Reliable Xtreme SR technology
for demanding connected LED applications

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

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

Applications
Philips Xitanium LED Xtreme SR drivers reduce complexity and cost of wireless connected lighting systems in outdoor and industrial applications. If you use Philips LED Xtreme SR drivers in combination with Philips Sensors and 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
Dedicated design-in support from Philips is available on request. 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 must be used
• Driver certificates list up-to-date compliance with relevant product standards

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

Safety warnings and installation instructions

- 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 SR 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 Philips with reference to minimum required luminaire IP rating serves only as a non-binding guidance; a different 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 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 both the LED module and driver.

- No components are allowed between the LED driver and the LED module(s) other than connectors and wiring intended to connect the Xitanium driver to the LED module.

- Adequate earth and/or equipotential connections needs to be provided whenever possible or applicable. Philips Design-in support is available; please contact your Philips sales representative.

Warning:

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

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**Xitanium LED Xtreme SR drivers and Certified Products**

The Xitanium SR drivers offer great benefits for Lighting Management Systems. To ensure full component interoperability, Philips provides SR Certification. The performance of SR products is tested and certified to eliminate any interface problems. This means you can offer connected lighting solutions without having to worry about software capabilities and system investments. We have a growing list of SR Certified Products that are compatible with Philips Xitanium SR LED drivers. They cover a wide range of connected lighting solutions from trusted providers of sensor and connectivity modules, building management systems and city management systems. To support the development of SR Certified Components, Philips has launched the SR Partner Program. SR partners receive all required details of the Xitanium SR driver interface for electrical and DALI data exchange protocols. Philips also provides test and verification tests and successfully tested products can be recognized via the SR Certified logo:

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**Xitanium LED Xtreme SR driver versions**

The Xitanium LED Xtreme SR drivers described in this guide are available in multiple power and current ratings which enable the most popular light output levels for outdoor and industrial applications. It is always highly recommended to check our latest Xitanium LED Xtreme SR driver leaflet for the most up-to-date overview of our range. This leaflet can be downloaded at: [www.philips.com/technology](http://www.philips.com/technology).

Detailed driver specifications can be found in the Xitanium LED driver datasheets which can be downloaded at [www.philips.com/technology](http://www.philips.com/technology). You can also view product specifications and access datasheets via the Easy Design-in tool at [www.easydesignintool.com](http://www.easydesignintool.com).

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**Configurability Interface (tooling)**

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

- SR interface (based on DALI 2.0 protocol)
- SimpleSet (new)

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**SimpleSet**

Philips SimpleSet new wireless programming technology allows luminaire manufacturers to quickly and easily program Xitanium LED Xtreme SR 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) or contact your local Philips representative.
**Sensor Ready Interface**
Xitanium LED Xtreme SR drivers reduce complexity and cost of luminaires used in (wireless) connected lighting systems. They feature a digital SR interface to enable direct connection to any suitable CMS (City Management System) controller or sensor. Functionality integrated into the SR driver eliminates auxiliary components such as power supplies and relay boxes used in many typical outdoor lighting controllers (OLC) today. The result is a simpler, less expensive luminaire that enables turning every luminaire into a wireless node and a more reliable DC powered controller.

**The simple two-wire SR interface supports these key functions:**

- Switchable built-in SR bus power supply to provide power to the connected control device (e.g. an RF module or an OLC)
- Two-way digital communication between the SR driver and control device, based on DALI 2.0 protocol
  - Standard DALI dimming, ON/OFF (excl. commissioning)
  - Power and energy reporting utilizing the power monitoring integrated in the driver
  - Diagnostic information

These functions are described further in this document.

**Compatibility with regular DALI 2.0 devices**
SR Certified Products are designed to fully benefit from the SR driver capability. DALI Edition 2.0 compliant devices can also be applied in conjunction with SR drivers, yet with limited functionality: e.g. DALI commissioning is not supported.

**Compatibility with outdoor CMS systems**
In the outdoor segment, the preferred option is to apply the SR driver in combination with the SR interface for both the CMS nodes and potentially additional sensors. However, in existing installations it can be requested to release the combination of the SR driver and a 7-pin NEMA base. The combination of SR driver and 7-pin NEMA base requires special attention. In addition, a new 3-pin mini base socket has been developed for Sensor Ready Certified systems. See the picture on the left + corresponding product link for more details. The Xitanium SR drivers can be applied in combination with a DALI Edition 2.0 compliant device. In other cases, a full system verification is advised to avoid high customer dissatisfaction and significant costs to repair.

