PHILIPS

Certaflux

LED system

Certaflux DLM ES CL

Design-in Guide

PHILIPS Certaflux

DLM ES CL G1

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Updated since previous version
Merge of Linear DIG with Spot & Downlight DIG

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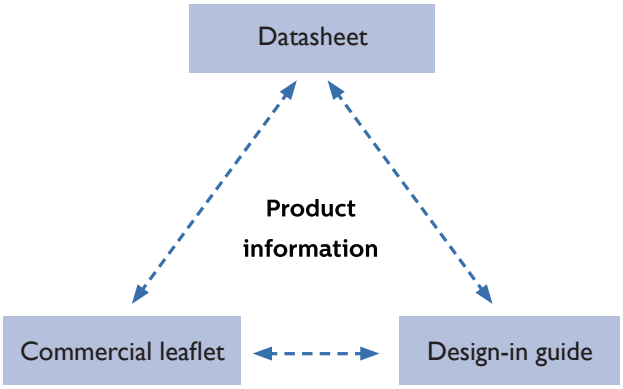
Certaflux DLM ES CL



Thank you for choosing Certaflux DLM ES CL G1. In this guide you will find the information you require to design a luminaire based on these modules. As LED technology is continuously improving, we advise you to visit our website: www.Philips.com/Technology for latest details.

Information and support

If you require any further information or support please consult your local Philips office. The Philips Design-in Team is also available to support you and you can contact with them via your local Philips 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 (compatible Philips drivers and Rsets)
- Datasheet contains the module specification
- Design-In Guide describes how to design-in the products

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.

2. Warnings and instructions

Safety warnings and installation instructions

To be taken into account during design-in and manufacturing.

Design-in phase

- Provide adequate environmental protection
- Avoid contamination (direct or indirect) from any incompatible chemicals reacting with the silicone. A list of incompatible chemicals is provided in the chapter for Compliance and Approval.
- Please use screw to fix the module and do not open module

Manufacturing phase

- Do not use products in case the LEDs are dislodged or if the housing is broken
- Do not drop the Certaflux DLM ES CL or damage in any way.
- Avoid contamination (direct or indirect) from any incompatible chemicals reacting with the silicone. A list of incompatible chemicals is provided in the chapter for Compliance and Approval.

Installation and service for luminaires incorporating the Certaflux DLM ES CL module

- Do not service the luminaire when the mains voltage is connected

Philips Design-in support

Is available; please contact your Philips sales representative.

3. Introduction to Certaflux DLM ES CL module

CertaFlux DLM ES CL module

Application Information

CertaFlux DLM ES CL is to provide a good replacement for TLE from LED solution in general lighting. This range product offers longer life time & efficient lighting solution for residential and commercial application.
It is consistent with other CertaFlux EaseSelect families of modules, delivering simple selection of lighting solution in one system. It also provides easy designs via easy wiring/assembly.

In this guide you will find the specific information required to develop a luminaire based on Certaflux DLM ES CL module. Product specific data can be found in the associated datasheet on www.Philips.com/Technology.

Choosing the Correct CertaFlux DLM ES CL module

CertaFlux DLM ES CL module available with 2 lumen (1500lm & 1900lm) and 2 CCT(830 & 865) for options. Please refer to the datasheet for details about each SKU. Since product is integrated version, no hassle to select drivers.

Naming of the CertaFlux DLM ES CL module

The names of the modules are defined as shown in the example below: **Certaflux DLM ES 1500/830 CL G1**

Certaflux	Our brand name for quality, value of money and reliable LED lighting
DLM	Downlight module
ES	Easeselect
1500	lumen package
830	CCT and CRI
CL	Ceiling lighting
G1	Indicates the first generation

Emergency Application

Certaflux DLM ES CL is not recommended work with Emergency systems.

4. Optical design-in

Certaflux DLM ES CL module address the issue of binning

High-quality LED light is achieved by mixing the light of various LEDs. High quality white light is characterized by a good color consistency and a color rendering of >80, popular CCTs in ceiling lighting applications of 3000 K and 6500 K. The function of special lens design is to shape the light distribution to meet the ceiling lighting luminaires.

