

PHILIPS

Fortimo

LED System

Fortimo FastFlex IP



Design-in Guide

An integrated and easy to design system offer heat sink and optics with good protection **on IP66**

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Introduction to this guide



Thank you for choosing Fortimo FastFlex IP module. In this guide, you will find all the information required to design this module into a luminaire as well as valuable hints and tips.

Information and support

On our website, you will not only find information about this module but also

- Design-in guides
- Datasheets
- Family sheets
- Optical files
- CAD files
- Certificates

of all these Philips LED products.

For Asia:

<http://www.lighting.philips.com.sg/oem-asia/support/technical-downloads>

For America's

<http://www.usa.lighting.philips.com/products/oem-components>

If you require any further information or support, please consult your local Philips office.

Basics

Each Fortimo FastFlex IP module system consists of

- One or more Fortimo FastFlex IP module (s)
- Compatible Multi-connector
- Compatible Philips Outdoor LED driver
- FastFlex IP Flying Wires Connector (optional)

To create a LED system, you can use one of the released compatible LED drivers. Please refer to the "Easy design-in tool" on

<https://www.easydesignintool.philips.com/>

For efficient support, please select "region" first.

Applications

Fortimo FastFlex IP module has been developed for outdoor and industry lighting applications

The Fortimo FastFlex IP module with Philips Outdoor driver can be used in:

- Class I IEC isolation systems

Warnings and instructions

The following recommendations should be taken into account when using Fortimo FastFlex IP module modules and Philips Outdoor LED drivers.



Important usage conditions

- Failure to comply with usage conditions will void product warranty

Design-in phase

- Do not apply mains power to the module directly.
- Connect the modules, drivers and all the other electrical components before switching on mains.
- Avoid contamination (direct or indirect) from any incompatible chemicals reacting with the LED. A list of incompatible chemicals is provided in the chapter for Quantity.
- The general IEC recommendations for luminaire design and legal safety regulations (ENEC, CE, ANSI, etc.) are also applicable to Philips FastFlex IP module. Luminaire manufacturers are advised to conform to the international standards for luminaire design Class I, IEC 60598-Luminaires).
- Class I luminaires must provide a protective earth.
- It is mandatory to design the luminaire so it is enclosed in such a way that it can only be opened with special tools (by an electrician) in order to prevent accidental contact with live parts.
- Do take into account the minimum required creepage and clearance distances.
- Connect all electrical components first before switching on mains.
- The LED module shall be powered by a LED control gear IEC/EN 61347-2-13 certified.
- Module is not applicable for Explosion-Risk application, such as gasoline station, chemical factory and so on.



Warnings:

- Metal enclosure of Fortimo FastFlex IP module must be grounded

Manufacturing phase

- Do not use damaged or defective LED modules, including damaged connectors or PCB.
- Do not drop the LED module or let any object fall onto it as this may damage the module. If the LED module has been dropped or an object has fallen onto the LED module, do not use it, even if there are no visible defects or signs of damage.
- The lens of module should be kept clean.
- Cautions for storage and transportation.

For long time (over one week):

- Store in a dark place.
- Do not expose to direct sunlight.
- Maintain temperature between -40°C ... $+65^{\circ}\text{C}$ and relative humidity (RH) should be between 5%...95%.

For short time:

- Maintain temperature below 65°C at normal. Noncondensing relative humidity.

Installation and service phase of luminaires

- The luminaire should not be serviced while the mains voltage is connected; this includes connecting or disconnecting the Fortimo FastFlex IP module wires from the driver.
- The water proof connector has to be fully tightened up to prevent the water penetration via the connection in the field application.
- Due to the T_{case} nominal temperature of the Fortimo FastFlex IP module is 75°C , it is important to take the maximum touchable metal surface temperatures of the module into account. With such a high T_{c} temperature the maximum temperature for touch safety can easily be exceeded. Do not touch the module directly.

