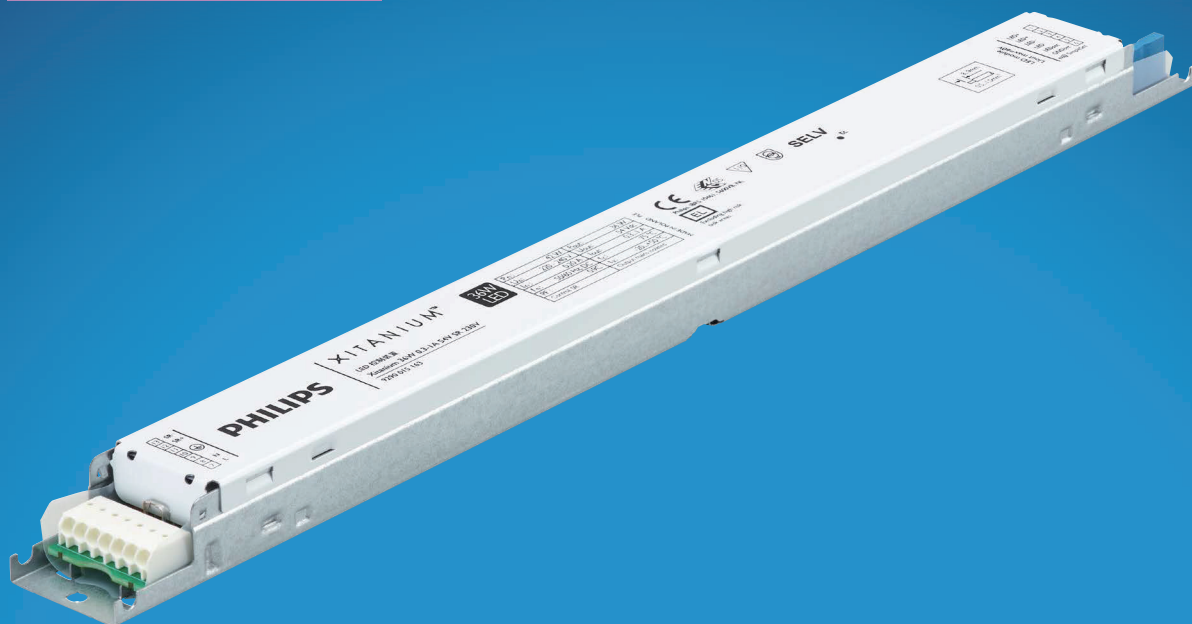


PHILIPS

Xitanium

LED indoor drivers

Linear SR and FlexTune



Design-in Guide

Reliable SR technology for connected LED applications

April 2022

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Introduction to this guide



Philips Xitanium SR driver

Thank you for choosing the Philips Xitanium Sensor Ready (SR) driver. 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 SR drivers. We advise you to consult our websites for the latest up-to-date information.

Applications

Philips Xitanium SR drivers reduce complexity and cost of wireless connected lighting systems in indoor applications. If you use Philips 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/oem

www.philips.com/multione

Design-in support

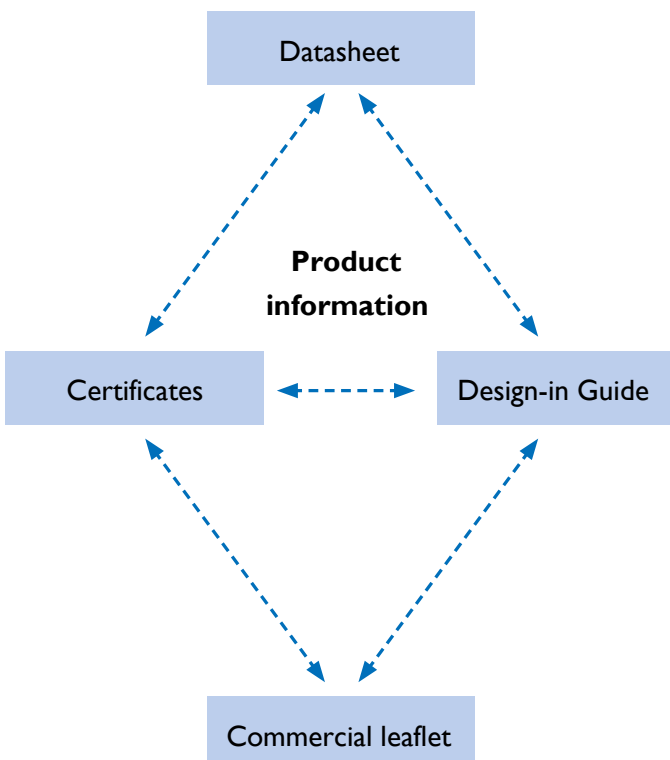
Dedicated design-in support from Signify is available on request. For this service please contact your local Signify representative.

Document overview

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

- Commercial leaflet contains product family information & system combinations
- Datasheet and 3D file contain 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 at the OEM download page of the OEM website www.philips.com/oem. If you require any further information or support please consult your local Signify representative.



Warnings and instructions



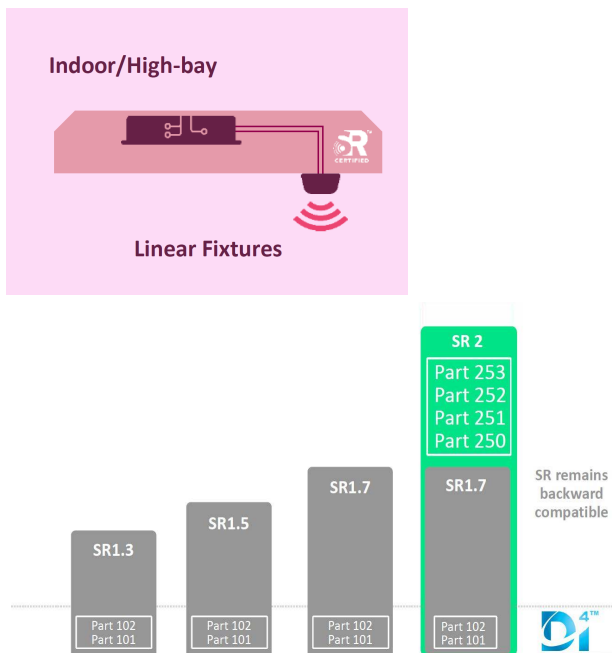
Safety warnings:

- Avoid touching live parts!
- Do not use drivers with damaged housing and/or connectors!
- Do not service the driver when the mains voltage is connected; this includes connecting or disconnecting the LED module!

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

- Do not use damaged products
 - Do not use the SR interface of Xitanium LED Xtreme SR drivers in wired luminaire-to-luminaire or in wired DALI network applications. Inter- and extra-luminaire use is not supported. All SR and auxiliary supply wiring must remain within the luminaire (**intra-luminaire use**).
- Note: this does **not** apply to Xitanium LED SR *FlexTune* drivers.
- The SR PSU must be disabled in case Xitanium LED SR *FlexTune* drivers are used:
 - in wired luminaire-to-luminaire DALI applications (**inter-luminaire use**)
 - in Touch and Dim applications
 - Do not connect mains voltage to the SR interface; immediate driver failure will result (*exception: Xitanium SR FlexTune drivers*).
 - 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 SR drivers are suitable for built-in use only and must be protected against ingress of and exposure to including but not limited to water, dust, insects or any other chemical agent - be it in the gaseous, vapor, liquid or solid form- which can be expected to have an adverse effect on the driver (e.g. use in wet/corrosive/dusty environments). It is the responsibility of both luminaire manufacturer and installer to prevent ingress and exposure. Any suggestion from Signify with reference to minimum required luminaire IP rating serves only as 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 must be provided whenever possible or applicable.
 - Signify Design-in support is available; please contact your Signify sales representative.

Introduction to Xitanium LED SR drivers



Evolution of Sensor Ready (SR) intra-luminaire digital protocol

Xitanium SR drivers and SR Certified Products

Our Xitanium SR drivers offer great benefits for Lighting Management Systems. To ensure full component interoperability, Signify provides SR Certification. The performance of third-party SR controllers (e.g nodes, sensors) is tested and certified on our SR drivers 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 our Philips Xitanium SR drivers. They cover a wide range of connected lighting solutions from trusted providers of controller and connectivity modules as well as building management systems.