Color consistency (SDCM)

The current specification of the Certaflux DLM ES CL module for color consistency is 7 SDCM at 0 hours. SDCM stands for Standard Deviation of Color Matching and the value 7 refers to the size of an ellipse around the black body locus.

Starting characteristics

The Certaflux DLM ES CL modules can be switched on in milliseconds, which is a general characteristic of LEDs.

Lumen maintenance

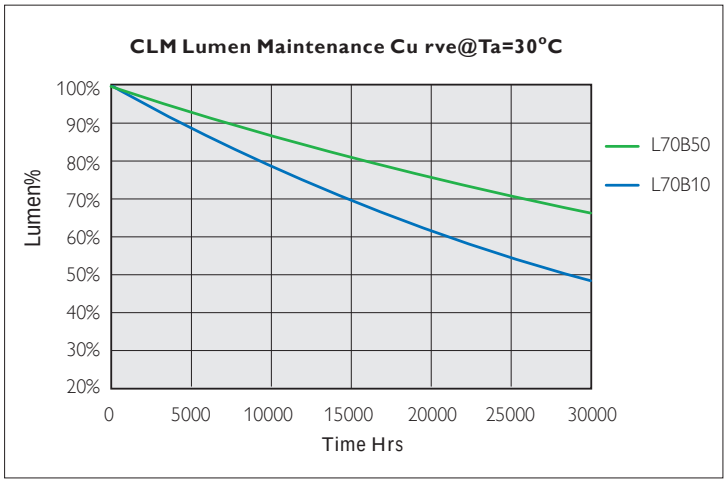
L70B50 @ 25,000 hours

The quality of the Certaflux DLM ES CL portfolio is backed by the Philips' claim of B50L70 @ 25,000 hours. This means that at 25,000 hours of operation at least 50% of the LEDs' population will emit at least 70% of its original amount of lumens.
This is contrary to conventional light sources, where some time after Service Life Hours the conventional light source emits no light at all. In this section the example graphs show the estimated lumen depreciation curves for different percentage of the population and at nominal Tc temperatures. The actual data for the CL modules can be found in the associated datasheet at www.Philips.com/Technology.

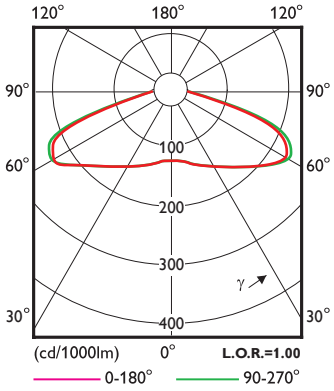
Average rated life is based on engineering data testing and probability analysis. The Certaflux DLM ES CL modules are specified to reach L70B50 for the nominal specifications.

Lumen maintenance for B10 and B50

The example graph is showing the lumen maintenance (% of initial lumen over time) for B50 (50% of the population) and B10 (90% of the population). Please look up the actual lumen maintenance graph in the associated datasheet of the Certaflux DLM ES CL module you are using at www.Philips.com/Technology.



Polar intensity diagram

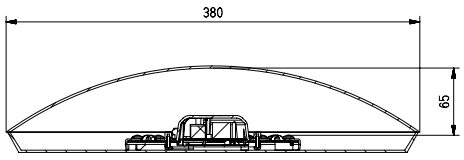


Light distribution diagram

Light distribution and secondary optics

The Certaflux DLM ES CL module generates a batwing beam shape; the polar intensity diagrams for each module are given in the datasheets.

The special batwing light distribution enables a simple ceiling luminaire design with good uniformity.



A reference luminaire design is proposed in the left picture. Also we suggest use proper diffuser on top to ensure light performance.