**Auxiliary Power Supply**
Next to the SR bus power supply, the Xitanium LED Xtreme SR drivers are equipped with a permanently-enabled internal 24 VDC power supply which is short-circuit proof and intended to power auxiliary luminaire devices that need more power than the SR bus can deliver. This supply can deliver 3W continuously and 10W peak with a duty cycle of 25% (t = 5.2 ms). This supply shares its common with the SR bus supply common. In case of a short – circuit, the light will switch off.

**Note:** It is not allowed to connect the auxiliary power supply of one driver in parallel to the auxiliary supply of another driver. These supplies need to be kept separated from each other.
**Adjustable Output Current (AOC)**

Flexibility in luminaire design is ensured by the adjustable output current (AOC). The adjustable output current enables operation of various LED configurations from different LED manufacturers whilst also ensuring the solution remains “future proof” for new LED generations. The output current can be 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”. Information about configuring drivers with SimpleSet can be found in the section “Configurability”.

**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 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 SR drivers can be done via the SR interface.

**Amplitude Modulation (AM) dimming**

Philips Xitanium LED Xtreme SR 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 most smooth and flicker-free operation over the entire dimming range.

**Ripple and flicker**

A small inherent ripple is superimposed on the DC output current of Philips LED Xtreme SR drivers. This ripple consists of a low-frequency LF component (double the mains grid frequency) and a high-frequency HF component and has such a low amplitude that optical interference (flicker) with camera systems other than those for high-speed HD recording is not be expected. The ripple value of both components are specified in the driver datasheet.

**Hot-wiring**

Philips LED Xtreme SR drivers do not support hot-wiring. In order to prevent damage to LED module and/or driver 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.

**DC mains operation**

Xitanium LED Xtreme SR drivers support operation 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 on www.philips.com/multione.

OEM Write Protection (OWP)
OWP allows the OEM to protect their driver setting over the lifetime of the driver by using a password. Drivers equipped with OWP will show this in the feature list if read out by the tool MultiOne. Specific 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 SR drivers offer a Diagnostics feature. The purpose of Diagnostics is to gather information and help diagnose the history of the driver and connected LED module. The Diagnostics feature consist mainly of counters which keep track of specific variables like the number of startups of the driver, operating hours, temperature of driver and LED modules, current and voltages etc. When the driver is shutdown the diagnostics data is stored automatically in non-volatile memory. Diagnostics can also be accessed through the SR interface with a password provided to SR Certified partners.

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

Energy Metering
The SR driver has built-in energy metering capability and can report metered energy and actual power consumption. The metering is compliant per EN50470-1 and EN50470-3. Accuracy of the power measurement is the higher of following two values across the entire driver operating window: 0.5W or +/-1% of measured input power. The energy metering feature stores consumption parameters in the non-volatile memory bank specified in the DALI 2.0 standard and the SR Certified specification.
**Driver naming**
Xitanium LED Xtreme SR drivers are part of a specific naming system. See the example below.

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**Xi SR 150W 0.2-0.75A SNEMP 230V S240 sXt**

- **Protection suffix:**
  - sXt = Xtreme technology; high robustness and lifetime

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

- **Rated AC input voltage**
  - 230VAC (= 220-240VAC)

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

- **Output current:**
  - Programmable min-max output current range (AOC) in A

- **Number of output channels:**
  - Either one (no indication) or two (2)

- **Output power:**
  - Rated Output Power (max)

- **LED driver family:**
  - FP = FULL Prog
  - LP = LITE Prog
  - SR= Sensor Ready

- **Type of LED driver:**
  - Xitanium (Xi)
Form factors

Xitanium LED Xtreme SR 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/technology.

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 check the website www.philips.com/multione to find the correct type. Every published interface tool is officially approved for use with the MultiOne software. The tool type number can be found by checking the LCN label on the tool itself.

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

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

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

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

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

Driver case temperature point (Tc point)
To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the driver remains within its rating.