In order to support the development of SR Certified Components, Signify has launched the SR Partner Program. SR partners will receive all required details of the Xitanium SR driver interface for electrical and DALI data exchange protocols. Signify also provides test and verification services. Successfully tested products can be recognized via the SR Certified logo:



Currently, our Xitanium SR drivers have been transitioned from SR specification v1.7 to v2.1 and will continue to evolve. Select SR driver types are now compliant with the new DALI standard for intelligent IoT-ready luminaires, called D4i. These drivers can be recognized by the D4i logo on their type plates. Philips driver compliance per D4i can be looked up in the driver datasheet at www.philips.com/oem and also at www.digitalilluminationinterface.org/products.

Xitanium LED SR driver versions

The Xitanium SR drivers described in this guide are available in multiple power and current ratings which enable the most popular light output levels for indoor applications. It is always highly recommended to check our latest Xitanium SR driver portfolio for the most up-to-date overview of our range. This leaflet can be downloaded at www.philips.com/oem.

Detailed technical specifications can be found in the Xitanium driver datasheets at www.philips.com/oem. You can also view product specifications and access the datasheets via the Easy Design-in tool at www.easydesignintool.com.

Configurability Interface (tooling)

The Xitanium LED SR drivers are configurable. A tailored package of features and parameters in these drivers can be set via a specific tool. This tool is called MultiOne Configurator.

SimpleSet

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

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

Sensor Ready Interface (DA+/DA-)

Xitanium 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 controller or sensor. Functionality integrated into the SR driver eliminates auxiliary components such as power supplies and relay boxes used in many typical lighting controllers 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 is -dependent on driver type- compliant with Part 207, 209 and D4i (Part 250/251/252/ 253).

Part 150 (auxiliary +24V power supply) is not applicable for Xitanium SR Indoor drivers since these drivers are not equipped with that supply.

Compatibility with regular DALI devices

SR Certified Products are designed to fully benefit from the SR driver capability. DALI compliant devices can also be applied in conjunction with Xitanium SR drivers, yet functionality may be limited compared to use with a DALI driver in a DALI network. Full functionality will be achieved in case DALI compliant devices are combined with Xitanium SR FlexTune drivers.

DALI Part 102

Select drivers support Part 102 by enabling the configuration of 16 scene settings and associated fade time and power-on level via our wireless SimpleSet tool. This feature also supports quick and easy replacement of a (failed) driver by reading out these DALI variables from the replaced driver and transferring these to a replacement driver without the need for re-commissioning of the replacement driver. Please refer to the datasheet to look up whether Part 102 functionality is supported.

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 user manual of MultiOne at www.philips.com/multione.

Dimming interface

Interfacing with the Xitanium LED SR drivers can be done via the SR interface.

Amplitude Modulation (AM) dimming

Philips Xitanium 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.

Temporal Light Artifacts (flicker & stroboscopic effects)

A small inherent ripple is superimposed on the DC output current of Philips LED SR drivers. This ripple consists of a low-frequency LF component (double the mains grid frequency) and a high-frequency HF component. This ripple current has such a low amplitude that Temporal Light Artifacts (flicker & stroboscopic effects) with camera systems other than possibly those for high-speed slow-motion HD recording is not be expected. The ripple value of both LF and HF components are specified in the driver datasheet. The typical values for TLA parameters short-term flicker value (P_{st}^{LM}) and Stroboscopic Visibility Measure (SVM) can also be found in the driver datasheet.

What does SVM mean?

- For objective assessment of stroboscopic effect, the Stroboscopic effect Visibility Measure (SVM) has been developed.
- The specification of the stroboscopic effect visibility meter and the test method for objective assessment of lighting equipment is published in IEC technical report IEC TR 63158.
- Stroboscopic effect is one of the particular temporal light artefacts. In common lighting applications, the stroboscopic effect is an unwanted effect which may become visible if a person is looking at a moving or rotating object which is illuminated by a time-modulated light source. The temporal light modulation may come from fluctuations of the light source itself or may be due to the application of certain dimming or light level regulation technologies. Another cause of light modulations is the incompatibility of a lamp with an external dimmer.

What does P_{st}^{LM} mean?

- P_{st}^{LM} measures the short term flicker severity, where “st” means short term and ‘LM’ refers to the method of measuring flicker, as defined in the standards.
- A value of $P_{st}^{LM} = 1$ means that the probability that the average observer will notice flicker is 50 percent.
- The regulation specifies the required level of $P_{st}^{LM} \leq 1$ at full load and applies to LED and OLEDs.

Tunable color temperature (FlexTune only)

Xitanium SR FlexTune LED drivers offers unparalleled flexibility for your next lighting project that utilizes correlated color temperature (CCT) tuning capability. These drivers are equipped with our Sensor Ready (SR) interface and offer a means for digital control of the driver including CCT tuning and all the benefits of a wireless connected system, including use in a wired luminaire-to luminaire based DALI control system.

Xitanium SR FlexTune LED drivers can be used with the different LED modules as part of the FlexTune system, or they may also be used with non-Signify modules by appropriately configuring the driver settings as described in the Appendix of this guide. With Xitanium SR FlexTune LED drivers one can precisely control the CCT and light output down to 1% minimum dim level while maintaining compliance with our TLA requirements across the full range of operation.

Xitanium SR FlexTune LED drivers are compatible both with the requirements outlined in DALI Part 207 (Device Type 6) and DALI Part 209 (Device Type 8) and are both D4i certified and DALI certified. These drivers can directly accept CCT and dim commands from an external sensor/network controller. This simplification offers an elegant system architecture to minimize complexity and maximize value to create the right digital foundation for your next connected lighting project. All of the configurable FlexTune features within the Xitanium SR FlexTune LED drivers are described in the Appendix of this design-in guide.

Hot-wiring

Xitanium LED 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 (DCemDim)

Xitanium LED SR drivers are allowed to be connected to a DC power grid (e.g. central emergency system). The driver behavior once switched to DC input voltage can be programmed via MultiOne software. Default the output current is reduced to 15% of its programmed output current at DC (emergency) operation. More details about DC input voltage suitability can be found in the driver datasheet.

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 MultiOne tool. 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. Please refer to the driver datasheet to find whether a specific driver support OWP.

Driver diagnostics & maintenance

Xitanium LED SR drivers offer a Diagnostics & Maintenance feature. The purpose of Diagnostics is to gather information and help diagnose the history of the driver and connected LED module for maintenance purposes. This feature consist mainly of counters which keep track of specific variables like the number of startups of the driver, operating hours, current and voltages etc. When the driver is shutdown the diagnostics data is stored automatically in non-volatile memory. Diagnostics reg. non-D4i drivers can be accessed through the SR interface with a password provided to SR Certified partners. Diagnostics and maintenance data reg. D4i-compliant drivers can be accessed according Part 253.

More information on this feature can be found in the instruction manual of MultiOne Engineering at www.philips.com/multione.

Energy data

Xitanium SR driver have built-in energy measurement capability and can report energy and actual power consumption data. Accuracy of the actual power measurement is higher of following 2 values: 0.5W or +/- 4 % measured input power. This feature stores energy reporting data in the nonvolatile memory bank provision specified in DALI-2 Part 252 and the SR Certified specification.

Luminaire data

Xitanium SR drivers are equipped with the Luminaire Info feature. This feature supports the extraction of luminaire data as input for system asset managment and enables the OEM to issue a unique Global Trade Identification Number (GTIN). It is compliant per Part 251.

Driver behavior on LED module fault conditions

Open load protection – If there is no LED module connected to the driver then the output current will drop to zero and the driver output voltage will rise to its maximum. When the driver detects this condition then it will shut down in order to protect itself and to avoid a potentially unsafe situation.

Output overvoltage detection – select driver types are equipped with intelligent LED module sensing circuitry. If the driver detects abnormal dynamic behavior of the connected LED module (reflected by rapid and/or irregular changes in forward voltage) then the driver will shut down its output and resume operation automatically after 10 seconds. If the abnormal behavior is persistent then the overvoltage detection will act repetitively until power is turned off (hiccup mode).

