Enabling future-proof LED technology for dynamic LED markets
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Introduction to this guide

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

Applications
The CertaDrive Indoor 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 below mentioned technology websites.

Information or support
Please consult your local Philips office or visit: www.philips.com/technology
Safety precautions

**Warnings:**

- 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!
- Switchable function to make the open load on the driver output is abnormal condition, it is not an intended application that be allowed.
- An external DC-rated fuse must be used when operated on DC mains!

**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
- For the strain relief installation, Crosshead PH-2 Screw is recommended to be used, recommended torque requirement for screw is 0.7~0.9 N.m.
- In case driver being used in three-wall condition for the independent application, make sure to keep at least 20mm distance from the body to wall for the sufficient thermal dissipation.
- Lamp control gear relies upon the luminaire enclosure for protection against accidental contact with live parts.

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

CertaDrive Indoor LED drivers are designed to operate LED solutions for general lighting applications such as down light, spot/accent, linear lighting in offices, public buildings as well as industrial and retail environments to fulfill the market need for essential lighting. The CertaDrive LED drivers offer basic specifications such as specific current and voltage settings, optimal to operate with Philips modules. The CertaDrive LED drivers have both high ripple and low ripple offerings available. Low ripple drivers can provide a better ripple current (<4% LF). These LED drivers are also interesting for OEMs producing and selling their own LED-boards. If the specific V/A specifications of these LED drivers do not suit the LED board specifications of the OEM, Philips offers the possibility to create fast derivative LED drivers with the required V/A of the OEM.

Note: The output current ripple specification highly depends on the Rd value of the load (lower Rd, higher current Ripple). It is suggested that Load Rd is selected according to the ripple specification.

Naming of the drivers

Example: CertaDrive 15W 0.35A 42V I 230V
CertaDrive: Brand name for reliable, good enough 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

Surge protection
The CertaDrive Indoor LED drivers have built-in surge protection up to a certain limit. 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 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. 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.
Improvement in EMI Performance

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

- Minimize the differential mode loop area of the LED 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. Long linear light sources are also part of that loop.

- 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 separated from the output wires (do not bundle).

- 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 metal parts like 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.
For Class II it is advised to establish a functional earth connection between all larger conductive, non-accessible luminaire parts and the driver to remedy potential EMC problems.

Sometimes, radiated EMC compliance cannot be achieved, necessitating the use of a 100 … 300 Ω axial ferrite bead(s) for either mains or lamp wiring (effective for interference between 30 MHz and 300 MHz), or coupling the wires through ferrite cores within the luminaire may improve the overall EMC performance. However, selection of the type and characteristics of the additional filter depends on what frequency components have to be damped and by how much.

Adhering to these rules will help in EMC compliance. For further questions, please contact your local Philips representative. Alternatively the Philips Lighting OEM Design-In team could be consulted for a possible solution.
Electrical isolation

Isolated drivers (SELV output)
Drivers in this group cannot generate output voltages higher than 120VDC. These drivers have double isolation from the primary to the secondary side and basic isolation (single isolation foil) between all the electronic circuits and the chassis, hence the presence of the Protective Earth (PE) symbol on the driver housing. This means that in case of driver housing accessibility (i.e. touchable by hand without the need of tools to gain access), the driver housing and all other accessible conductive parts need to be connected to PE. However, these isolated drivers (SELV output) can be used in both Class I and Class II luminaires under the following conditions:

- When used for **Class I** the protective earth connection should be present
- When used for **Class II** (and SELV), the driver should be incorporated in the luminaire in such a way that
  a. The driver housing is electrically isolated with respect to electrical conductive materials, such as the housing or reflector and as such not touchable during installation or operation.
  b. All metal luminaire parts (chassis, heat sink, metallic reflector) connected to the driver housing are not allowed to be accessible by bare hand, or
  c. Any accessible conductive luminaire parts should have basic isolation towards the non-accessible luminaire parts and/or driver housing.

**Note:** for Class II, EMC requirements should be met without PE connection and particularly also any functional earth connection from driver to accessible fixture/chassis is strictly prohibited, as it will form insufficient (non-single fault-proof) insulation with respect to live parts connected to the driver.
Low mains voltage
CertaDrive Indoor LED drivers meet the IEC 61347-1 safety standard. In accordance to this standard, the following safety requirements are met:
• Basic isolation between the Primary and Secondary side wires:
• Driver output voltage < 1000 VDC
• Insulation test voltage 1000 V + 2 * U
• Double isolation between all wires and chassis: Insulation test voltage: 3750 V.

Non-isolated drivers
These drivers have no isolation from the primary to the secondary side and basic isolation (single isolation foil) between all the electronic circuits and the chassis, hence the presence of the Protective Earth (PE) symbol (see image on the left) on the driver housing.
Non-isolated drivers can be used in Class I luminaires. Be aware that all output connections of these drivers are not touch-safe when the driver is switched on. An adequate earth connection needs to be made to all electrical conductive parts in the luminaire. The bottom part (unpainted) of the driver housing can be used to create 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 a degraded performance. Most drivers in this group typically can generate output drive voltages higher than 60VDC. Always test the quality of your earth contacts between all relevant conductive parts.

Warnings for Non-isolated drivers
• Do not touch any non-insulated live parts, even on the output (secondary) side!
• Any live part on the output (secondary) side should not touchable during normal operation.
Connectors
Different connectors are used on the Philips CertaDrive Indoor LED drivers. More info about wiring (diameter, length, etc.) can be found in the datasheet. The datasheets of each driver can be downloaded via www.philips.com/Technology.

Mains
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 and can be found in the driver datasheet at www.philips.com/technology.
How to… Determine the number of drivers on a MCB

The maximum amount of drivers on a 16A 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 mm² cable and another 20 m to the middle of the power distribution) in the worst-case scenario. With an impedance of 800 m² 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 MCBs it is advisable to reduce the number of drivers by 20%.
6. The maximum number of drivers that can be connected to one 30 mA Residential Current Detector is 30.
Introduction
This chapter describes the relationship between the CertaDrive Indoor LED drivers in association with Tc point and lifetime.

Definitions
- Case temperature: temperature measured at the Tc point of the driver
- Ambient temperature (Tamb): temperature outside the driver
  When switched off > 2 hours, temperature at Tc point is likely to equal Tamb

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.

All temperature measurements are related to a Tcase point (Tc) on the driver. Tc temperature 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 * or -sign on the label of the driver.

Since there is a direct relation between the case temperature (Tc) and the driver components inside the driver, it is sufficient to measure the temperature at the Tc point of the LED driver. This Tc point must not exceed the maximum values stated in the associated datasheet in the download section on www.philips.com/technology.

How to... Measure Tc at the Tc point
The location of the Tc point is identified on the product label. Tc point is inside the dot (See ellipse in figure on the left). The temperature can be measured using for example 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 linear 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.philips.com/technology](http://www.philips.com/technology).

**Driver lifetime**

The lifetime of LED drivers depends on the temperature during operation. This means there is a relationship between the Tc point on the LED driver and its lifetime. CertaDrive Indoor LED drivers have a specified minimum lifetime of 30,000 hours with a minimum of 90% survivors at the specified Tc-life (see also respective datasheet).
### Quality

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Please refer to the datasheet of the driver for more information.