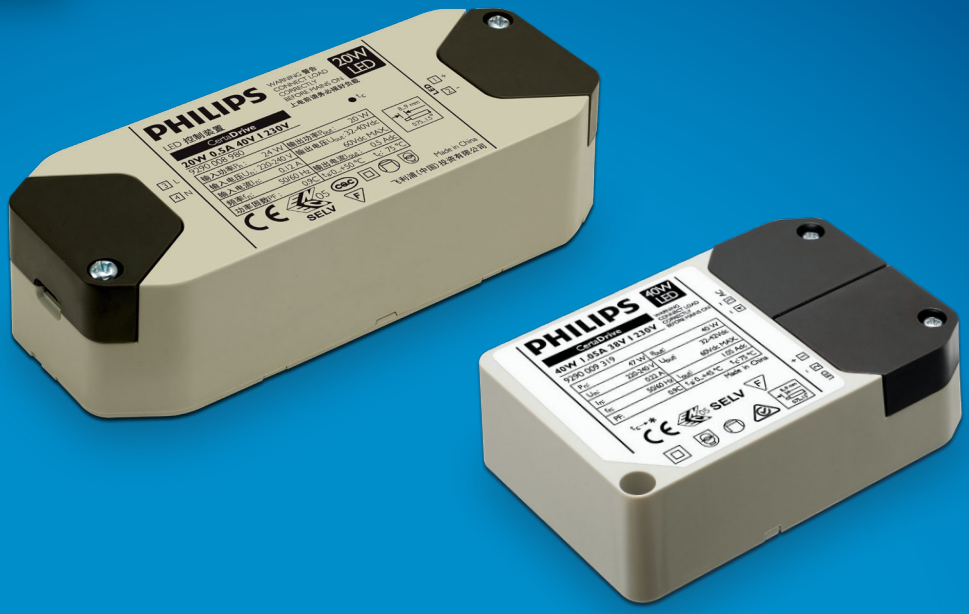
PHILIPS

CertaDrive

LED indoor driver

Spot & Downlight



Design-in Guide

Enabling **future-proof LED technology** for dynamic LED markets

April 2015

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December, 2014

Updated since previous version
Updated EMC information

Contents

Introduction to this guide

Examples of CertaDrive indoor down & spotlight LED drivers

Thank you for choosing the Philips CertaDrive 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 CertaDrive LED drivers optimized for indoor down- and spotlighting. We advise you to consult our websites for the latest up-to-date information.

Applications

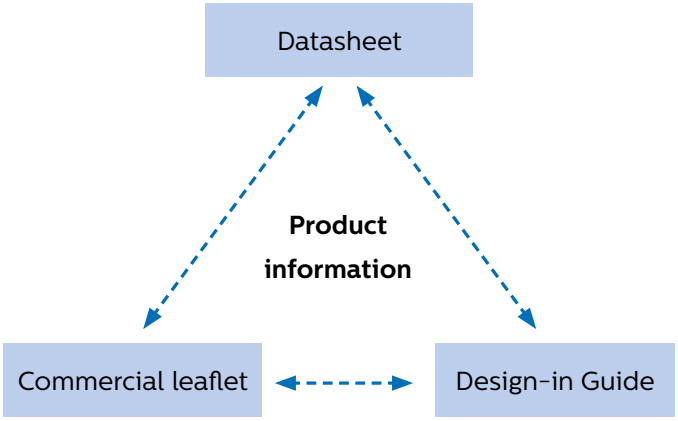
The CertaDrive Indoor Spot & Downlight LED drivers are designed to operate LED solutions for indoor lighting, like offices, public buildings and retail environments. If you use Philips LED drivers in combination with Philips LED modules, specific design-in guides are available from the below mentioned technology websites.

Information and support

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

Design-in support

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



Determine which documents contain what information

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

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

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

Safety precautions

Warning:

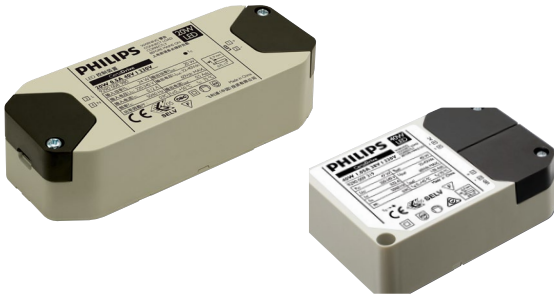
- Avoid touching live parts!
- Do not use drivers with damaged housing and/ or connectors!
- Do not use drivers with damaged wiring!
- Class I luminaires must be connected to protective earth!