Short-circuit protection – If the output + and - terminals of the driver are shorted then the output current will momentarily rise while the forward voltage will drop to zero. When the driver detects this then it will shut down in order to protect itself and to avoid a potentially unsafe situation.

Overpower protection – If the specified maximum output power is exceeded (e.g. use of an incompatible LED module) then the output current will be reduced until the rated driver output power is reached. This way the driver protects itself to avoid a potentially unsafe situation.

Automatic recovery – If the fault condition is resolved and the mains is applied again, the LED-driver will start automatically its normal way of working at its designated operating point.

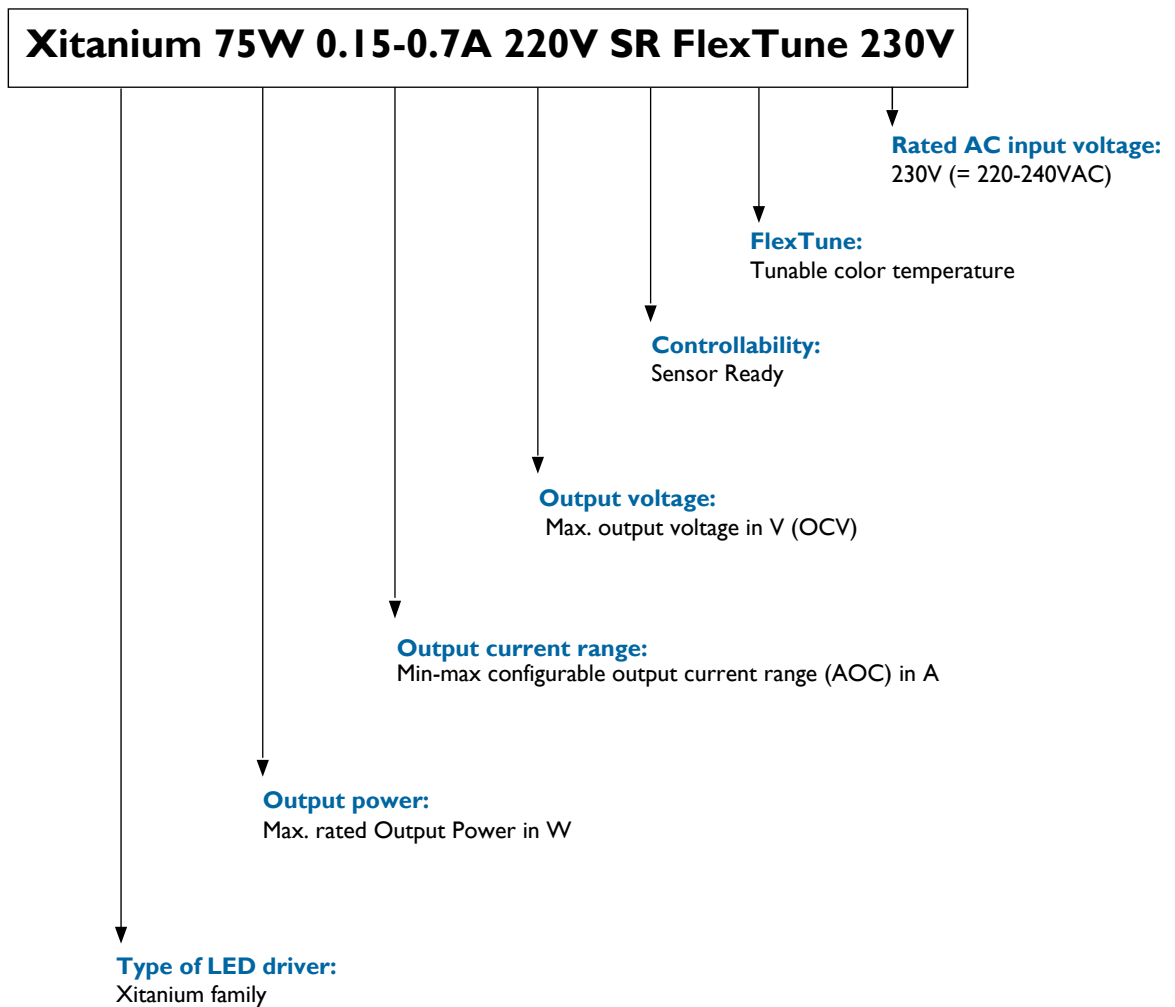
Use in hazardous areas



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

Driver naming

Xitanium SR drivers are part of a specific naming system. See the example below.



Mechanical Design-in

Dimensions

Xitanium 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/oem. It is recommended to build in drivers such that the driver housing and the driver input and output connectors are not affected by potential water ingress in the luminaire (e.g. due to luminaire sealing malfunction or condensation).

Mounting

It is highly recommended to mount the driver by using all available mounting feet in order to achieve optimal thermal contact and maximum mechanical robustness against shocks and vibration.

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 tools as shown on the left, the minimum distance is 19 mm (+/- 1 mm) for the LCN 9020. For the LCN 9030, tool, a minimum space of 8.3mm will suffice.

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.



LCN9630 SimpleSet interface tool



LCN9620 SimpleSet interface tool

Thermal Design-In

Introduction

To facilitate design-in of LED drivers, the critical thermal management points of the LED driver are set out in this section. In Signify's 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 (t_c 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 point (t_c) is a reference for the temperatures of the critical internal driver components. The location of the t_c point is identified on the product label. The t_c point is marked by the * or ° symbol on the label of the driver.

How to measure t_c point temperature

The temperature of this point can be measured using a thermocouple that is firmly glued to this defined point on the driver housing. For a representative measurement the temperature of the t_c point must be stable before any reliable data can be obtained (typically > 3 hours or when the temperature difference is less than 1°C within one hour).

Relation between t_c and ambient temperature t_a

The t_c point temperature increases, by approximation, linearly with the driver ambient temperature (t_a). The temperature offset between driver t_a and t_c depends on the thermal design of the luminaire and the actual delivered output power relative to the specified rated output power. A lower output power allows for a higher driver ambient temperature as long as the maximum specified driver t_c temperature is not exceeded.

There are two driver t_c values specified with corresponding lifetimes: $t_c(\text{life})$ and $t_c(\text{max})$. The rated driver lifetime can be achieved if the t_c value remains between $t_a(\text{min})$ and $t_c(\text{life})$. Reduced driver lifetime will result if the driver is running up to $t_c(\text{max})$. The approved driver ambient temperature range and specified $t_c(\text{life})$ and $t_c(\text{max})$ values and corresponding driver lifetimes are specified in the driver datasheet.



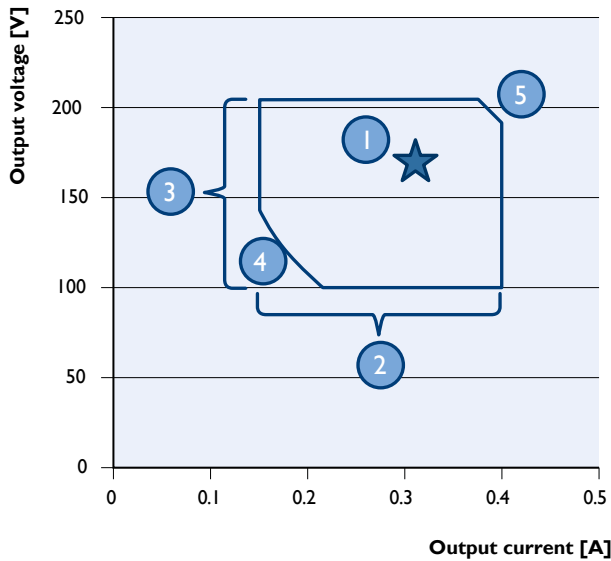
Warning: Driver operation outside specified $t_a(\text{min})$ - $t_c(\text{max})$ range is not supported and driver warranty will be void.



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

Note: Xitanium LED 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 t_c point temperature. Therefore, this readout should not be used to define thermal suitability of the driver in the application.