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

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

Note: Xitanium Xtreme SR drivers allow for a driver-internal temperature readout through the MultiOne Diagnostics feature. This readout is purely for diagnostic purposes and does not represent the driver Tc point temperature. Therefore, this readout should not be used to define thermal suitability of the driver in the application.
Relation between Tc and ambient temperature
The Tc increases, by approximation, linearly with the driver ambient temperature (Tamb). The temperature offset between driver Tamb and Tc depends on the thermal design of the luminaire and the actual delivered output power relative to the specified nominal output power. A lower output power allows for a higher driver ambient temperature as long as the maximum specified driver Tc is not exceeded. For the approved driver ambient temperature range as well as specified Tc point values please check the specific driver datasheet.

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

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

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

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

If the output current reduction is not sufficient to offset the Tc point temperature increase then the output current is eventually reduced to zero at 96°C and the driver output will be switched off. Normal operation will not resume until the Tc point temperature has cooled down to 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 as a measure to prevent nuisance.

**Driver Temperature Limit (DTL)**

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

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

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

**Warning:** the DTL Tc point threshold temperature at which the output current should be reduced must not be set too low. Otherwise, undesired light output reduction may result during normal operating conditions. A meticulous thermal investigation of the driver application is required to ensure that the configured DTL threshold occurs neither at too low nor at too high driver operating temperature conditions.
**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 temperature of the LED module (Tc-life) is not exceeded under normal application conditions. The utilization of an NTC (Negative Temperature Coefficient resistor) serves the purpose to help achieve the useful lifetime of the LED module if external thermal influences result in the temperature for lifetime (Tlife) 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.

Xitanium Xtreme SR drivers are by default configured for the following three standard NTC types:

1. 10 kilo Ohm NTC - Murata, p/n NCP18XH103J03R
2. 15 kilo Ohm NTC - Vishay, p/n NTC50805E3153GMT (previous p/n: 2381 615 54153)
3. 15 kilo Ohm NTC - Murata, p/n NCP15XW153E03RC (+ 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°C) and β 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.

**Notes:**

- It is not allowed to combine the NTC ground connection with the LED - connection. These two connections must be kept separate.

- The length of each wire between the MTP driver interface and the NTC on the LED module is not allowed to exceed 60cm. Do not use shielded wiring.

- It is neither allowed to connect multiple MTP inputs from multiple drivers in parallel nor to have multiple MTP interfaces share a common connection. Always keep multiple MTP interfaces fully separated from each other.
Electrical Design-In

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 SR 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 Vf string) 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:

1. SimpleSet: output current can be set using the Philips MultiOne software and SimpleSet interface.
2. SR interface: output current can be set using the DALI-2-USB interface.

Note: the forward voltage Vf of the connected LED module must remain within the specified driver operating window voltage boundaries under all application conditions!

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.

Note: The two outputs of a dual-channel driver share a common minus. Therefore, the two outputs cannot be put in series.
How to Select an appropriate drive

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 the available drivers, please refer to www.philips.com/technology.

1. Determine the 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 SR 75W 0.2 – 0.7A SNEMP S240 sXt, the minimum programmable driver current is 0.2 A and maximum is 0.7 A.
5. Does the required voltage fit the voltage range of the driver? The exact value can be found in 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 SR 150W SNEMP 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 SR 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 an intuitive tool that unlocks the full potential of all programmable drivers from Philips, ensuring that the driver performance matches the needs of the lighting solution. It offers unprecedented flexibility, before, during and after the product installation.

Programming of new Xitanium LED Xtreme SR drivers can be done either by using the SimpleSet or the SR interface.

For more information on MultiOne please refer to the section Driver Configuration or visit: www.philips.com/multione. This site contains detailed information on how to install the software and how to program the driver.
Connectors
Philips Xitanium LED Xtreme SR drivers are equipped with Wago or equivalent type push-in connectors. The mains, and Equipotential connectors are -depending on driver type - Wago type 804 or 250 while the LED output connectors are Wago type 250. All connectors accept stranded, solid core and crimped wires. More info about connectivity (wiring diagram, wire diameters, strip length) can be found in the driver datasheet.

Notes: although the driver connectors allow for quite small wire cross section areas (down to 0.2mm²) it is recommended for optimal connectivity to use mains and LED output wires having at least 0.5mm² cross section area.

For currents between 1.0 and 1.5A (rms/DC) per connector, a minimum cross section of 0.75mm² is advised.

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

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

Mains operating conditions
Xitanium LED Xtreme SR 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 form or a "modified sinewave".