Safety warnings and installation instructions

- Do not use damaged or defective contacts or housings
- Do not use damaged products
- Cap off all unused wires to prevent accidental contact with the luminaire or driver housing
- The luminaire manufacturer is responsible for his own luminaire design and has to comply with all relevant safety standards
- The CertaDrive Indoor LED drivers are intended for indoor use and should not be exposed to the elements such as snow, water and ice. It is the luminaire manufacturer's responsibility to prevent exposure.
- Do not service the driver when the mains voltage is connected, this includes connecting or disconnecting the LED load.
- Please provide adequate earth connection when applicable.

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

Introduction to CertaDrive Indoor Spot &Downlight LEDdrivers



CertaDrive LED Drivers

Introduction

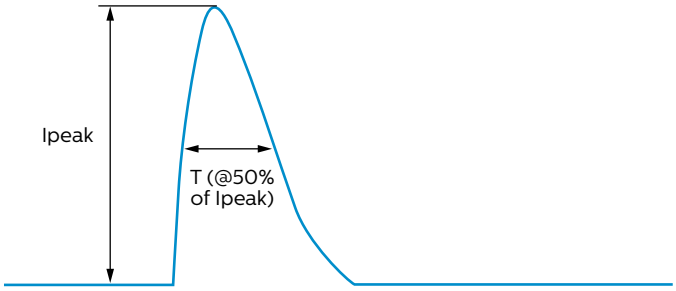
CertaDrive LED drivers are designed to operate LED solutions for general lighting applications such as downlighting and spot/accent lighting.
The operating points are chosen specifically to suit the most commonly used CoB applications.

Example: CertaDrive 15W 0.35A 42V I 230V

CertaDrive: Brand name for reliable, easy to use LED drivers

15W	:	Maximum output power
0.35A	:	Output current
42V	:	Maximum output voltage
I	:	Independent housing design
230V	:	Mains AC input voltage

Electrical design-in



Graphical representation of inrush current

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

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

Connectors

Different connectors are used on the Philips CertaDrive Indoor Spot & Downlight drivers. More info about the type of connector and wiring (diameter, length, etc.) can be found in the datasheet. The datasheets of each driver can be downloaded via www.philips.com/technology.

Mains Connectors

Orange push-in connectors are used to connect the drivers to the mains.

Inrush current

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

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

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

Inrush parameters are driver-specific an can be found in the driver datasheet at www.philips.com/technology.

To Determine the Number of Drivers on a MCB

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

Notes:

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

Surge protection

The CertaDrive Indoor Down- and Spotlight drivers have limited built-in surge protection. Depending on the mains connected, additional protection against excessive high surge voltages may be required by adding a Surge Protection Device.
The actual limit can differ per driver and can be found in the driver's datasheet in the download section on www.philips.com/technology.

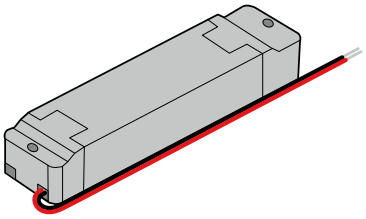
Touch current

The CertaDrive Indoor Spot & Downlight LED drivers are designed to meet touch current requirements per IEC 61347-1 standard. The specified maximum values are 0.7 mA peak for IEC and 0.75 mA RMS for UL norms. The test is done with the driver alone. In a luminaire, touch current may be higher, since the LED load may introduce additional touch current. Precautions may be required on the luminaire level and if multiple drivers are used in a single luminaire.