Electrical Design-In



Example Operating Window of a Xitanium SR driver

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

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 still 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 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 V_f 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 configured in three ways:

1. SimpleSet: via Philips MultiOne software and SimpleSet interface.
2. SR interface: via Philips MultiOne software and USB2DALI interface.
3. LEDset: connecting a current setting resistor to the LEDset interface.



Warning: in order to ensure stable driver operation the forward voltage V_f of the connected LED module must remain within the specified driver operating window voltage boundaries under all application conditions!

How to Select an appropriate driver

Depending on application requirements, several drivers may fit a specific application. The following steps will help in selecting the appropriate driver(s).

For a complete overview of the available drivers, please refer to www.philips.com/oem or use the Easy Design in Tool (EDIT) at www.easydesignintool.philips.com.

1. Determine the required driver current (I_{drive}) and voltage (V_f)
2. Calculate the required power (P_{drive}) where:
 $P_{drive} = V_f \times I_{drive} \text{ (W)}$
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 Xitanium 75W 0.7 – 2.0A 54V 230V, the minimum programmable driver current is 0.7A and maximum is 2.0A.
5. Does the required voltage fit the voltage range of the driver? The exact value can be found in the driver 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 the driver mentioned above, the maximum output power is 75W.

Programming the output current

The Xitanium 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 configurable 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.

Configuration of Xitanium SR drivers can be done either by using the SimpleSet tool or the SR interface.

The output current can also be set by using a LEDset resistor. Please refer for more details to the Xitanium LED Linear Indoor driver design-in guide at p.19-24 at www.philips.com/oem.

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

Xitanium LED SR drivers are equipped with push-in connectors. More info about connectivity (wiring diagram, wire diameters, strip length) can be found in the driver datasheet.

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 SR drivers support operation on power sources or grids providing a clean and symmetrical sinusoidal AC voltage wave form, a clean DC voltage or rectified sinewave input voltage ("joker voltage").

Operation on power sources including but not limited to having e.g. a square-wave voltage form or a "modified sinewave" is not supported.

Low and high mains voltage

Xitanium LED 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.

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 high mains voltage

An excessive high mains voltage will stress the driver and have an adverse effect on the lifetime. Xitanium 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 LED SR drivers are suitable for direct connection to TN and TT grids. Depending on driver type, a luminaire-based fuse in the driver neutral connection may be required in case both feeding phases are "hot".



Warning: certain restrictions apply for use in IT grids.

Direct connection of Xitanium 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. Keep in mind that the insulation between the driver mains input and the metal driver housing is **basic**.

Power Factor (PF)

Xitanium SR drivers have a high power factor which is controlled by an active Power Factor Controller. Its power factor characteristic is inherently capacitive and its capacitive nature cannot be compensated for. The output power dependent PF graph can be found in the driver datasheet.

DC emergency operation (DCemDim)

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 SR drivers, the DC Emergency Dim feature 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 default setting when connected to a DC input is 15% of the defined output current.

The mains input of DC-rated drivers is not polarity-sensitive for DC input voltage and the driver is fully CISPR 15 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 LED SR drivers are equipped with an internal fuse rated for AC & DC voltage operation. Therefore, the use of an external DC voltage rated fuse is not required in case of DC (emergency) operation.

More on setting parameters of DCemDim can be found in the user manual of MultiOne. 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 and should be avoided.

Inrush current

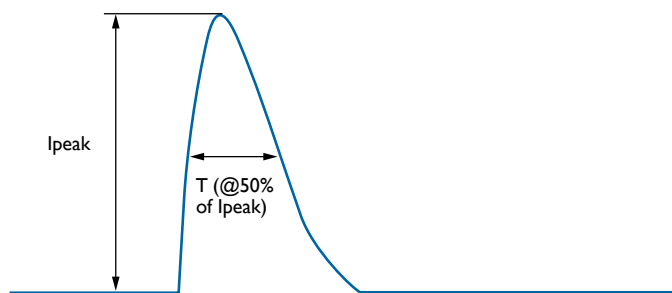
The term 'Inrush current' refers to the briefly occurring high input current which flows into the driver during the moment of connection to mains; see the illustration on the left. Typically, the amplitude is much greater than the steady-state input current. The cumulative inrush current of a given combined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



Note: 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. Signify has not tested the effectiveness and compatibility of such devices in the application. It is the responsibility of both luminaire manufacturer and installer to ensure compatibility as well as compliance with national electrical codes when either device is used in the application.



Graphical representation of inrush current

MCB type	Rating (A)	Relative number of LED drivers (%)
B	4	25
B	6	40
B	10	63
B	13	81
B	16	100 (reference)
B	20	125
B	25	156
B	32	200
B	40	250
C	4	42
C	6	63
C	10	104
C	13	135
C	16	170
C	20	208
C	25	260
C	32	340
C	40	415
L, I	16	108
L, I	10	65
G, U, II	16	212
G, U, II	10	127
K, III	16	254
K, III	10	154

The max. recommended amount of drivers in the table above only serves as guidance. The actual maximum amount in the application may differ; it is dependent on MCB brand/type and inherent MCB tolerances.

How to Determine the Number of Drivers on a MCB

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

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

Example:

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

How to determine the Number of Drivers on a melting fuse

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

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

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

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

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

Example:

A group of identical drivers is connected to a 16A gG melting fuse with a melting integral value of $350A^2s$. Specified driver inrush current peak and width is 65A and $330\mu s$. Maximum steady-state input current is 0.8A per driver.

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

Answer: the I^2t value of the inrush current is $(65A)^2 \times (0.8 \times 330 \times 10^{-6}s) = 1.12A^2s$ per driver. The aggregate value of the driver inrush current must remain below $0.5 \times 350A^2s = 175A^2s$. This translates in a maximum of $\sqrt{(175A^2s/1.12A^2s)} = 12$ drivers.

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

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

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



Notes:

- Specified inrush current data is based on a average mains grid with an impedance of $400\text{m}\Omega + 800\mu\text{H}$. 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 30mA Residential Current Device (RCD) is typically 30. However, the actual maximum amount depends on RCD brand and type so the actual number may vary and will have to be defined on-site.

Surge immunity

Xitanium LED SR drivers have elevated surge immunity. Depending on the mains connected, additional protection against excessive high surge voltages may be required by adding a Surge Protection Device. The actual driver immunity level can differ per driver and can be found in the driver's datasheet.

Protective conductor current

Xitanium LED SR drivers are designed to meet safety requirements per IEC 61347-1 standard. The specified value of the protective conductor current can be found in the driver datasheet. The test is done on driver level only. In a luminaire, this current may be higher, since the LED module may introduce additional current due to its inherent parasitic capacitance. Therefore, precautions may be required on luminaire level. In a luminaire, the cumulative protective conductor current may be higher, since the LED module may introduce additional current. Precautions may be required on the luminaire level if multiple drivers are used in a single luminaire.

Electro-Magnetic Compatibility (EMC)

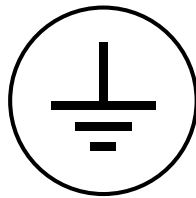
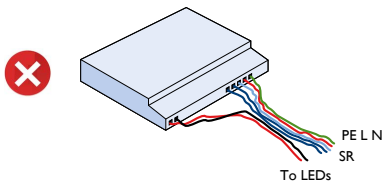
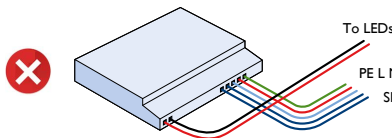
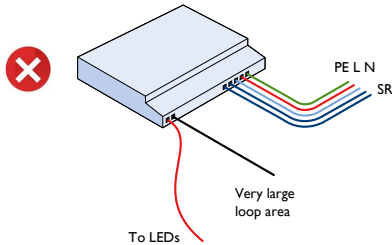
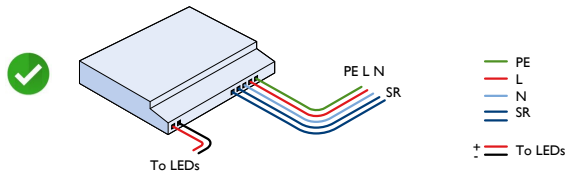
Electro-Magnetic Compatibility (EMC) is the ability of a device or system to operate satisfactorily in its electromagnetic environment without causing unacceptable interference while having sufficient immunity. Xitanium LED SR drivers meet EMC requirements per CISPR15 for conducted and radiated emissions. This test is conducted with a reference setup that includes a driver and an LED module + heat sink combination mounted on a metal plate and is verified in Insulation Class I configuration.