5. Mechanical design-in

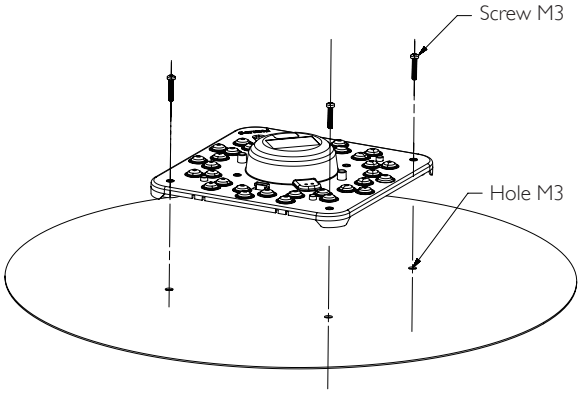
About the Certaflux DLM ES CL module

Do not open Certaflux DLM ES CL module during the mechanical Design-in as Certaflux DLM ES CL module is a highly integrated module.

Mechanical fixation

Please note that due to the thickness of the LED board, mounting of the light engine from the back is not possible, only fixation through the module is applicable. The picture below shows the correct mounting procedure. The diameter of these holes is 3 mm and self-tapping screws can be used.

2D or 3D CAD drawings are available upon request or at www.Philips.com/Technology



CertaFlux DLM ES CL module dimensions

3D CAD files can be downloaded from our website www.Philips.com/Technology. Basic dimensions for each module can also be found in the datasheets which are also available at the afore mentioned website.

Recommended torque

The recommended torque for mechanical fixation of the Certaflux DLM ES CL module to the luminaire is 0.5 Nm

6. Thermal design-in

The critical thermal management points for the LED module are set out in this chapter in order to facilitate the design- in of Certaflux DLM ES CL module. If these thermal points are taken into account, this will help to ensure optimum performance and lifetime of the LED system.

Optimum performance

To ensure optimum performance, the Certaflux DLM ES CL module must operate within specified temperature limits.

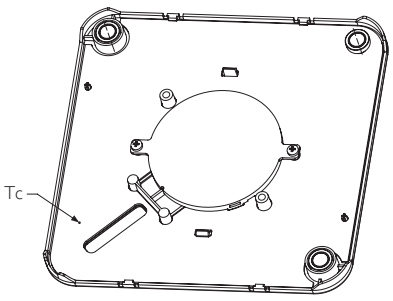
Test requirements

Measurements, e.g. of temperature, luminous flux and power, are reliable once the luminaire is thermally stable, which may take between 0.5 and 2 hours, and is defined as at least 3 readings of light output and electrical power over a period of 30 minutes taken 15 minutes apart with stability less than 0.5%. The time depends on the thermal capacity of the luminaire (see also the relevant clauses in IEC 60598-1).

Note:
Thermal stability can be considered if the temperature changes are less than 1°C over three measurements taken 15 minutes apart. Measurements must be performed using thermocouples that are firmly glued to the surface (and not, for example, secured with adhesive tape).

Critical measurement points

Because LEDs are temperature sensitive, LED modules require a different approach with respect to the maximum permissible component temperature. This is different to most other types of conventional light sources.



Case temperature at Tc point

For LEDs the junction temperature is the critical factor for operation. Since there is a direct relation between the case temperature and the LED junction temperature, it is sufficient to measure the casing of the LED module at its critical point. The critical point is on the rear surface of the LED module, as shown in the figure on the left. If the case temperature (Tc) at the critical measurement point exceeds the recommended Tc temperature, the performance of the LEDs will be adversely affected, for example in terms of light output, lifetime or lumen maintenance.

Tc-lifetime

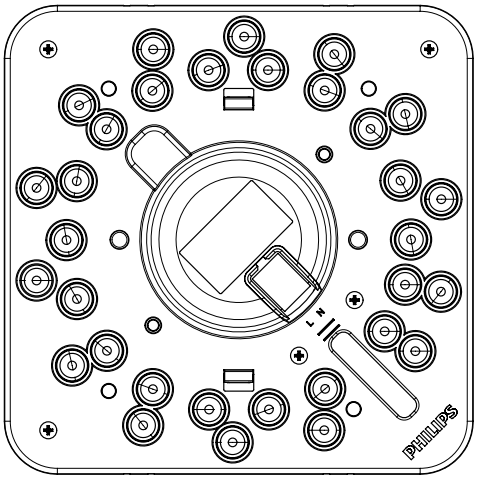
At Tc-lifetime all the specifications mentioned in Certaflux DLM ES CL module commercial leaflet, datasheets and design-in guide are valid and a 2 year system warranty is applicable.