Electromagnetic compatibility (EMC)

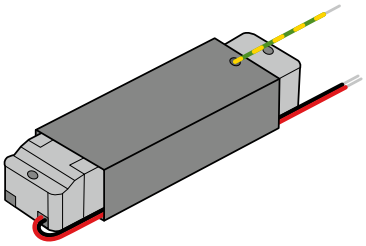
Electromagnetic compatibility (EMC) is the ability of a device or system to operate satisfactorily in its electromagnetic environment without causing unacceptable interference in practical situations. CertaDrive indoor LED drivers meet EMC requirements per CISPR15 ed 7.2. This test is conducted with a reference setup that includes a driver and an LED load/heat sink combination mounted on a metal plate.

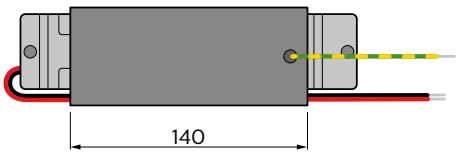
The reference set-up defined for point-source drivers used in a plastic Class II fixture is visualized below:

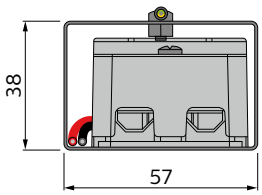


The output wiring routed along the total enclosure, although not recommendable, is very common in track-luminaires and simply had to be defined this way as reference.

The reference set-up defined for point-source drivers used in a Class I fixture is visualized below under different viewing angles including dimensions:







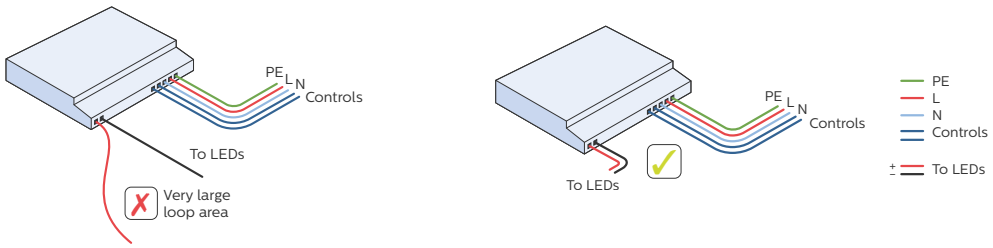
To represent a standard metal (track) luminaire the metal sleeve around the driver has been defined having approximately the same dimensions as the inside of the commonly used track fixture luminaire.

The distance from plastic housing towards the metal sleeve can influence the EMI performance.
This metal sleeve must be connected to earth to represent the Class I application.
The mains wiring should be kept as short as possible and be routed with maximum distance from the wiring to the LED's.

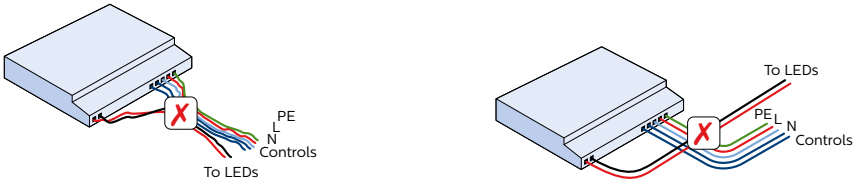
Improvement in EMC Performance

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

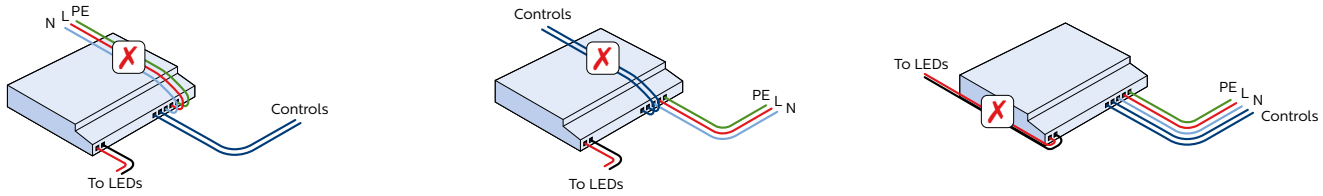
- Minimize the differential mode loop area of the lamp wires going from the driver to the light source by keeping the wires close together (bundling). This will minimize the magnetic field and reduce the radiated EMI.