Cable length and EMC

Signify has successfully performed EMC tests for a total output cable length of 0.6m (cable length between driver and Philips Fortimo LED Line modules). Select drivers may allow for a longer length; please refer to the driver datasheet to look up the applicable maximum value. Since EMC performance of the luminaire is heavily dependent on the wiring itself, we advise for lengths exceeding the maximum specified length to repeat EMC testing to ensure compliance.

Remote mounting and EMC

Xitanium SR LED Indoor Linear drivers are primarily intended for built-in use only inside/on a luminaire. Remote mounting or independent use will require additional measures like strain reliefs and may require additional measures for EMC compliance.



Symbol for Protective Earth (PE)



Warnings for non-isolated drivers:

- Do not touch any non-insulated live parts, even on the output (secondary) side!
- This includes the LEDset component.
- Make sure to fully insulate the LEDset to prevent it from accidentally touching the driver housing.

EMC performance precautions

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

- Minimize the loop area of the LED output wires going from the driver to the LED module by keeping the output wires close together (bundling).
- Minimize the parasitic capacitive coupling of the LED output wiring towards earth by keeping the wiring length as short as possible.
- Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and SR control wires separated from the LED output wires. Do not bundle or cross the LED output wires with either SR or mains L+N wires.
- Keep the earth wires as short as possible to maximize their effectiveness and use, as much as possible, large metal areas (chassis, mounting plates, brackets) for earthing purposes instead. Establish a reliable electrical connection by using a toothed washer and screw(s) fastened with adequate mounting torque.

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

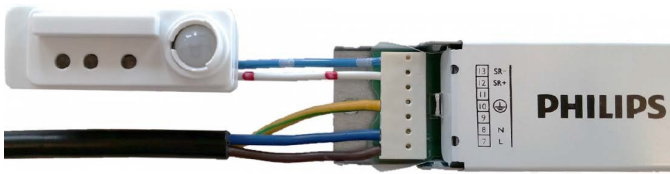
Electrical insulation and protective earth

Non-isolated drivers

Xitanium LED SR drivers have no insulation between the mains input and the LED output. Therefore, all internal driver parts are live. **Basic** insulation is present between all internal live parts and the metal driver chassis; therefore the driver housing must be connected to Protective Earth as indicated by the Protective Earth (PE) symbol as shown on the left.

Non-isolated drivers are designed for use in Class I luminaires and do not support use in Insulation Class II applications without further additional safety measures on luminaire level.

Warning: all output connections of non-isolated drivers (incl. LEDset) are live and thus not safe to touch; therefore all live parts must be made inaccessible by luminaire design. The (unpainted) bottom part of the driver chassis can be used to create a protective earth contact to the luminaire housing, as the earth connector is internally connected to the driver housing. An intermitting earth contact should be prevented, as this is potentially unsafe and can cause degraded luminaire performance.



Two-wire sensor connected to driver SR interface

Sensor Ready Interface

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 (Part 250)
- Memory Bank I Extension to store luminaire data (Part 251)
- Two-way digital communication between the SR driver(s) and control device, using standard DALI protocol via a polarized SR bus:
 - Standard DALI dimming, ON/OFF
 - Power and energy reporting utilizing the power monitoring integrated in the driver (Part 252)
 - Diagnostic and Maintenance information (Part 253)

See www.digitalilluminationinterface.org/d4i/ for more info.



Warning: although communication via the SR (DA+/DA-) interface is based on DALI protocol, the interface itself is **not** an inter- or extra-luminaire DALI interface! The SR bus supports **intra-luminaire use only**.

Exception: the use of the SR bus of Xitanium SR *FlexTune* drivers is not limited to intra-luminaire use only. The SR bus of these drivers supports **inter-luminaire** use as well, also in combination with DALI drivers.

Built-in SR bus power supply unit (SR PSU)

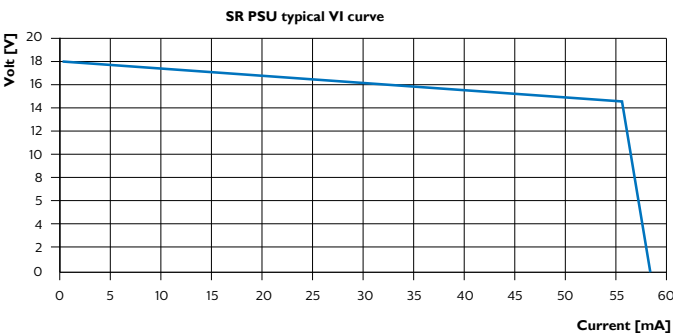
- Xitanium SR drivers have the ability to supply the SR bus with a built-in SR PSU. This PSU can be disabled and enabled. By factory default, the SR PSU is enabled and ready for use with an external control device. The SR PSU is compliant per DALI Part 250.

- The SR PSU is capable of delivering a minimum current of 52mA (ISR) to the SR bus and the connected device(s).

- The SR PSU will never supply more than 60mA (ISR_MAX).

- The SR bus voltage is depending on the controller load and the amount of SR PSUs connected in parallel. See the graph on the left for the typical VI curve for one SR PSU.

- When the internal SR PSU is switched OFF the SR driver will extract a maximum of 2mA from the SR bus (like standard DALI gear).



Warnings:

Xitanium SR drivers: A maximum of **four** SR interfaces with enabled SR PSU are allowed to be connected in parallel in order not to exceed the maximum allowable SR bus current of 250mA. If more than four SR interfaces are connected in parallel then the SR PSUs of additional drivers must be disabled.

Xitanium SR FlexTune drivers: disable the SR PSU of **all** drivers in case these are used in a wired DALI network. SR bus polarity must be observed.

For your convenience it is suggested that disabling is done individually *before* mounting the driver in the luminaire. Disabling the supplies of multiple already mounted and connected drivers via MultiOne software won't be possible afterwards without having to access each driver physically.

Luminaire control devices

Most luminaire controllers intended to be used in an SR system will be powered from the SR bus. 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 interface is connected in parallel.
- The total available SR bus current (ISR_MAX_TOTAL) must not exceed 250mA. This current can be determined by adding up ISR_MAX of all connected and enabled SR PSUs. As a consequence a maximum of **four** enabled SR PSUs are allowed to be connected in parallel.
- The total current delivered to the SR bus (ISR_DELIVERED) can be determined by adding ISR of all connected enabled SR PSUs.
- The total current extracted from the SR bus (ISR_EXTRACTED) can be determined by adding up consuming devices like SR drivers with disabled SR PSU, other DALI gear and control devices (max. 2mA/device).
- To guarantee good communication, a margin of 8mA is needed to drive the SR bus itself (ISR_MARGIN).
- The following rule should be respected:
$$\text{ISR_EXTRACTED} + \text{ISR_MARGIN} \leq \text{ISR_DELIVERED}.$$



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 SR PSU of this driver is enabled. The specification of the control device states that the extracted peak current is 40mA. Will this SR system have good communication?

Answer: one SR PSU is involved, so SR bus polarity is irrelevant.

$\text{ISR_MAX_TOTAL} = 60\text{mA}$. This is $\leq 250\text{mA}$.

$\text{ISR_DELIVERED} = 52\text{mA}$

$\text{ISR_EXTRACTED} = 40\text{mA}$

$\text{ISR_MARGIN} = 8\text{mA}$

Result: $40 + 8\text{mA} \leq 52\text{mA}$

Conclusion: this system will function properly.

2. Is it allowed to add an SR driver with disabled SR PSU to this SR system?

Answer: an SR driver with disabled SR PSU extracts 2mA from the SR bus.

$\text{ISR_EXTRACTED} = 40 + 2 = 42\text{mA}$.

$42 + 8\text{mA} \leq 52\text{mA}$

Conclusion: this system will function properly.