	Nominal*	Life**	Max***	Unit
Certaflux DLM ES 1500lm G1	--	--	<80	°C
Certaflux DLM ES 1900lm G1	--	--	<85	°C

* Nominal value at which typical performance is specified
** Value at which lifetime is specified
*** Maximum value for safe operation, do not operate above this value

7. Electrical design-in and flexibility

Specification item	Value	Unit
Wire cross-section (Solid wire)	0.5 – 2.5	mm^2
	20 – 12	AWG
Wire cross-section (Stranded wire)	0.5 – 2.5	mm^2
	20 – 12	AWG
Wire strip length	10 - 11	mm



Connector for Line and Neutral

Connecting the module

There are 2 connectors available on the Certaflux DLM ES CL module, these have been clearly marked for Line and Neatrual. These can be used with simple push in wires in order to connect with the main power supply. The following are the specifications for the wires that can be used:

Class I and Class II

Certaflux DLM ES CL module can both support Class I and Class II luminaire.

Note:

1. If apply into a class II luminaire, 0.5~0.75mm^2 sleeve cable is proposed to be used together with strain relief Philips provided;
2. If apply into a class II luminaire and 1.0~ 2.5mm^2 sleeve cable is used, please design a new strain relief to match with module;
3. If apply into a class II luminaire and 1.5~2.5mm^2 single layer cable is used with strain relief we provided, please add one insulation layer between luminaire metal base and led module, or please make sure the total luminaire is made by plastic material;
4. If apply into a class I luminaire, 1.5~2.5mm^2 single layer cable is proposed to be used together with strain relief Philips provided.

8. Compliance and approval

Certaflux DLM ES CL module comply with following norms and standards:

Safety

IEC/EN 62031	LED modules for general lighting - safety specifications
IEC 62471/62778	Photo biological safety of lamps and l amp systems
IEC 61347-2-13	Control gear safety

Electromagnetic compatibility

CISPR 55015	Limits and methods of measurement of radio Disturbance characteristics of electrical lighting and similar equipment
IEC/EN 61000-3-2	Limits for harmonic current emissions (equipment input current <16 A per phase)
IEC/EN 61547	Equipment for general lighting purposes -EMC immunity requirements

Environmental

The product is compliant with European Directive 2002/95/EC of January 2003 on Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS).

Approval

- CB
- Working voltage at which the insulation is designed for 250V

IEC recommendations

The general recommendations for luminaire design given by the IEC (IEC 60598) and the national safety regulations are also applicable to LED-based luminaires.

Note:
It is not recommended to use the Certaflux DLM ES CL without the housing. Direct exposure to the blue LED light is dangerous for the eyes.

Photobiological safety aspects

As of March 2007, LEDs and LED-based products for general lighting are no longer included in the scope of the Eye Safety standard for lasers, IEC 60825-1 'Safety of laser products'. The new lamp standard, IEC 62471 'Photo biological safety of lamps and lamp systems', which covers incoherent light sources, now applies. This international standard gives guidance on evaluating the photo biological safety of lamps and lamp systems including luminaires. It specifically defines the exposure limits, reference measurement technique and classification scheme for the evaluation and control of photo biological hazards from all electrically powered incoherent broadband sources of optical radiation, including LEDs but excluding lasers, in the wavelength range from 200 nm to 3000 nm.

In the photo biological safety standard, hazard categories are defined as follows:

Radiance-based

• Blue Light	LB	300 - 700 nm
• Retinal Thermal	LR	380 - 1400 nm

Irradiance-based

• Actinic UV Skin & Eye	ES	200 - 400 nm
• Eye UVA	EUVA	315 - 400 nm
• Thermal skin*	EH	380 - 3000 nm
• Eye IR	EIR	780 - 3000 nm

* Thermal skin is not defined in IEC 62471 and hence cannot be classified in risk groups.

Certaflux DLM ES CL module gave the following results
The following should be taken into account:

- The effective radiance measurement for Blue Light (LB) modules is 'exempt group', meaning that the LED modules are categorized in exempt group. Final assessment of the luminaire is recommended.