Introduction of Fortimo FastFlex IP system

System Overview

Fortimo FastFlex IP is an integrated module solution with IP66 protection, excellent optical and heat management that offers high energy efficacy and high quality of light. Fortimo FastFlex IP products are designed to enable optimum LED lighting in Outdoor - streets and roads - as well as in Industry (high-bay) applications - warehouses, factories, large-format retail stores. A range of compatible Xitanium drivers complement these modules to further differentiate your lighting solution on efficacy, lifetime and robustness under extreme temperature conditions.

Product Range

Fortimo FastFlex IP module described in this guide are available in different light distribution, CCT and CRI versions which enable the creation of outdoor and industrial LED lighting systems for every type of application.

Summarized, the range of Philips FastFlex IP modules can be divided in 3 main groups designed to offer a suitable solution to each type of OEM:

- Fortimo FastFlex IP 6KLM module
- Fortimo FastFlex IP 5KLM HB module
- Fortimo FastFlex IP 6KLM UHE module

Commercial naming of Fortimo FastFlex IP

The names of Fortimo FastFlex IP module are defined as shown in underneath example.

Fortimo FastFlex IP 6KLM UHE 730 II-S/HB-60
Fortimo FastFlex IP 6KLM UHE 730 II-S
Fortimo FastFlex IP 5KLM 840 HB-60

Fortimo: Our brand name for efficient, clear and reliable lighting

FastFlex: Our modules is fast and flexible in terms of design and usage

IP: Ingress Protection

6KLM: With lumen output of 6000lm

UHE: Ultra high efficacy

730: For a color rendering index >70;
30 stands for a CCT of 3000 K

II-S: Classification of the light distribution
Type II, short light distribution

HB-60: Symmetrical light distribution and
FWHM (full width at half maximum) is
60 degree

Philips outdoor drivers for Fortimo FastFlex IP module

These high efficient LED drivers are designed for the Fortimo FastFlex IP module. These are available as an independent driver, dimmable or with a fixed output. More information about the Philips outdoor drivers can be found in the Philips outdoor driver design in guide and commercial leaflet. These documents can be downloaded via

Asia:

<http://www.lighting.philips.com.sg/oem-asia/support/technical-downloads>

For America's

<http://www.usa.lighting.philips.com/products/oem-components>

The Philips outdoor driver datasheets can also be downloaded on this website.

It is highly recommended to use the approved Philips outdoor LED drivers. For a list of approved drivers please refer to www.easydesignintool.com





Waterproof Multi-Connector

The FastFlex IP multi-connector provides easy wire connection between module and driver with IP67 protection. It comes in 1-3 and 1-5 configurations which can meet most of the wire requirement.

As the extension cord of the input end of FastFlex IP multi-connector, FastFlex IP flying wires connector support to wire the driver which is with out water proof connector.

The names of Fortimo FastFlex IP Multi-connector are defined as shown in underneath example.

FastFlex IP Multi-connector 1-3

FastFlex: Our modules is fast and flexible in terms of design and usage

IP: Ingress Protection

1-3: 1 to 3 FastFlex IP module(s) can be wired

The datasheet can be downloaded via our website at
For Asia:
<http://www.lighting.philips.com.sg/oem-asia/support/technical-downloads>

For America's
<http://www.usa.lighting.philips.com/products/oem-components>

Luminaire Class I applications

Fortimo FastFlex IP modules are suitable for luminaire Class I applications in combination with approved Philips Xitanium IP67 outdoor drivers. Approved combinations comply with the latest IEC 60598 luminaire standard requirements.

For further questions, please contact your local Philips representative. Alternatively the Philips Lighting OEM Design-In team could be consulted for a possible solution.

Optical design-in

Light distribution

Fotimo FastFlex IP module provide six kinds of beam shape choices (Please see polar intensity diagram), which can meet the most of requirement in street lighting and industry application.

IES files can be downloaded from <http://www.philips.com/technology>.