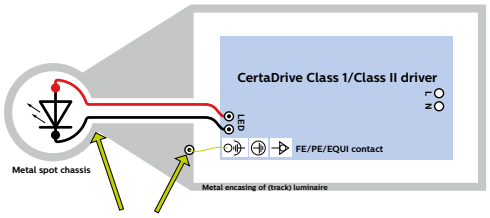
- Minimize the common mode parasitic capacitance of the output wiring + light source to earth by keeping the length of the wires between driver and light source as short as possible. Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and control wires(DALI,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



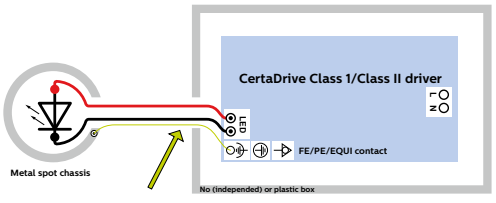
- Do not route any wiring over and/or along the driver enclosure to avoid any coupling/crosstalk with internal components of the driver.



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



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

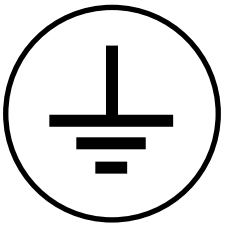


Metal spot chassis of an independent configuration connected to FE of driver

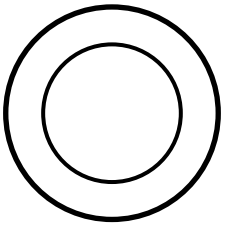
Adhering to these rules will help in EMC compliance. For further questions and/or design-in support please contact your local Philips representative.

Cable length and EMC

Philips has successfully performed EMC tests for systems with a cable length of 60cm. For longer cables it is advised to repeat these tests.



Symbol for Protective Earth (PE)



Symbol for Double Isolation between primary and secondary side of a driver, in combination with built-in usage.

Isolated drivers (SELV output)

These drivers have double isolation from the primary to the secondary side and a plastic chassis.

Electrical isolation

All CertaDrive Indoor Spot & Downlight LED drivers are SELV. This means that the output voltage doesn't exceed the SELV voltage limitations (<50 VAC, rms, <120 VDC). Also the output circuitry is double isolated from the mains.

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 Philips' product design phase all possible precautions have been taken to keep the component temperature as low as possible. However, the design of the luminaire and the ability to guide the heat out of the luminaire are of utmost importance. If these thermal points are taken into account this will ensure the optimum performance and lifetime of the system.

Case Temperature Point (Tc point)

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the driver remains within its rating. In the LED driver design, all precautions are taken to ensure that the components within the driver are at the lowest possible temperatures.

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

To measure Tc at the Tc point

The temperature can be measured using a thermocouple that is firmly glued to the driver housing. For a representative measurement the temperature must be stable before any reliable data can be obtained (typically > 0.5 hours).

Relation between Tc and ambient temperature

The Tc increases, by approximation, linearly with the ambient temperature (Tamb). The temperature offset between Tamb and Tc depends on the thermal design of the luminaire. The CertaDrive LED driver has been designed for indoor use. For approved ambient temperature range please check the associated driver datasheet on www.philps.com/technology.

Quality

Compliance and approval	Generated disturbances, EMI and EMC
EN 55015 A2/CISPR15	Conducted EMI 9 kHz-30 MHz
EN 55015 A2/CISPR15	Radiated EMI 30 MHz-300 MHz
IEC 61000-3-2 A1 + A2	Limits for harmonic current emissions
IEC 61000-3-3	EMC – Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment rated up to 16 A

Immunity	
IEC / EN 61547, A12000	Equipment for general lighting purposes – EMC immunity requirements
IEC / EN 61000-4-2	Electrostatic Discharge
IEC / EN 61000-4-3 A1	Radiated radio frequency, electromagnetic field immunity
IEC / EN 61000-4-4	Electrical fast transient/burst immunity
IEC / EN 61000-4-5	Surge immunity
IEC / EN 61000-4-6	Conducted disturbances induced by RF fields
IEC / EN 61000-4-11	Voltage dips, short interrupts, voltage variations

Performance	
IEC 62384	DC or AC supplied electronic control gear for LED modules - Performance requirements

Safety standards	
IEC 61347-1	General and safety requirements
IEC 61347-2-13	LED Particular requirements for DC or AC supplied electronic control gears for LED modules

04/2015
Data is subject to change.

www.philips.com/technology
www.philips.com/certadrive