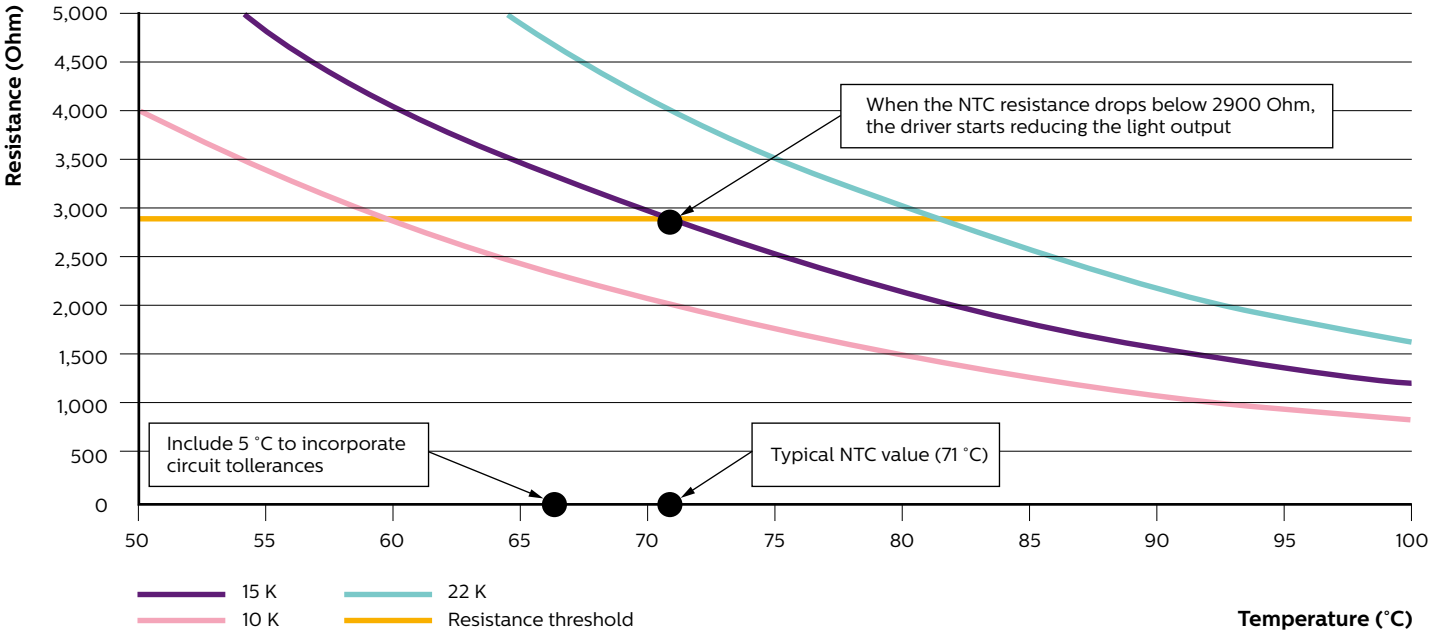
1. 15 k NTC - Vishay 15 kOhm ±2% NTC, B25/85 = 3700, 2381 615 54153
2. 15 k NTC - Murata 15 k, Part number NCP15XW153E03RC (with a separate 390 ohms resistor in series with the NTC)

Setting MTP behavior (programmable drivers only)

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

Setting the thermal de-rating point via NTC

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



Controllability

Amplitude Modulation (AM) output dimming

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

Control characteristics

Control input

1-10 V

This is the traditional way of dimming a driver based on dimming voltage, in 1% increments. Note that the 100% level is determined by the max output current level. The minimum current that can be supplied by the driver is specified in the datasheet.

1-10 V is only supported by the Xitanium Xtreme LITE Prog LED drivers.

It provides a way to control the output by means of an analog current-controlled voltage source. The interface is designed to comply with IEC60929 Annex 'Control by DC Voltage' (1-10 V).