Color Consistency (SDCM)

Color consistency refers to the spread in color points between modules. It is specified in SDCM (Standard Deviation of Color Matching) or Mac Adam ellipses, which are identical. The value refers to the size of an ellipse around a point close to the black body locus. Staying within this ellipse results in a consistency of light which ensures that no color difference is perceivable between one LED module and another with the naked eye in most applications.

SDCM value in the datasheet represents an integrated measurement over the complete LED module.

The current general specification of Fotimo FastFlex IP 6KLM and 5KLM HB module is within 5 SDCM.

Moreover, FastFlex IP 6KLM UHE is within 4 SDCM. This results are good color consistency performance for outdoor and industry application.

Color targets (CCT)

The color target points of both Correlated Color Temperature (CCT) and Color coordinates (CIEx, CIEy) of Fotimo FastFlex IP module are found in the respective datasheets on

www.philips.com/technology.

Spectral light distribution

The typical spectral light distributions of the Fotimo FastFlex IP module are shown in the respective datasheets on www.philips.com/technology.

In a system with multiple modules, it is recommended that the modules are mounted with a distance of between 0 mm and 10 mm maximum between each module to ensure correct optical performance.

Note:

The optical-related parameters in the datasheet are provided under nominal conditions, like nominal flux at nominal Tc.

Component and process tolerances can result in imperfectly symmetrical light distributions. Maximum acceptable tolerances will have minimal impact on optical distributions and optical performance in the final application for a variety of reasons. All polar intensity diagram illustrations are just an indication of the beam shape. We suggest making use of the IES files available on the Fotimo FastFlex IP module website.

Thermal design-in

To facilitate design-in of Fotimo FastFlex IP module systems, the critical thermal management points of the LED modules and 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.

Thermal specifications

The main thermal specification that needs to be taken into account when designing in the FastFlex IP module system is the T_{case} temperature. The T_{case} must never exceed $T_{case,max}$ tested in a draft-free lab environment at 25 °C.

Please refer to the product datasheet for further details.

Operating temperature

Definitions

- **LED module temperature:** temperature measured at the T_c point of the LED module.
- **Driver temperature:** temperature measured at the T_c point of the driver.
- **Ambient temperature (T_{amb}):** temperature outside the luminaire.
- **Ambient temperature in a lab environment:** air temperature in a testing area, in a controlled environment free from drafts
- **Average ambient temperature:** monthly average temperature based on at least 2 measurements per day, with at least 8-hour intervals between measurements

Module temperature

To achieve typical product lifetime characteristics, it is crucial to ensure that the product is operating within the specified temperature limits. These limits are determined not only by the product and the application, but also by the luminaire design and ambient environment.



Warnings:

- Maximum T_{case} should never exceed specified $T_{case,max}$
- Please refer to the specific datasheet for the maximum T_{case} Value
- Thermal design should ensure that driver $T_{case} < \max$ specified driver T_{case}

Thermal measurements

The maximum ambient temperature at which the luminaire will operate constitutes the initial key criterion for defining the correct temperature limit and validating the thermal luminaire design.

If the maximum ambient temperature ($T_{amb,max}$) is 25 °C or lower, the luminaire design needs to ensure that the module temperature does not exceed the maximum T_{case} when tested in a lab environment at 25 °C ambient.

Note: The ambient temperatures given above are average temperatures during the operational period of the module.

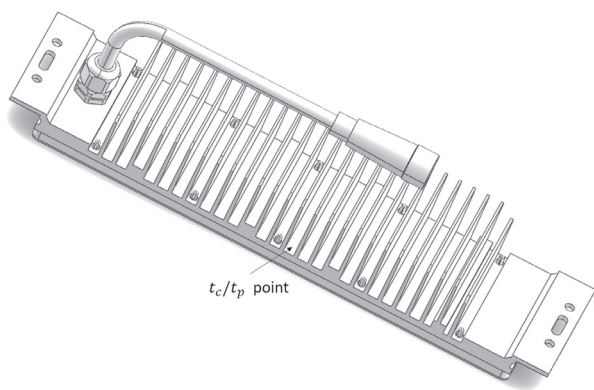
Critical temperature point (T_{case})