Humidity

Certaflux DLM ES CL module can withstand a high humidity (60% rh) environment.

Exposure to direct sunlight

Exposure to direct sunlight during operation may have severe temperature or UV effects.

Vibration and shocks

Shock resistance: 30 g @18 ms semi-sinusoidal. Vibration resistance: sweep10-50 Hz, one hour at resonance frequency (all 3 axes) without failure.

IP codes, dust and moisture protection

Certaflux DLM ES CL module has IP 20 classification. The OEM is responsible for proper IP classification and approbation of the luminaire.

Philips Certaflux DLM ES CL module is to be used for indoor applications

When used in a non-weather protected environment, additional measures shall be taken to protect the Certaflux DLM ES CL module from water ingress.

Glow-wire test

Philips Certaflux DLM ES CL module conforms to the 650-degree glow-wire test. Reference test:
According to additional national deviations for clause 13.3 (Annex 2c of EN 60598-1). An exception is made for France, where local regulations are more strict.

End-of-life behavior

Unlike typical conventional light sources, LEDs are not subject to sudden failure or burnout. There is no time at which the light source will cease to function. Instead, the performance of LEDs shows gradual degradation over time. When used according to specification, Certaflux DLM ES CL module is predicted to deliver an average of 70% of their initial intensity after 25,000 hours of operation. The life of the system is therefore more dependent on the other electronic system components and soldering methods.

Certaflux DLM ES CL module disposal

We recommend that the Certaflux DLM ES CL module or its components are disposed of in an appropriate manner at the end of their (economic) lifetime. The modules are essentially normal pieces of electronic equipment containing components that at present are not considered to be harmful to the environment and can be disposed of with normal care. We therefore recommend that these parts are disposed of as normal electronic waste, in accordance with local regulations.

Chemical Compatibility

The Certaflux DLM ES CL module makes use of LEDs containing a silver-finished (Ag) Lead frame. The lead frame finish is sensitive to pollution and or corrosion when exposed to Oxygen and certain Volatile Organic Components [VOCs]. Examples of VOCs are substances containing Sulfur or Chlorine. In that case parts of the lead frame may blacken, which will impair the lumen output or the color point of the LED light. Materials that are known to have a higher risk to be a source of Sulfur and Chlorine are for example rubbers used for cables & cable entries, sealing's or corrugated carton. Also do NOT use adhesives, cleaning agents, coatings containing suspect VOCs. Nor use the product in aggressive (corrosive) environments that may cause damage to the LED's.

We recommend ensuring that the direct environment of these LEDs in the luminaire does not contain materials that can be a source of Sulfur or Chlorine, for optimal reliability of the LED, LED module and/or LED luminaire. Furthermore, make sure that the products with these LEDs are not stored or used in vicinity of sources of Sulfur or Chlorine, and the production environment is also free of these materials. Also avoid cleaning of the LED products with these types of LEDs with abrasive substances, brushes or organic solvents like Acetone and TCE.

Applications of the product in industry and heavy traffic environment should be avoided in case of risk of ingress of Sulfur and Chlorine from the environment.

A list of chemicals, often found in electronics and construction materials for luminaires that should be avoided, is provided in the table below. Note that Philips does not warrant that this list is exhaustive since it is impossible to determine all chemicals that may affect LED performance. These chemicals may not be directly used in the final products but some of them may be used in intermediate manufacturing steps (e.g. cleaning agents). Consequently, trace amounts of these chemicals may remain on (sub) components, such as heat sinks. It is recommended to take precautions when designing your application.

In case of questions on compatibility of materials or applications of the product please contact your Philips representative for application support.