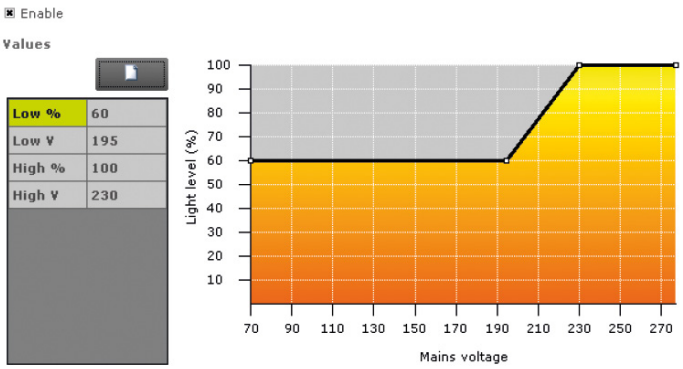
DALI

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

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

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

Note: Xitanium Xtreme FULL Prog LED drivers are by default configured to have Line-switch interface as the 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 mext mains cycle. However, in order to obtain full DALI compatibility it is highly recommended to *disable* Line-switch through the MultiOne configurator.



AmpDim

LineSwitch

The LineSwitch feature requires the use of an extra mains pilot line. This is a one-step 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 can be achieved by either applying or disconnecting mains voltage to the LineSwitch driver input.

Connecting mains voltage to the LineSwitch input will lead to a 'High' level of LineSwitch. A 'Low' level of LineSwitch is obtained through disconnecting the LineSwitch input from mains voltage.

Xitanium LED Xtreme drivers are by default programmed with LineSwitch enabled, where the 'High' level is defined as active (due to the light level being lower than the level defined in the disconnected 'Low' state). All parameters of LineSwitch can be programmed via the MultiOne configurator. Settings are effective after a power cycle of the driver.

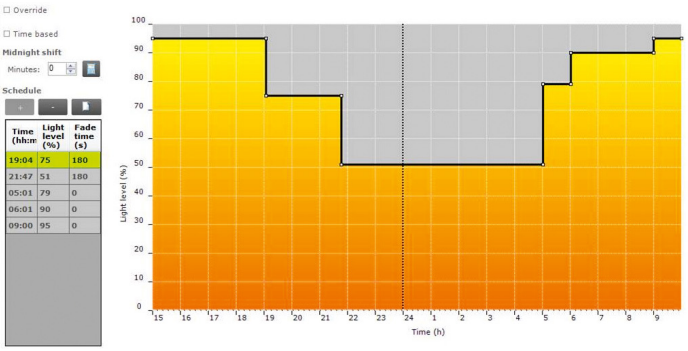
Note: LineSwitch is able to 'override' the Dynadimmer/ Dynadimmer LITE profile to temporarily set the output to 100%, e.g. in case of emergencies.

AmpDim

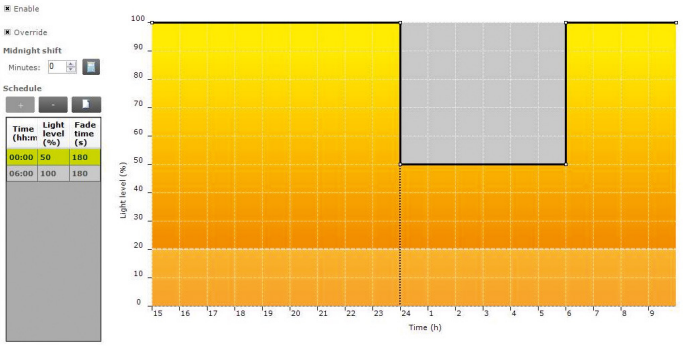
Historically mains dimming was used on magnetic ballasts to dim conventional lamps. By lowering the mains voltage, a proportionate reduction in light output was achieved. Until now electronic ballasts were not able to replicate this function. AmpDim enables cabinet based dimming without the need for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

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

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



Dynadimmer



Dynadimmer LITE

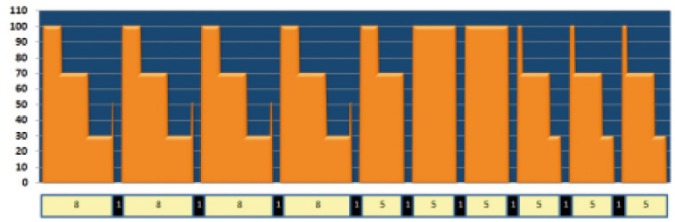
Programming note

- There needs to be a minimum of 20 V difference between Start and Stop Voltage settings when programming the driver.
- There must be a minimum delta of 5 V in the mains voltage before the driver starts dimming. This prevents accidental dimming due to small fluctuations in the mains voltage. Please refer to Figure 28 for complete parameters.