The T_c test point indicates a reference point for measuring the LED module's temperature. This can be used during the luminaire design to verify that the temperature remains below the maximum specified temperature for the T_c test 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 aluminum casing of the FastFlex IP at its critical temperature point. Please refer to figure. If the case temperature at the T_{case} point exceeds the recommended T_{case} lifetime, this will have an adverse effect on the performance of the LEDs and FastFlex IP module in terms of light output, lifetime and lumen maintenance.

The T_c position is at the back of the module: at the central of the module in horizontal direction and about 5mm distant from the edge in vertical direction.

Note: The location of the T_p and T_c is same. (T_p point is the designated location of the point where to measure the performance temperatures T_p and T_p rated at the surface of the LED module)





Important:

In case the OEM chooses to allow the temperature at T_c other than nominal, the lifetime and reliability of the LED module must be taken into account. Given a constant drive current (mA), following temperature regions can be distinguished:

1. Temperature at $T_c <$ nominal value ($^{\circ}\text{C}$)
 - a. Efficacy (lm/W) higher than nominal value. Light output (lm) higher than nominal value.
 - b. Lifetime $>50,000$ hours @ I life.
2. Temperature at T_c between nominal value and lifetime value ($^{\circ}\text{C}$)
 - a. Efficacy (lm/W) lower than nominal value. Light output (lm) lower than nominal value.
 - b. Lifetime $>50,000$ hours @ I life.
3. Temperature at T_c between lifetime value and absolute maximum value ($^{\circ}\text{C}$). No warranty applicable in this case.
 - a. Efficacy (lm/W) lower than nominal value. Light output (lm) lower than nominal value.
 - b. Lifetime $<50,000$ hours.
4. Temperature at $T_c >$ absolute maximum value:
Do not exceed the absolute maximum value as this can lead to LED module failure. No warranty applicable in this case.

Measurement of critical temperature point

On the back of the module, there is a T_{case} (T_c) point, which should be used for all temperature measurements. The temperature must be stable before any reliable data can be obtained (depending on the size and material of the luminaire, this will take between 30 and 180 minutes and even overnight). It is essential to have a stable connection between the thermocouple and the module. Any shifting of the thermocouple will result in measurement errors and poor measurement repeatability.

Note:

In order to ensure accurate T_{case} test results, the case temperature should not vary by more than 1°C for a period of at least 30 minutes.

Critical module temperature with respect to CLO

Fortimo FastFlex IP module can be used with Xitanium Programmable LED drivers with a Constant Light Output (CLO) feature. Over the system lifetime the driver will automatically increase the output current to compensate for lumen depreciation and to keep light levels constant. For the thermal design it is important to ensure that the T_{case} temperature and drive current do not exceed their maximum ratings at end of life.

Note:

- Programming CLO increases the thermal load over the lifetime of the module. Thermal management needs to ensure T_{case} at end-of-life does not exceed the maximum T_{case} of the module. (Please refer to the respective product datasheet)
- CLO current at end-of-life drive current must not exceed maximum specified current. (Please refer to the respective product datasheet)

Thermal behavior of Philips outdoor drivers

Besides the LED modules, another important component is the driver. For specific design-in guidelines please consult the associated design-in guide for the Philips outdoor LED drivers and the associated driver datasheet, to be found on the download section of www.philips.com/technology.

Critical driver temperature point with respect to CLO

When the Fast FlexIP module is used with Philips Programmable LED drivers, CLO will increase the output current. As a result, the driver losses will increase accordingly, which in turn will lead to a higher driver T_{case} temperature. For the thermal design it is therefore important to ensure that the T_{case} temperature of the driver is within specification for its $T_{case\ max}$ at end of life.