Xitanium LED Xtreme SR 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 the grid.

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

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.

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

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

This shutdown functionality was intended to prevent overcurrent conditions in the mains grid. Without shutdown the driver input current would increase proportionally with decreasing mains voltage since the driver is designed to maintain full light output of the luminaire and thus output power. This would exacerbate the undervoltage condition further. Consequently, mains cables 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 SR drivers have a 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 is ultimately shut down. A small hysteresis of 5 ... 10V 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

**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.
**Excessive high mains voltage**

An excessive high mains voltage will stress the driver and have an adverse effect on the lifetime. Xitanium LED Xtreme SR drivers will survive an input overvoltage of 264 ... 320VAC for a period of max. 48 hours and 320 ... 350VAC for a period of max. 2 hours.

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

**Power grids**

Xitanium Xtreme LED SR drivers are suitable for direct connection to TN, TT and IT grids. Depending on driver type, a luminaire-based fuse in the driver neutral connection may be required in case both feeding phases are “hot”.

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**Note:** certain restrictions apply for use in IT grids. Direct connection of Xitanium LED Xtreme SR 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.

**Power Factor (PF)**

Xitanium Xtreme LED SR drivers have a high power factor which is inherently capacitive. Its capacative nature cannot be compensated for. The output power dependent PF graph can be found in the driver datasheet.

**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 Xitanium LED Xtreme SR 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.

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.

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.
Xitanium Xtreme LED SR drivers are not equipped with an internal fuse rated for AC & DC voltage operation. Thus an external DC voltage rated fuse is required in case of DC operation. The use of an external, luminaire-based DC rated fuse with sufficient DC voltage rating and breaking capacity is required. Suggested fuses (per each driver) are:

- 3.15A 400VDC, 1.5kA BC, 5x20mm Littelfuse Slo-Blo® 477
- 3.15A 250VDC, 10kA BC, 5x20mm Siba Fast 7008913.3.15
- 3.15A 400VDC, 30kA BC, 6.3x32mm Siba gPV 7006526.3.15

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

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

**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. 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 on p. 32).

- 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. Philips has not tested the effectiveness of such devices in the 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.
### 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:

\[
\text{Max. amount of drivers} = \text{reference} \times \text{relative number in %}
\]

**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.

### 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 \(I_{\text{peak}}\) and \(T_{\text{width}}\) 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 \(I^2t\) value 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\(^2\)s. Specified driver inrush current peak and width is 53A and 300µs. Steady-state input current is 0.9A per driver.

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

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

The corresponding steady-state input current is \(16 \times 0.9 = 14.4\text{A}\). This is above the 80% rating of the 16A fuse. Therefore, the maximum recommended amount of drivers is \((16A \times 0.8) / 0.9 = 14\) drivers.

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

- Specified inrush current data is based on an average mains grid with an impedance of 400 mΩ + 800µH. Deviating mains impedance is of minor importance regarding the maximum amount of drivers per MCB.
- 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 30 mA Residential Current Device (RCD) is typically 30.
**Surge immunity**

Xitanium LED Xtreme SR drivers have elevated differential-mode and common-mode surge immunity levels which by far surpass the requirements 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).

**Touch current**

Xitanium LED Xtreme SR 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 performance and reduced surge immunity will result.
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 or being too sensitive in practical situations. Xitanium LED Xtreme SR drivers meet EMC requirements per CISPR 15 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 verified in Insulation Class I and II configurations.

Remote mounting and EMC

Xitanium LED Xtreme SR drivers are designed primarily for built-in use only and not remote mounting. Remote mounting of Xitanium LED Xtreme SR drivers may be possible as long as the additional summarized voltage drop as function of output current along the LED + and LED – wires is accounted for.

Philips has successfully performed CISPR15 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.

Note: 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: the driver EQUI terminal must be connected to the luminaire chassis as well as to Protective Earth (Class I) for optimal EMC performance and surge immunity. Doing so for 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 functional and designed for equipotential bonding; it does not have a safety function.