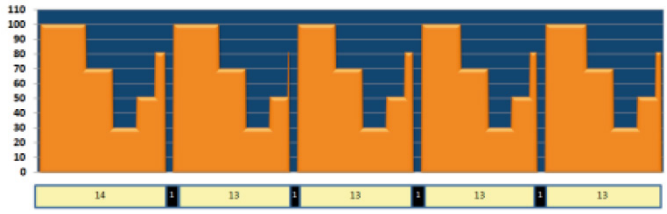
Dynadimmer and Dynadimmer LITE

Dynadimmer: applicable to FULL Prog drivers
Dynadimmer LITE: applicable to LITE Prog drivers

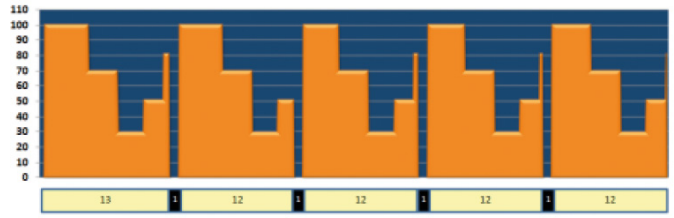
The Integrated Dynadimmer is a dimming control developed by Philips that enables a simple, pre-programmed multistep dimming. Main function is energy reduction by reducing light during the night when it is not required to have full light output. This function is integrated in the features of Xitanium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



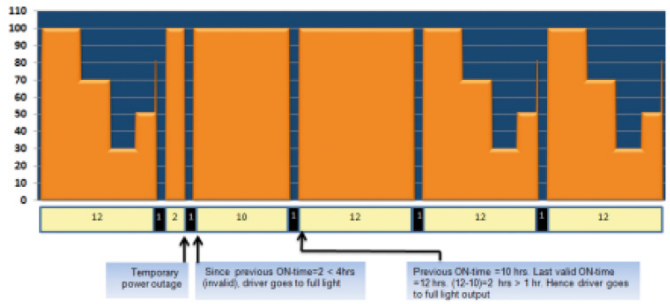
Change in ON-time duration > 1 hour



Dimmig scene setting when ON-time changes from 14 hours to 13 hours



Dimming scene setting when ON-time changes from 13 hours to 12 hours



Temporary power outage or mains power interruption for maintenance

Integrated Dynadimmer settings

Synchronising changes to ON-Time duration

There are two possibilities when there is a change in ON-time duration between successive dimming cycles. Following are two examples.

Settings change: More than 1 hr difference

When the change in ON-time is greater than 1 hour: Similar to the learning mode explained in Figure 6, the driver will need 3 cycles to learn the new ON-time duration and synchronize with Dynadim schedule setting. Figure 36 shows this scenario, where the ON-time cycle changes from 8 hours to 5 hours (8-5= 3 > 1 hour).

Settings change: Less than 1 hr difference

When the change in ON-time duration is less than or equal to 1 hour: This represents normal operation, wherein the driver averages the last 3 ON-times and calculates the virtual clock time. The dimming schedule stays active while gradually adapting to the new ON-time. Figure 37 and 38 show the sequence of events as the ON-time changes from 14 to 13, and finally 12 hours.

Input mains power interruption

If the input mains voltage drops to zero for more than 1 second, the driver will record it as a turn OFF event and will try to re-calculate the virtual clock time again when mains power is restored. This only means that the driver will need to synchronize to regular ON-time duration. (See previous section - Synchronization to change in ON-time duration).

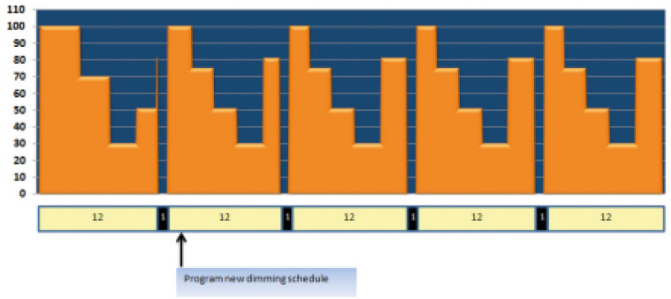
On the other hand, if the duration of a mains voltage drop to 0V is less than 1 second, energy to sustain the microcontroller operation within the driver is not lost and hence the Dynadim dimming cycle remains unaffected.