3. Can this SR PSU also be switched on?

Answer: yes, but polarity of both SR PSUs should be observed.

$\text{ISR_TOTAL} = 2 * 60 = 120\text{mA}$. This is $\leq 250\text{mA}$

Conclusion: this system will function properly.

Configurable driver parameter	Configuration		
	(Factory default)	SimpleSet	SR Interface using MultiOne Tool
Adjustable Output Current (AOC)	•	•	•
SR PSU (ON/OFF)		•	•
Standard DALI Configurable Parameters			•

Configuration options

Digital SR communication

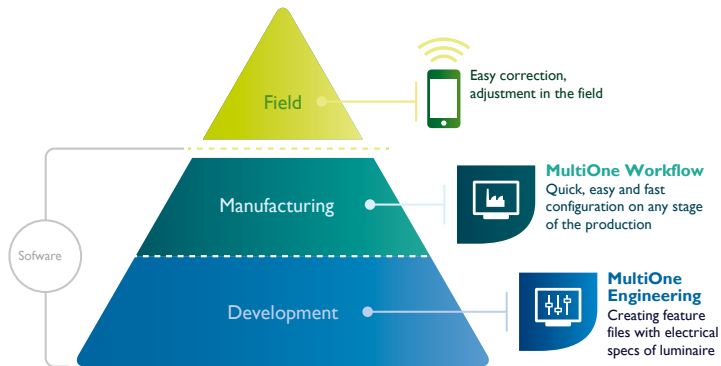
Driver control via SR bus commands is possible through the standard digital interface based on DALI protocol.

- 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 driver also supports many logged and realtime diagnostic features/parameters which can be accessed via the SR interface, as per SR Certified specification or D4i standard.

Standby power consumption

Xitanium LED SR drivers consume < 0.50W per driver when in standby mode. This standby power is excluding power consumed by a sensor connected to the SR bus. The SR PSU - if enabled- remains active when the driver is in standby mode.

Driver configuration



Introduction

Select Xitanium Indoor Linear SR drivers offer a tailored 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 configurable drivers from Signify, ensuring that the driver performance matches the needs of the lighting solution. It offers unprecedented flexibility, before, during and after the product installation. Programming of the drivers can be done either by via SimpleSet or via the SR interface.

For more information on MultiOne installation – software and programming: please visit www.philips.com/multione.

Control 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.

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

Adjustable Light Output (ALO)

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

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

Depending on driver type, there are 2 ALO versions available: one version with and one without the option to set the ALO minimum level. Please refer to the driver datasheet to find out which ALO version is supported.

Touch and Dim (SR FlexTune drivers only)

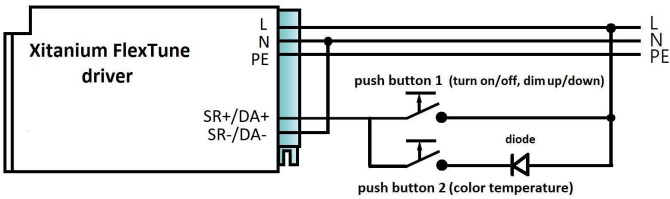
Xitanium SR FlexTune drivers are equipped with the Touch and Dim feature (TD). This feature is based on applying momentary mains voltage by means of two momentary push buttons to the SR-DA interface. These push buttons can be used to turn on/off and dim up/down the light (push button 1) and to change the color temperature (push button 2). See the connection diagram on the left. Mains voltage is permanently present at the LED driver mains input (even when the light is switched off) and light can be switched on or dimmed by momentarily applying mains voltage to the SR/DA interface via push button 1. A short push will switch the light on or off, depending on the previous situation. In order to tune the color temperature with push button 2 a series diode must be connected in series with push button 2. This diode must have a voltage rating of at least 700V. It is recommended to use a general-purpose diode, e.g. 1N4007. Alternatively, any DALI 209 compliant control module can be used.

Touch and Dim behavior

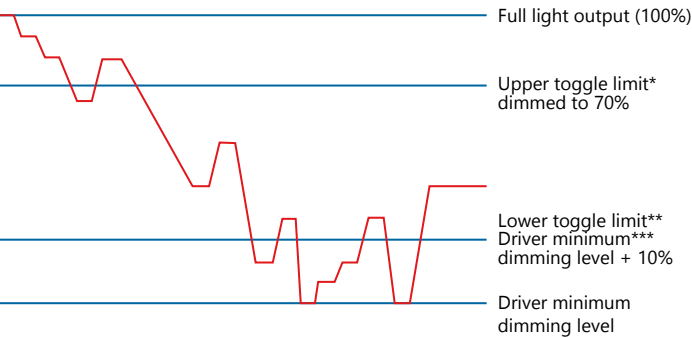
When the light is turned off (short push on push button 1), the driver will store the current light level and color temperature. As soon as the driver is turned back on again (short push) the driver will recall these stored values.

If push button is pushed for a longer period of time then, the light will dim up or down, depending on what is opposite from the last dimming direction. See the graph and timing table on the bottom left for details. Once the mains power returns after a power failure, the driver will activate the power-on level according to IEC 62386: 102.

Note: the driver SR PSU of all drivers must be disabled in case the Touch and Dim feature is used!



Appropriate connection of the Xitanium SR FlexTune driver, using the Touch and Dim protocol



* Always dim down above the upper toggle limit
** Always dim up under the lower toggle limit
*** Examples:
- a driver with a minimum dimming level of 10% leads to lower toggle level of 10% + 10% = 20%
- a driver with a minimum dimming level of 1% leads to lower toggle level of 10% + 1% = 11%

Touch and Dim action	Contact duration	Driver response
Ignore	< 40 ms	Ignore
Short push	40ms to 0.5s	Toggle on/off
Long push	0.5s to 10s	Dim up or down
Reset push	>10s	Driver synchronization



DC emergency dimming operation (DCemDim)

Xitanium LED 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 (15%) configurable emergency dimming level.

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.

SR PSU

Xitanium LED SR drivers are equipped with an integrated Power Supply Unit (PSU) to power controller and nodes via the SR communication bus. This PSU can be disabled if power is not needed. The PSU must be disabled if more than four SR PSUs are connected in parallel in order to prevent SR bus current exceeding 250mA.

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, SR dim level 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:

$$I_{out} = AOC \times ALO \times SR \text{ dim level}$$

Example:

Driver AOC = 500mA, ALO = 80%, SR dim command = 242 (70%). Actual output current is then $500 \times 0.8 \times 0.7 = 280\text{mA}$.

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

$$\text{Maximum output current} = \text{rated AOC} \times 0.6$$

OEM Write Protection (OWP)

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

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

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

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

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

It is important for the OEM to set up a password management system, keeping feature file and password together in the BoM of the luminaire. The password management is under the responsibility of the OEM who sets it. In case of a lost password, the OEM is advised to contact the local Signify representative.

Appendix: FlexTune

CCT tuning

It is important to understand the CIE chromaticity diagram because the DALI standard adopted for color control uses the x, y coordinates representing each CCT. The DALI 209 standard, also known as DALI Type 8, defines a DALI compatible device (Device Type 8), which allows a user to change color temperature and intensity to their preference within the same luminaire to achieve tunable white color changing. The Xitanium SR FlexTune driver is a DALI Type 8 device and uses x, y coordinates for color tuning.

The Xitanium SR FlexTune driver meets the requirements of DALI 209 with the following two exceptions:

- The DALI command, STORE_COLOUR_TEMPERATURE_Tc_LIMIT, used in conjunction with the DALI commands COLOUR_TEMPERATURE_PHYSICAL_COOLEST_Tc and COLOUR_TEMPERATURE_PHYSICAL_WARMEST_Tc, will have no effect for the Xitanium SR FlexTune driver. These parameters, Cool LED* and Warm LED* are configured, through the MultiOne configurator, by the use of the LED string configuration feature* in order to achieve the most accurate color temperature performance.
- The factory defaults for the DALI commands, POWER_ON_COLOR and SYSTEM_FAILURE_COLOR, will return predefined values for both the Power on Tc* and System failure Tc*. The values for these features can be modified by the OEM or end user to their preference.

*: See the "SimpleSet configurable features: FlexTune specific features" section for an explanation and configuration settings of these features.