Important points for luminaire design

- Make sure the LED module is working in environment with enough space.
- When install more than one FastFlex IP module in luminaire, please separate the module in order to get better cooling.
- The open slots on the top cover of the luminaire housing will help to decrease the module temperature.
- Place the module(s) and driver at a distance from each other to obtain a more homogeneous temperature distribution in the luminaire

Contact Philips at any time if you need advice on your luminaire design.

Note:

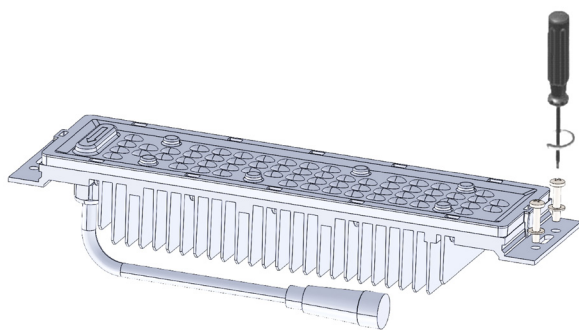
It is suggested to check the thermal performance of each Fortimo FastFlex IP module in the luminaire.

- Make sure the temperature of Tc point on each module do not exceed the Tc max when the luminaire is working under max ambient temperature with max tolerance input DC current.
- Installation direction shall be taken into account.

Please refer to individual product datasheets for T_{case} max information.

Mechanical design-in

Fortimo FastFlex IP module is easy to install and maintain. Its mechanical interface with luminaire is CSA compliant. Fortimo FastFlex IP system can be fixed in luminaire securely using the mounting holes located on the module(s) and driver. Please refer to the dimensional drawings for specific details. The 3D CAD files can be downloaded from the Philips Technology website at www.philips.com/oem.



Mechanical fixation

In order to ensure the reliability of the installation, at least one mounting hole at each side of the module should be used to fix the module on the luminaire housing. Recommend using an M4 hexagonal socket-head cap screw with an M4 spring-lock washer for screws with cylindrical heads. Recommend to use stainless screws.

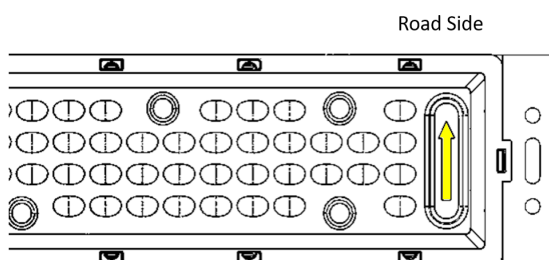
The recommended torque for mechanical fixation of the Fortimo FastFlex IP modules to the luminaire fixture is 0.7 Nm. The maximum torque that should be applied depends on the screw type and luminaire material. Make sure the thread on the luminaire housing is deep enough to fix the module reliably.

To prevent the screws from loosening during normal use, especially in high vibration applications such as bridges or overpasses, washers should be used that will help prevent the screw from backing out. Typical washers that can be used to preload the joint are toothed, split ring, and Belleville (conical).

Module placement in a luminaire

FortimoFastFlex IP is a product with integrated optics. No additional secondary optical accessories are needed. Some of the FastFlex IP modules provide asymmetrical beams which can be identified by name, as the definition of the light distribution classification is at the end of the name. e.g. Fortimo FastFlex IP 6KLM 730 II-S.

For these light distribution, the module position inside the luminaire will directly impact on beam direction. Please follow the remark on Fortimo FastFlex IP module for installing the module to right direction, this is critical to get the correct light distribution.



Driver placement in a luminaire

Please refer to the specific Philips LED driver product datasheet and design-in guide for individual product dimensions and installation instructions.

For outdoor application or any other environments which are required IP protection, make sure the luminaire housing can provide sufficient water and dusty protection for the system.

Wiring

Philips Fortimo FastFlex IPmodules are equipped with IP-rated connector which formfactor meets CSA standard. They are the products designed for OEMs looking for a “one stop shop”, where module and connector are provided by Philips allowing a short fixture development cycle.