Input mains power dip

The driver is robust enough to handle an input mains voltage dip to 25 V for 1 minute. Light output will reduce for the duration of the mains dip, but the dimming cycle will not be affected.

Input Mains Power OFF for maintenance or temporary power outage

This scenario is illustrated in Figure 39. The driver will go to full 100% light output for the subsequent cycle after a power outage and then continue with regular dimming schedule.



Programming new Dynadimmer schedule

Programming a new dimming schedule

A new dimming schedule can be programmed any time the driver is powered ON. The new dimming schedule takes effect immediately after programming (Figure 40).

Integrated Dynadimmer allows dimming to predefined light levels based on the nightly operating time. With flexibility in setting time and light levels, the user can configure the driver for specific locations and application needs.
It is possible to set up to 5 dim levels (LITE: 2 levels) including 0% and up to 5 time intervals (LITE: 2 intervals). The driver does not have a real time clock. Instead it runs a virtual clock, determined by the length of nightly operating hours.
After 3 valid ON-OFF cycles, the driver will calculate the virtual clock time. A valid cycle is defined as a period during which the driver operates continuously for ≥4 hours to ≤24 hours and where the time difference between consecutive ON-OFF cycles is less than 1 hour.

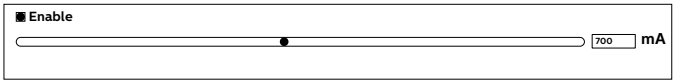
All parameters of Dynadimmer can be programmed via the MultiOne configurator.

Features

Adjustable output current (AOC)

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. When AOC is disabled, the driver's nominal output current will be applied.

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

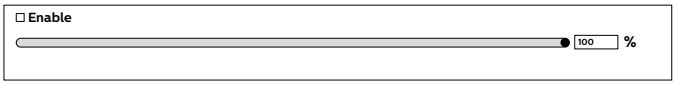


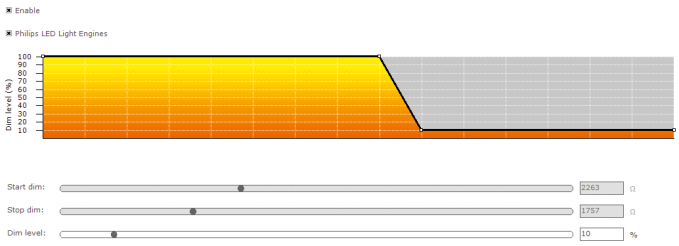
Adjustable Light Output (ALO)

Applicable to : FULL Prog drivers only

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.

This feature is disabled by default.





MTP

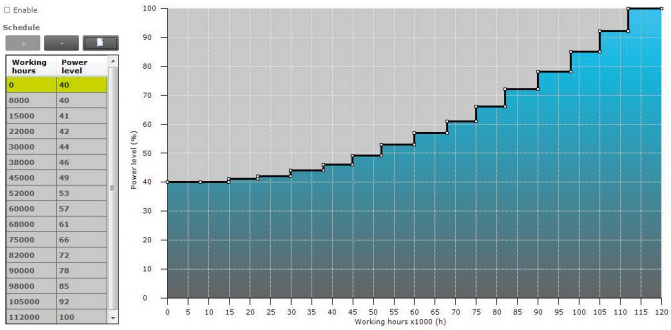
Module Temperature Protection (MTP)

Applicable to : FULL Prog drivers only

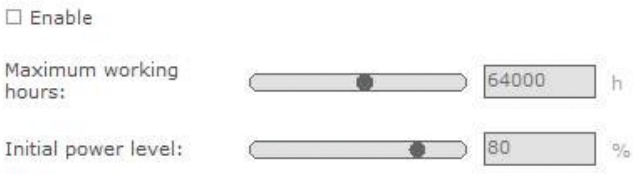
MTP is the method in which a thermal sensor (NTC resistor) implemented on the module board is sensed by the driver, which will cut back output current when a predefined (temperature) limit is exceeded in order to protect the LED module from thermal overstress.