The MultiOne configurator allows for both x, y coordinate entry and CCT entry but for CCT entry, the CCT entry is converted to an estimated x, y coordinate. This conversion results in some error in accuracy and the direct x,y coordinate entry method is recommended for this reason. All of the x, y coordinate calculations are done within the MultiOne tool and the resulting DALI values are transferred to the Xitanium SR FlexTune driver. The Xitanium SR FlexTune driver interprets these values and performs the correct CCT tuning.

Note: All x, y and CCT MultiOne configurator entries are values that have originated from the datasheets for the LED module being used with the Xitanium SR FlexTune driver.

MultiOne implementation

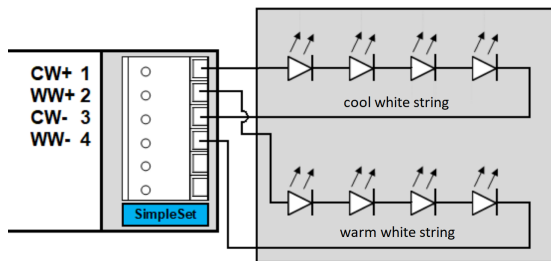
The Xitanium SR FlexTune driver uses a subset of the DALI 209 variables to program the desired CCT behavior. These are shown below with the corresponding MultiOne GUI representations. These MultiOne GUI items are explained in more detail in the section: Features of Xitanium SR FlexTune LED drivers. More information concerning MultiOne and its implementation is located here: www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator

DALI 209 variable

COLOUR TEMPERATURE Tc PHYSICAL COOLEST
COLOUR TEMPERATURE Tc PHYSICAL WARMEST
POWER ON COLOUR VALUE
SYSTEM FAILURE COLOUR VALUE
COLOUR TEMPERATURE Tc COOLEST
COLOUR TEMPERATUER Tc WARMEST

MultiOne GUI item

Cool LED
Warm LED
Power on Tc
System failure Tc
Tc coolest
Tc warmest



Output connection diagram

Driver wiring

Connector terminals with their corresponding functions are shown in the diagram to the left. The driver housing must be grounded for electrical safety (protective earth).

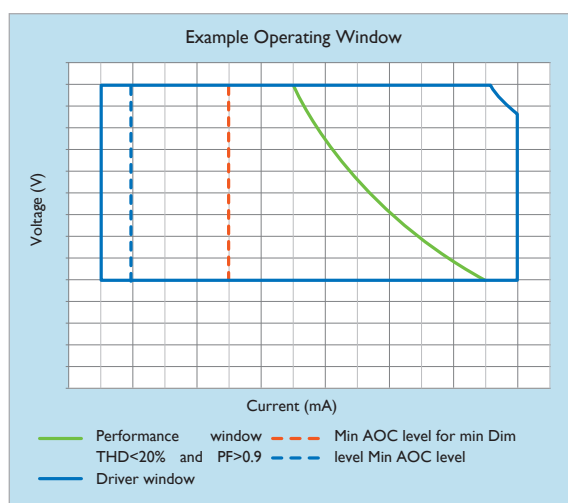
Connector terminals with their corresponding functions as well proper connections are shown in the diagram to the left.

There are two dedicated positive LED+ as well as two negative LED- connector terminals provided for connection to the cool white positive (CW+) and warm white positive (WW+) LED modules.



Important wiring guidelines

- The CW and WW connections are **not** interchangeable. Do not connect e.g. the minus return wire of the warm white string to the - CW driver connector or combine the WW+ with CW+ or WW- with CW- to reduce the number of wires.
- Parallel connection of the two driver outputs is **not** supported.
- Keep wiring between the driver and the LED module as short as possible.
- **Due to the CCT tuning design of the driver, there is a maximum length defined for any connection between the driver output and the LED module to maintain CCT tuning accuracy.** Larger distances are permissible but CCT tuning accuracy cannot be guaranteed and may impact EMC performance. Please consult the datasheet for the maximum allowable length.
- Keep the sets (+/-) of CW and WW wires between the driver output and LED module the same length whenever possible for the best performance.
- Route the CW- and WW- wires closely together. Consider twisting the CW- and WW- wires, where possible, for the best overall EMC performance.
- Remote mounting of the Xitanium SR FlexTune driver is not supported.



Example operating window (dimmable driver)

Operating window

Xitanium SR FlexTune drivers can deliver different levels of output power, depending on driver type, and a different output current/ output voltage window applies to each. The LED module current and voltage characteristics must be within the driver window (under steady state, full output or dim). The driver performance cannot be guaranteed outside the window. See the illustrated example of an operating window for a dimmable driver. Please consult the datasheet for the specified operating window for the driver you are using.

Note that the total output power of the two outputs combined cannot exceed the rated driver output power. The difference in LED module forward voltages between the CW and WW outputs is not allowed to more than +/- 6%.

The LED module voltage is typically influenced by a number of factors such as the LED temperature, binning (tolerance), drive current and aging. It is important to consider these factors when determining the required voltage range for a certain LED module to ensure that the LED voltage stays within the operating window of the driver. The driver will limit the voltage available for the LEDs based on its operating window.

SimpleSet configurable features: FlexTune specific features

Note: Please also refer to the Philips MultiOne configurator user manual for more information. More information concerning MultiOne and its implementation is located at www.lighting.philips.co.uk/oem-emea/products/philips-multione-configurator.

The SimpleSet configurable features, as shown in the figure below, are specific to the FlexTune system. These features are:

- LED string configuration by x, y
- LED string configuration by Tc (CCT)
- Light level configuration - constant lumen output
- Light level configuration - flexible lumen output
- Additional color configuration - power on Tc
- Additional color configuration - system failure Tc
- Additional color configuration - Tc coolest
- Additional color configuration - Tc warmest
- Additional color configuration - Tc offset (+/-)

These features are explained in more detail in the following pages.

Note: The values in the figure below are the default setting for the Xitanium SR FlexTune 75W driver.

The screenshot displays the Philips SimpleSet configurator interface for the FlexTune system. The interface is divided into a left sidebar with a tree view of configuration categories and a main content area with detailed settings.

Left Sidebar (Tree View):

- Device features (selected)
- Test
- Energy meter
- Diagnostics
- Installer
- Data containers
- Summary
- ALO
- CLO
- Corridor M...
- DALI 102
- DALI 253 M
- DC Emerge...
- FlexTune (selected)
- Luminaire ...
- Min dim level
- OWP
- SR PSU

Main Content Area (FlexTune):

LED string configuration

Configuration by:

	X	Y	Tc	Rated lumen	Rated current
Cool LED	0.3123	0.3282	6533 K	2328 Lm @	200 mA
Warm LED	0.4578	0.4101	2723 K	2157 Lm @	200 mA

Light level configuration

Light output over Tc range:

Cool LED: Lm @

AOC: mA

Warm LED: Lm @

AOC: mA

Additional color configuration

Power on Tc: K

System failure Tc: K

Tc coolest: K

Tc warmest: K

Tc offset (+/-): K

Feature	Description of the feature	Notes and examples
LED string configuration by x, y	<p>LED string configuration using x and y coordinates. This feature allows the LED characteristics to be entered into the configurator by the OEM. Input is based on the x and y chromaticity coordinates of the warm and cool CCT of the module. These coordinates are the endpoints for the entire color range of the LED module. Using the LED modules x and y coordinates results in the most accurate CCT operating point. The rated lumens of the LED module at a rated current is entered as well for both the cool and warm temperature. The information for the x and y coordinates, lumen and current ratings can be found in the datasheet of the LED module.</p>	<p>The OEM enters the x and y coordinates for the cool and warm LED module characteristics as provided in the datasheet by the LED module manufacturer. The rated lumens for the LED module is also entered along with the rated current at that specific lumen level for both the cool and warm temperatures. This information is also entered from the LED module datasheet.</p> <p>Note: To provide a proper estimate of the lumen output from the luminaire, the user needs to enter the luminaire rated lumens and the rated current value related to that specific lumen level into the configurator for both the cool and warm LED.</p> <p>Note: This is an OEM write protected feature.</p>