Electrical insulation

Driver insulation classifications between the several inputs and output can be found in the driver datasheet. Insulation classifications of Xitanium LED Xtreme SR drivers are optimized for design-in in Insulation Class II luminaires 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 for all Xitanium LED Xtreme SR drivers.
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 SR 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 Philips representative.
Sensor Ready Interface

Xitanium LED Xtreme SR drivers reduce complexity and cost of luminaires used in (wireless) connected lighting systems. They feature a digital SR interface to enable direct connection to any suitable CMS controller or sensor. Functionality integrated into the SR driver eliminates auxiliary components such as power supplies and relay boxes used in many typical outdoor lighting controllers (OLC) today. The result is a simpler, less expensive luminaire that enables turning every luminaire into a wireless node and a more reliable DC powered controller.

The simple two-wire SR interface supports these key functions:

- Switchable built-in SR bus power supply to provide power to the connected control device (e.g., an RF module or an OLC)
- Two-way digital communication between the SR driver and control device, based on DALI 2.0 protocol
  - Standard DALI dimming, ON/OFF and control functions
  - Power and energy reporting utilizing the power monitoring integrated in the driver
  - Diagnostic information

Built-in SR bus power supply

- The Xitanium Xtreme SR driver has the ability to supply the SR bus with a built-in power supply that can be turned ON/OFF. By default the power supply is turned on and ready to be used with an external control device (e.g. RF sensor).
- The SR supply should in principle be turned off if used in an SR network with multiple drivers to avoid that wrong SR polarity can lead to high currents on the SR bus.
- It is not recommended to use Xitanium Xtreme SR drivers in a wired DALI network. For this purpose the use of Xi Full Prog drivers with DALI interface are available.
  - The built-in SR supply is capable of delivering a minimum current of 52 mA (ISR) to the SR bus and the connected device(s).
  - The built-in SR supply will never supply more than 60mA (ISR_MAX).
  - The SR bus voltage will be between 12V and 20VDC depending on the connected device load and the amount of SR supplies put in parallel. See the graph below for the typical VI curve for one SR supply.
  - When the internal SR supply is switched OFF the SR driver will extract a maximum of 2 mA from the SR bus (like standard DALI gear).

Control device(s)

- Most control devices intended to be used in an SR system will be powered from the SR bus or the 24VDC auxiliary power supply.
- When communication is present on the SR bus, the bus gets pulled down by the data packages. This reduces the average current available for the power consuming control device. When communicating the average available current can drop with 50%. This should be taken into account when designing the control device.
- The extracted peak current (ISR_EXTRACTED) should be limited by the control device.
Rules for building an SR system

- SR bus polarity must be respected when more than one SR supply is connected in parallel.
- The total maximum SR bus current (ISR_MAX_TOTAL) must not exceed 250 mA. This current can be determined by adding up ISR_MAX of all connected SR supplies. As a consequence a maximum of four SR supplies can be connected in parallel.
- The total current delivered to the SR bus (ISR_DELIVERED) can be determined by adding ISR of all connected SR supplies.
- The total current extracted from the SR bus (ISR_EXTRACTED) can be determined by adding up consuming devices like SR drivers with switched OFF SR supply, other DALI gear and control devices.
- To guarantee good communication, a margin of 8 mA is needed to drive the SR bus itself (ISR_MARGIN).
- The following rule should be respected:
  
  \[ \text{ISR}\_\text{EXTRACTED} + \text{ISR}\_\text{MARGIN} \leq \text{ISR}\_\text{DELIVERED}. \]

Caution:

When the above rules are not taken into account, communication cannot be guaranteed and damage to components may occur.

Typical examples

1. One SR driver is connected to a control device. The internal SR supply of this driver is switched ON. The specification of the control device states that the extracted peak current is 40 mA. Will this SR system have good communication?

   - One SR supply is involved, so BUS polarity is irrelevant.
   - ISR_MAX_TOTAL = 60 mA. This is \leq 250 mA
   - ISR_DELIVERED = 52 mA
   - ISR_EXTRACTED = 40 mA
   - ISR_MARGIN = 8 mA
   - 40 + 8 mA \leq 52 mA

   This system will function properly.

2. Is it allowed to add an SR driver with switched OFF SR supply to this SR system?

   Yes, an SR driver with switched OFF SR supply extracts 2 mA from the SR bus.
   - ISR_EXTRACTED = 40 + 2 = 42 mA.
   - 42 + 8 mA \leq 52 mA

   This system will function properly.

3. Can this SR supply also be switched on?

   Yes, but the polarity of both SR supplies should be verified.
   - ISR_TOTAL = 2 * 60 = 120 mA. This is \leq 250 mA.