Chemical Name	**Normally used as**
Acetic acid	Acid
Hydrochloric acid	Acid
Nitric acid	Acid
Sulfuric acid	Acid
Ammonia	Alkali
Potassium hydroxide	Alkali
Sodium hydroxide	Alkali
Acetone	Solvent
Benzene	Solvent
Dichloromethane	Solvent
Gasoline	Solvent
MEK (Methyl Ethly Ketone)	Solvent
MIBK (Methyl Isobutyl Isobutyl Ketone)	Solvent
Mineral spirits (turpentine)	Solvent
Tetracholorometane	Solvent
Toluene	Solvent
Xylene	Solvent
Castor oil	Oil
Lard	Oil
Linseed oil	Oil
Petroleum	Oil
Silicone oil	Oil
Halogenated hydrocarbons (containing F,Cl,Br elements)	MISC
Rosin flux	Solder flux
Acrylic tape	Adhesive
Cyanoacrylate	Adhesive

Environmental

The product is compliant with European Directive 2011/65/EC on Restriction of the Use of Certain Hazardous Substances in electrical and electronic equipment (RoHS2).

Cautions

During storage and transportation

- Store in a dark place. Do not expose to sunlight.
- Maintain temperature between -40 ~ +80 °C, and RH 5 – 85%.

During operation

Philips shall not be held responsible or liable for any damage, costs or expenses to the user, resulting from an accident or any other cause during operation if the system is used without due observance of the absolute maximum ratings and other instructions provided by Philips.
There must be no ice/water/fog exist or attach on the whole module during the application.

Note:
That warranty is applicable for the Philips Certaflux DLM ES CL module for 3 switching cycles per day.

9. Contact details

Philips Fortimo LED SLM systems
www.Philips.com/Technology

Or contact your local Philips sales representative.

Philips ESD support
www.innovationservices.philips.com

Phone : +31- (0) 40 27 46658
Fax : +31 - (0) 40 27 42224

The Philips corporate EMC competence centre is a leading provider of approbation and consultancy services.

10. Disclaimer

Philips will perform the testing of the LED systems to high standards of workmanship. The tests are carried out with reference to the EN/IEC standards, if any, which are regarded by Philips as being of major importance for the application of the lamp gear and the lamp within the fixture for horticultural applications.
The design-in guide, regarding the testing and design in of he LED system provided by Philips, is not an official testing certificate, and cannot be regarded as a document for official release of the fixture. The OEM is liable for the official testing by a certified test body and all markings, such as CE and ENEC marks, on the fixture assembly.
The design-in guide is for information purposes only and may contain recommendations for detecting weak points in the design of the system (lamp – lamp gear – fixture), if any.
Specifically mentioned materials and/or tools from third parties are only indicative: other equivalent equipment may be used but it is recommended that you contact Philips for verification.
Philips will not be liable for unforeseen interactions of the proposed solutions when applied in the fixtures or applications using these fixtures. Philips has not investigated whether the recommendations are or will in the future be in conflict with existing patents or any other intellectual property right.
Philips does not warrant that its recommendations are technically or commercially the best options.
Since the tests are only performed on one particular fixture provided by the customer, it will be treated as a prototype. This means that there is no statistical evidence regarding later production quality and performance of the lamp – lamp gear – fixture system.
As Philips does not have control over manufacturing of the fixtures, Philips cannot be held liable for the fixture assembly.
Philips will not accept claims for any damage caused by implementing the recommendations.

No warranty whatsoever may be claimed by the OEM with regard to the content and/or quality of the design-in guide or any other advice, or the conclusions and/or recommendations in the design-in guide or any other document, either express or implied, and Philips expressly disclaims any implied warranties of any kind, including without limitation any warranties of satisfactory quality, fitness for a particular purpose or non-infringement and any warranties regarding the design-in guide or any other advice or the use of the results of any activity performed while testing the fixture with respect to its correctness, quality, accuracy, completeness, reliability, performance or otherwise.
The OEM expressly agrees that test design-in guides are provided by Philips on an 'as is' basis and an 'as available' basis at customer's sole risk and expense.
Philips shall not be liable for any lost profits or lost savings, indirect, incidental, punitive, special, or consequential damages whether or not such damages are based on tort, warranty, contract, or any other legal theory – even if Philips has been advised, or is aware, of the possibility of such damages.s
The OEM must bring any claim for damages within ninety (90) days of the day of the event giving rise to any such claim, and all lawsuits relative to any such claim.

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Data subject to change

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