LED string configuration

Configuration by
X, Y

	X	Y	Tc		Rated lumen		Rated current
Cool LED	0.31	0.327	6671 K		2200 Lm	@	308 mA
Warm LED	0.457	0.408	2717 K		2040 Lm	@	394 mA

Feature	Description of the feature	Notes and examples
LED string configuration by Tc (CCT)	<p>LED string configurations using Tc (CCT) values. This feature allows the LED characteristics, based on the LED module cool and warm temperature CCT values, to be entered by the OEM into the configurator. These CCT values are the endpoints for the entire color range possible of the LED module. Using the LED modules CCT values is not as accurate as using the X and Y coordinate method for CCT accuracy. Using the CCT value method, the X and Y chromaticity coordinates are estimated using the CCT values supplied. This process of estimation results in a less accurate actual CCT operating point. The rated lumens for the LED module at a rated current is entered as well for both the cool and warm temperature. The information for the CCT values, lumen and current ratings are included in the datasheet of the LED module.</p>	<p>The OEM enters the CCT values for the cool and warm LED module characteristics as provided in the datasheet by the LED module manufacturer. The rated lumens for the LED module is also entered along with the rated current at that specific lumen level for both the cool and warm temperatures. This information is also entered from the LED module datasheet.</p> <p>Note: To provide a proper estimate of the lumen output from the luminaire, the user needs to enter the luminaire rated lumens and the rated current value related to that specific lumen level into the configurator for both the cool and warm LED. The lumen output from the luminaire must take into consideration the losses of the luminaire (lens, paint, etc.).</p> <p>Note: This is an OEM write protected feature.</p>

LED string configuration

Configuration by Tc

	X	Y	Tc		Rated lumen		Rated current
Cool LED			6671 K		2200 Lm	@	308 mA
Warm LED			2717 K		2040 Lm	@	394 mA

Note: When "Configuration by Tc" is selected, the X and Y values are estimated. This may result in lower Tc accuracy.

Feature	Description of the feature	Notes and examples
Light level configuration -constant lumen output	<p>Light level configuration with constant lumen output. This feature allows the LED module lumen output level to be held constant at a specified lumen level. The lumen level is determined from the module datasheet and only the cool LED current information corresponding to specified lumen level is entered into the configurator by the OEM. The warm LED current level will be automatically filled into the configurator as a calculated value by MultiOne based on the LED module information entered in the LED string configuration . The lumen levels for both the cool and warm LEDs will be shown and can be confirmed against the current level that was input as data. The driver will maintain the lumen output over the entire CCT range from coolest to warmest.</p> <p>Note that the adjustable output current (AOC) feature is included as part of the Light Level Configuration feature. The AOC feature allows the maximum output current to be set within the stated range for the output current (Iout) as noted in the driver datasheet. For constant lumen output, the cool LED will always have a lower current value in comparison to the warm LED due to the higher efficiency of the cool LED. This means the maximum current provided by the driver will always be limited by the warm LED and minimum driver current will always be limited by the cool LED.</p>	<p>The OEM enters the current value for the cool LED as provided in the datasheet by the LED module manufacturer for a given lumen level. The lumen output information will be displayed by the configurator and can be verified for accuracy. The AOC level can then be set (slider or box entry) to whatever current is needed for the particular lumen output at the luminaire level.</p> <p>Note: This is an OEM write protected feature.</p>

Light level configuration

Light output over Tc range

Constant

Cool LED

4636

 Lm @

AOC

 649 mA

Warm LED

4636

 Lm @

AOC

 895 mA

Feature	Description of the feature	Notes and examples
Light level configuration - flexible lumen output	<p>Light level configuration - flexible lumen output. This feature allows the LED module lumen output level to be flexible across a wide CCT range. A reference lumen level can be determined from the module datasheet from both the cool and the warm LED current information corresponding to a specified lumen level and both of these current values are entered into the configurator by the OEM. The lumen levels for both the cool and warm LEDs will be shown and can be confirmed against the current levels that were input as data. The user has the ability to tailor the current levels, either cooler or warmer, at either end of the LED module CCT range, affecting the lumen output at every specific CCT. The driver will vary the lumen output over the entire CCT range from coolest to warmest.</p> <p>Note that the adjustable output current (AOC) feature is included as part of the Light Level Configuration feature. The AOC feature allows the maximum output current to be set within the stated range for the output current (Iout) as noted in the driver datasheet. For flexible lumen output, either the cool or warm LED can have a higher or lower current level or possibly even the same current level. This means the maximum current provided by the driver will always be limited by the cool or warm LED with the most current and the minimum driver current will always be limited by the cool or warm LED with the least amount of current.</p>	<p>The OEM enters the current value for both the cool and warm LED as provided in the datasheet by the LED module manufacturer for a given lumen level. At this point the lumen output information will be displayed by the configurator and can be verified for accuracy. The AOC level can then be set (slider or box entry) to whatever current is needed for the particular lumen output at the luminaire level. The OEM has flexibility to tailor the lumen output at different CCT points as needed or required.</p> <p>Note: This is an OEM write protected feature.</p>

Light level configuration

Light output over Tc range

Flexible

Cool LED

4636

Lm @

AOC

649

mA

Warm LED

4634

Lm @

AOC

895

mA

Feature	Description of the feature	Notes and examples
Additional color configuration - power on Tc output	<p>Additional color configuration - power on Tc. This feature allows the ability for the OEM to specify an initial CCT at power on of the system (driver plus LED module). Selection of the CCT is limited to the available range of the LED module as initially entered into the LED string configuration settings.</p>	<p>The OEM can set the initial CCT by slider or box entry to what is desired at system power on.</p> <p>Note: This is an OEM write protected feature.</p>
Additional color configuration -system failure Tc	<p>Additional color configuration-system failure Tc. This feature allows the ability for the OEM to specify a CCT in the instance of failure of the system. System failure is defined here as a DALI bus communication failure. Selection of the CCT is limited to the available range of the LED module as initially entered into the LED string configuration settings.</p>	<p>The OEM can set an expected CCT by slider or box entry to what is desired in the event of a DALI bus communication failure.</p> <p>Note: This is an OEM write protected feature.</p>
Additional color configuration -Tc coolest	<p>Additional color configuration-Tc coolest. This feature allows the ability for the OEM to specify a cool CCT lower limiting endpoint other than the CCT cool LED limit set by the LED module parameters. Selection of the cool CCT endpoint is limited to the available range of the LED module as initially entered into the LED string configuration settings.</p>	<p>The OEM can set a lower limiting endpoint for the coolest CCT by slider or box entry to what is desired. The limiting endpoint will not allow operating at a CCT below the chosen setting.</p> <p>Note: This is an OEM write protected feature.</p>
Additional color configuration -Tc warmest	<p>Additional color configuration-Tc warmest. This feature allows the ability for the OEM to specify a warm CCT upper limiting endpoint other than the CCT warm LED limit set by the LED module parameters. Selection of the warm CCT endpoint is limited to the available range of the LED module as initially entered into the LED string configuration settings.</p>	<p>The OEM can set an upper limiting endpoint for the warmest CCT by slider or box entry to what is desired. The limiting endpoint will not allow operating at a CCT above the chosen setting.</p> <p>Note: This is an OEM write protected feature.</p>

Feature	Description of the feature	Notes and examples
Additional color configuration - TC offset (+/-)	<p>Additional color configuration-Tc offset (+/-). This feature allows the user to enter a positive or negative CCT offset in Kelvin. This may be used to offset for color shifts caused by secondary optics or light guides or even external influences such as non-white painted surfaces near the light source. This feature can also be used for field tuning of fixtures.</p>	<p>The OEM can use this feature by entering positive or negative value using the slider or box entry to create a CCT offset for color tuning.</p> <p>This feature can also be used for field tuning of fixtures where differences might be noted between luminaries in close proximity to one another.</p> <p>Note: This is not an OEM write protected feature.</p>

Additional color configuration

Power on Tc

4000

K

System failure Tc

3500

K

Tc coolest

6500

K

Tc warmest

2717

K

Tc offset (+/-)

0

K

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/oem. For further questions please contact your local Philips sales representative.

System Disposal

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

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