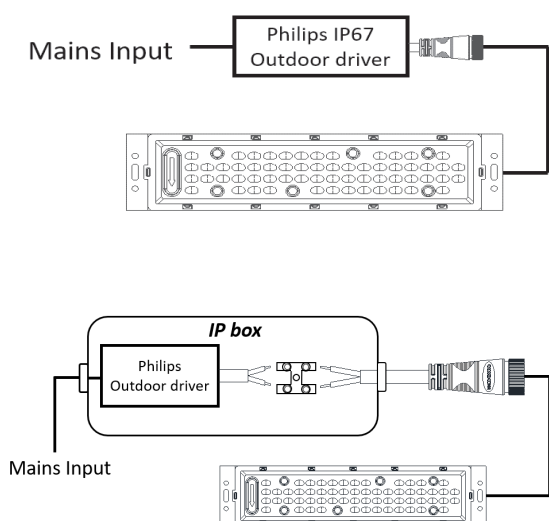
Please check the multi-connector datasheet for more information.

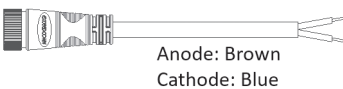
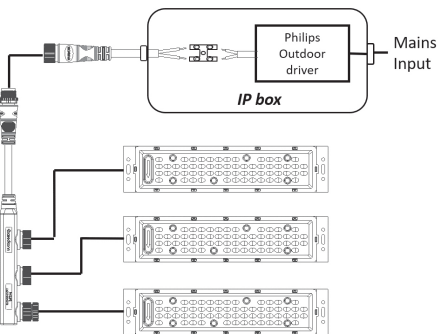
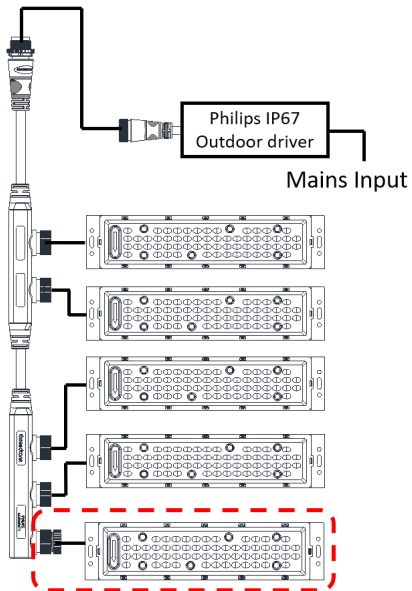
www.philips.com/oem.

One module to one driver

If the output end of the selected driver is matching with the input end of module, they can be connector to each other directly.

If the output end of the selected driver do not follow CSA standard, FastFlex IP Flying Wires Connector can be used as adaptor. For such application, make sure the luminaire housing can provide sufficient IP protection for the system.





Multiple modules to one driver

The FastFlex IP multi-connector provides easy wire connection between modules and driver with IP67 protection. It comes in 1-3 and 1-5 configurations. When using it to wire, FastFlex IP modules are in series, so to guarantee the normal usage and IP rating, a cap must be installed on the no-connected end. According to the output end of the selected driver to wire the them directly or use flying wire as an adaptor.

Note:

- Make sure there are enough space for multi-connector and cables in the luminaire.
- The module should be attached securely to the fixture.
- To avoid mechanical damage and potential safety issue, all the cables should be in a state of normal bending in the luminaire. Avoid contacting with any sharp objects and being pressed excessively.
- The water proof connector has to be fully tightened to prevent the water leaking into the connection in the filed application. The recommended torque is 1.2N·m.
- The design of the housing should be according to the IP standards in the application.
- Pay attention to standard ESD precautions when installing the module

Electrical design-in

The mains supply must be connected to the input end of LED driver.