   This system will function properly.
Digital SR communication

Dimming via SR bus commands is possible through the standard digital interface based on DALI 2.0 (IEC 62386 101, 102 Ed2.0) protocol.

- Note that the output current at 100% level is determined by the driver. The minimum current that can be supplied by the driver is specified in the datasheet. The lowest dim level is defined by the higher of the two values: Minimum output current or 10% dim level.
- The Xitanium Xtreme SR driver has built-in energy measurement capability and can report energy and actual power consumption. Accuracy of power measurement is higher of following 2 values: 0.5W or +/-1 % measured input power. This feature stores parameters in the non-volatile memory bank provision specified in the DALI 2.0 standard and the SR Certified specification.
- The driver also supports many diagnostic features/parameters which can be accessed via the SR interface, as per SR Certified specification.
- Although the SR interface supports DALI 2 commands, it is not a DALI interface as such since the interface is polarity-sensitive. It is not recommended to use the SR driver in wired DALI networks. For that purpose Xitanium Full Prog drivers with DALI interface are available.

Standby power consumption

Xitanium LED Xtreme SR drivers consume max. 0.5W per driver when in standby mode. This standby power is excluding power consumed by a sensor connected to the SR bus and/or a sensor connected to the auxiliary 24VDC power supply. The SR bus supply - if enabled- and auxiliary power supply remain active when the driver is in standby mode.
Introduction

The Xitanium LED Xtreme SR 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 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 SR drivers can be done either by SimpleSet or by the SR interface. The name of the driver indicates which interface is supported.

For more information on:

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

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

Please check the driver datasheet of the driver to verify if the selected driver supports specific configurability.
**MultiOne characteristics**
The characteristics of the MultiOne configurator are:
- One tool for all Philips configurable drivers: Xitanium LED Indoor and Outdoor drivers; HF-R Indoor fluorescent gear; DynaVision Xtreme HID electronic gear...
- Future proof by design: modular approach, very scalable and backwards compatible.
- Provides access to all features built in the driver.
- Tool combines configuration with debugging.
- Settings of the drivers can be changed any point in the product lifecycle.
- Settings of the drivers can be changed at any point in the product lifecycle (if allowed - see OWP section).

**Basic blocks**
This configurator consists of:
1. Philips MultiOne Interface tool
2. USB cable (connection to PC or laptop)
3. Philips MultiOne Software

**Philips MultiOne Interface tool**
There are different versions of MultiOne interface tooling depending on the type of communication:

1. LCN8600/00 MultiOne Interface USB2DALI
   The interface that can be used with the MultiOne PC software to commission, configure, diagnose drivers via the DALI interface.

2. LCN9610/LCN9620/LCN9630 SimpleSet interface
   The interface that can be used with the MultiOne PC software to configure drivers wirelessly using SimpleSet technology.

3. More interfaces are coming up ...

When ordering the MultiOne Interface, the correct USB cable will be supplied with the interface tool. Each interface tool has its own cable. Check if USB ports of the PC are able to power the interfaces.

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

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

2. MultiOne Workflow
   Developed to configure all devices or subassemblies in the production environment or field in a simple and quick way. Workflow exists of 2 packages:
   - Workflow GUI (direct use)
   - CommandLine (integration in test bench, robot, automation …)

Software (free downloadable) and latest version check can be obtained at: www.philips.com/multione.

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

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

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

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

A User Software key is required to install MultiOne Engineering (available at no charge). This key can be requested here:

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

More information on how to program a driver can be found in the section Getting Started of the MultiOne instruction manual. Link: www.philips.com/multione.
**MultiOne System**

**Settings**
The Xitanium LED Xtreme SR 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 datasheet in the download section at [www.philips.com/technology](http://www.philips.com/technology).

**More information of using Multione**
On our up-to-date website [www.philips.com/multione](http://www.philips.com/multione) you can find:

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

Request User software key:
- [www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator/multione-configurator-form.html](http://www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator/multione-configurator-form.html)
Control features

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

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.

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

Adjustable Light Output (ALO)
Factory default setting: disabled

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

There are 2 ALO versions available:

- ALO

- ALO and ALO min.
LED Module Temperature Protection (MTP)
Factory default setting: disabled

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 at page 14 for more details on NTC type.

Driver Temperature Limit (DTL)
Applicable to: potted drivers
Factory default setting: disabled

Description
Use the Driver Temperature Limit feature to configure the temperature limitation settings for the driver.