This feature is enabled by default.

The driver accommodates for two NTC resistor choices. See the driver datasheet for more details on NTC type.



CLO



CLO LITE

Constant Light Output (CLO, CLO LITE)

CLO: Applicable to FULL Prog drivers

CLO LITE: applicable to LITE Prog 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).

CLO LITE can be configured by setting a start and an end point. The light level between these point will linearly increase.

This feature is disabled by default.

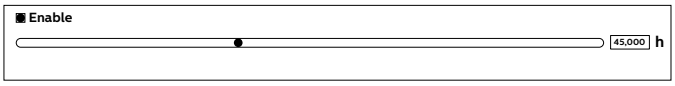
End of Life (EOL)

Applicable to : FULL Prog drivers only

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

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

This feature is disabled by default

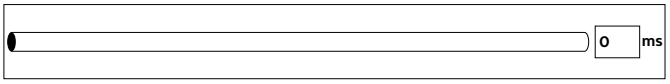


Adjustable Start up Time (AST)

Applicable to : FULL Prog drivers only

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

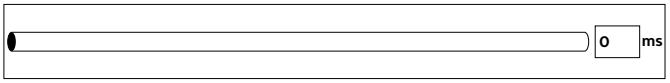
This feature is disabled by default.



Light Source Operating (LSO)

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

This feature is disabled by default.



DC emergency dimming operation (DCemDIM)

Applicable to : FULL Prog drivers only

These drivers are equipped with an auto-detect DC feature.
As soon as a DC input voltage is detected by these drivers, it will set the output current AOC to a predefined emergency
dim level. This predefined dim level can be modified by using the MultiOne software.

Compliance and approval

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

Disclaimer

Philips will perform the testing of the LED systems to high standards of workmanship. The tests are carried out with reference to the EN/IEC standards, if any, which are regarded by Philips as being of major importance for the application of the lamp gear and the lamp within the fixture for horticultural applications.
The design-in guide, regarding the testing and design in of the LED system provided by Philips, is not an official testing certificate, and cannot be regarded as a document for official release of the fixture. The OEM is liable for the official testing by a certified test body and all markings, such as CE and ENEC marks, on the fixture assembly.
The design-in guide is for information purposes only and may contain recommendations for detecting weak points in the design of the system (lamp – lamp gear – fixture), if any.
Specifically mentioned materials and/or tools from third parties are only indicative: other equivalent equipment may be used but it is recommended that you contact Philips for verification.
Philips will not be liable for unforeseen interactions of the proposed solutions when applied in the fixtures or applications using these fixtures.
Philips has not investigated whether the recommendations are or will in the future be in conflict with existing patents or any other intellectual property right. Philips does not warrant that its recommendations are technically or commercially the best options.
Since the tests are only performed on one particular fixture provided by the customer, it will be treated as a prototype. This means that there is no statistical evidence regarding later production quality and performance of the lamp – lamp gear – fixture system.
As Philips does not have control over manufacturing of the fixtures, Philips cannot be held liable for the fixture assembly.
Philips will not accept claims for any damage caused by implementing the recommendations.
No warranty whatsoever may be claimed by the OEM with regard to the content and/or quality of the design-in guide or any other advice, or the conclusions and/or recommendations in the design-in guide or any other document, either express or implied, and Philips expressly disclaims any implied warranties of any kind, including without limitation any warranties of satisfactory quality, fitness for a particular purpose or non-infringement and any warranties regarding the design-in guide or any other advice or the use of the results of any activity performed while testing the fixture with respect to its correctness, quality, accuracy, completeness, reliability, performance or otherwise.
The OEM expressly agrees that test design-in guides are provided by Philips on an ‘as is’ basis and an ‘as available’ basis at customer’s sole risk and expense.
Philips shall not be liable for any lost profits or lost savings, indirect, incidental, punitive, special, or consequential damages whether or not such damages are based on tort, warranty, contract, or any other legal theory – even if Philips has been advised, or is aware, of the possibility of such damages.
The OEM must bring any claim for damages within ninety (90) days of the day of the event giving rise to any such claim, and all lawsuits relative to any such claim must be filed within one (1) year of the date of the claim.
Any claims that have been brought or filed in conflict with the preceding sentence are null and void.

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