Philips Outdoor driver

The Fortimo FastFlex IP module is designed to be used with Philips Xitanium IP67 drivers and Philips Advance driver. Philips Xitanium IP67 drivers allows for an easier design-in for non-IP rated luminaire design. More information about the Xitanium IP67 drivers can be found in its design in guide and commercial leaflet. These documents can be downloaded via <http://www.lighting.philips.com.sg/oem-sg> More information about Advance driver information can be found via <http://www.usa.lighting.philips.com/products/oemcomponents>



Warnings:

- The mains supply must be connected to the LED driver.
- Drive the FastFlex IP module using constant current sources, not constant voltage sources.



Important usage notes

- Minimum drive current = 10% of maximum drive current. If dimmed below minimum drive current, Philips does not guarantee the specified product performance
- Please check the maximum drive current of each product. This limit must be observed in all cases, including CLO.
- Please refer to the respective product datasheet for the reference T_{case} and for the maximum T_{case} values. T_{case} must not exceed the provided figure at the given drive current.
- Failure to comply with usage conditions will void product warranty

Dimming function

The Xitanium IP67 1-10V and Advance 0-10V dimming drivers offer a full range of output current control, enabling customized luminaire design and performance.

For more information about the dimming functions of Philips drivers can be found in the Philips outdoor driver design in guide and commercial leaflet. For other dimming functions, please contact your Philips sales representative.

Compatible Drivers with Fortimo FastFlex IP

A list of compatible drivers, specific to your choice of module and operating point can be obtained from the Easy Design-in Tool that can be found at www.easydesignintool.com In case of queries, please contact your Philips representative.



Warnings:

When using a long cable between the module and driver, extra care should be taken in the design of EMI, surge and noise suppression. It is also important to ensure the cable is guided out of the optical path

Surge protection in a FastFlex IP LED system

Fortimo FastFlex IP modules have a high level of integrated protection against the adverse effects of external surges and electro-static discharges. For optimum system protection, apply external common-mode and differential mode surge protection at luminaire level in order to mitigate the harmful effects of surges on the LED driver and the FastFlex IP LED module. More details on surge protection please visit www.philips.com/oem

Note:

If surge protection structure not within power supplier, a lightning protector should be needed additionally for outdoor application.

Reliability

Lumen maintenance

B50L70 @ 50,000 hours

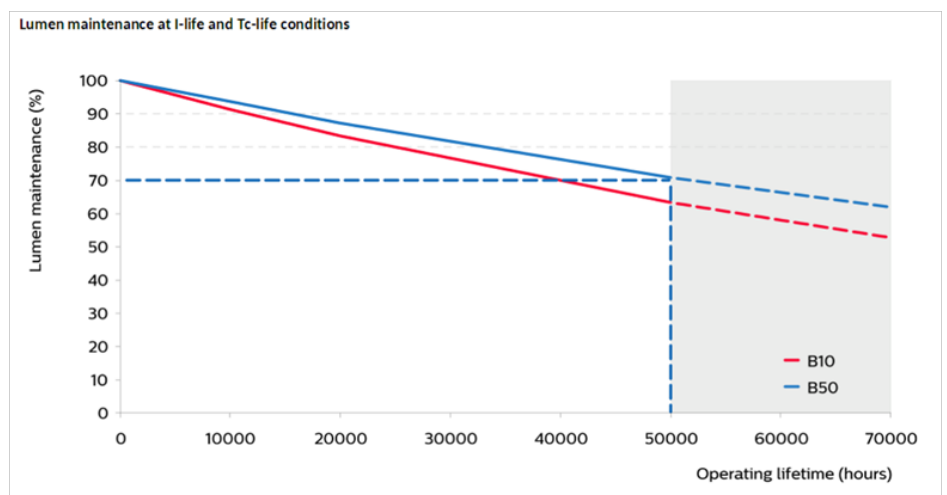
The quality of the Fortimo FastFlex IP portfolio is backed by the Philips' claim of B50L70 @ 50,000 hours. This means that at 50,000 hours of operation at least 50% of the module population will emit at least 70% of its original amount of lumens. This is contrary to conventional light sources, where 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 Fortimo FastFlex IP modules can be found in the associated datasheet at <http://www.lighting.philips.com.sg/oem-sg>.