Usage
Select the Enable check box to use this feature. Use the sliders to changes the values for this feature.

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

Dim level: Set the dim level for the Stop dim temperature.

Constant Light Output (CLO)
Factory default setting: disabled

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

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

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

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

![Enable](50,000 h)

**Adjustable Start-up Time (AST)**
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 0s and 30s, in increments of 1ms.

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

![5 ms]

**Light Source Operating Hours (LSO)**
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 is enabled it is recommended to set the correct light source age.

![5 h]
DC emergency dimming operation (DCemDim)
Factory default setting: enabled

Xitanium LED Xtreme SR 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 SR commands when operated at DC input voltage unless the optional checkbox “Allow dimming” in the DC Emergency tab is selected.

![Enable Allow dimming](image)

Dynadimmer
Factory default setting: disabled

The Integrated Dynadimmer is an autonomous dimming control developed by Philips that enables simple, pre-programmed customized multistep dimming without the need for external control infrastructure. Its main function is energy reduction by reducing light levels or switching off the light during the night when it is not required to have full light output.

Dynadimmer operation override is possible by SR commands at any time, provided the override checkbox is ticked during Dynadimmer configuration in MultiOne. Once in override mode, the driver will remain in SR mode until the next mains power cycle.

This override does not interfere with the Dynadimmer synchronization algorithm (see next section).
Dynadimmer working principe
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. 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 Philips has introduced the programmable Dynadimmer feature which simply uses the driver power-on time duration as reference.

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.

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. During this synchronization phase 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 to 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.

For example if the sunset in Berlin is at 19:00 this will be in Poland at 18:25 and in Portugal 19:35. To be able to synchronize the absolute clock time with a photocell controlled system in Poland the offset should be set at -25 minutes and for Portugal +35 minutes.

By default the mid position of a time zone (in above time-zone this will be close to Berlin) will be selected; in most cases this default value will be accurate enough.

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 synchronization phase) the Dynadimmer will handle maintenance or short power interruption in correct ways, thus preventing dimming schedule disruptions.
Dynadimmer attention points

If after synchronization the change in power-on time is more than one hour then the driver does not need three new power-on cycles for re-synchronization. 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 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.
Dynadimmer attention points (cont’d)

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.

- **Notes:**
  - The Dynadimmer does not compensate step-wise for the 1-hour shift in time due to daylight savings time changes in fall and spring.
  - 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.
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, SR dim level, MTP, DTL, Dynadimmer and DCemDim.

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:

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

\[ \text{AOC} \times \text{ALO} \times \text{CLO} \times \text{SR dim level} \times (\text{MTP and/or DTL}) \]

\[ \text{AOC} \times \text{ALO} \times \text{CLO} \times (\text{MTP and/or DTL}) \]

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%, SR dim command = 242 (70%). Actual output current is then 280mA.

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

Actual output current = \( \text{rated AOC} \times 0.6 \) (max).
### Group of features - OEM protection

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### Individual features - OEM protection

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</tr>
<tr>
<td>The password must contain 4 numbers (0-255).</td>
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</table>

### OEM Write Protection (OWP)

Factory default setting: disabled

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

- a set of features (fixed)
- a selection of individual features (free selection) To know which features are locked you see a small lock symbol on each feature while trying to write the driver.

How to program this feature is described in the user manual of MultiOne Engineering at [www.philips.com/multione](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 easy programmed in production via the MultiOne workflow software. New drivers or replacement drivers can be programmed on this way. Already programmed drivers with password are protected and will give an error. They can only be changed using the correct password.

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

Driver compliances and approvals can be found in the published driver Declarations of Conformity (DoC) and ENEC/CB certificates as published on www.philips.com/technology. For further questions please contact your local Philips sales representative.
Disclaimer

Philips will perform the testing of 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 LED gear and the LED light source in the application.

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 luminaire. The OEM is liable for the official testing by a certified test body and all markings, such as CE and ENEC marks, on the luminaire 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 – luminaire), 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 luminaires or applications using these luminaires. 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 luminaire 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 – luminaire system.

As Philips does not have control over manufacturing of the luminaires, Philips cannot be held liable for the luminaire 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 luminaire with respect to its correctness, quality, accuracy, completeness, reliability, performance or otherwise.

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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.