Average rated life is based on engineering data testing and probability analysis. The Fortimo FastFlex IP modules are specified to reach B50L70 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 Fortimo FastFlex IP you are using at <http://www.lighting.philips.com.sg/oem-sg>.



FastFlex IP modules will be LED module performance (IEC 62717) certified.

The relevant standards are summarized below.

To ensure luminaire approval, the conditions of acceptance need to be fulfilled. Details can be requested from your local sales representative. All luminaire manufacturers are advised to conform to the international (luminaire standards IEC 60598-1 or UL1598) and national standards of luminaire design.

Sustainability

FastFlex IP modules are compliant with European Directive 2011/65/EU, recasting 2002/95/EC on Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS). The modules comply with Reach, as defined by the EU Chemical Agency.

Warranty

The warranty on FastFlex IP module performance only applies if the product is used in combination with approved Philips outdoor LED drivers. Please refer to the Easy design-in tool and get advice from your local sales representative

IP rating, humidity and condensation

The Fortimo FastFlex IP is an integrated module solution with IP66 protection which enables OEM customers to easily design outdoor luminaire.

To make sure the whole system can be waterproof, please confirm that all the other components in the system fulfill the waterproof requirement or the design of the luminaire housing can provide sufficient IP rank for non-waterproof components in the system.

Photobiological safety

The photobiological safety standard IEC TR 62778 ('Photobiological safety of lamps and lamp systems') gives guidance on how to evaluate the photobiological safety of lamps and lamp systems including luminaires. This standard specifies the exposure limits, reference measurement technique and classification scheme for the evaluation and control of photobiological hazards from all electrically powered incoherent broadband sources of optical radiation including LEDs in the wavelength range from 200 nm through 3000 nm. Measured results of emission limits for Fortimo FastFlex IP modules using the non-GLS (50 cm) method are listed in the datasheets that can be found at <http://www.lighting.philips.com.sg/oem-sg>

From the nature of most LEDs applying blue light, emphasis has been put on the hazard in terms of Photo Biological Safety (PBS). Evaluation by the European lighting industry (ELC, Celma) has concluded LED light sources are safe for customers when used as intended. A photobiological safety report is available at <http://www.lighting.philips.com.sg/oem-sg>

Nevertheless luminaire makers have to comply with luminaire standards including PBS. To avoid extensive retesting, it is preferred to build on the test conclusions of the LED (module) suppliers; however this should be discussed and agreed upon with the used certification body. The testing conclusion then will be expressed in Risk Groups (RG), where RG0 and RG1 are considered safe and/or do not require specific action for the luminaire makers (as compared to RG2 and 3).

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. In general, LED modules have no effect on the EMC of a luminaire. Contact Philips at any time if you need advice on your luminaire design for EMC problem.

Electrostatic discharge (ESD)

Introduction to ESD

It is generally recognized that Electro Static Discharge (ESD) can damage electronic components, like LED chips, resulting in early failures. Professional users of electronic components are used to implementing extensive and rigorous measures to prevent ESD damage in their finished products. With the introduction of LED components for lighting, a new breed of users, such as OEMs and installers, are now involved in handling and using electronic LED components in the manufacturing process.

ESD consultancy

Depending on the protection level of the LED module a minimum set of measures has to be taken when handling FastFlex IP modules. Philips LED products have a high degree of ESD protection by design. ESD measures are required in a production environment.

Environmental compliance

Independent ESD consultancy companies can advise and supply adequate tools and protection guidance. Philips Innovation Services can provide consultancy www.innovationservices.philips.com

More information can be found in the section entitled 'Contact details'.

Remote system operation

Please consult the design-in guide for Philips outdoor LED drivers.

Use of circuit breakers: Philips LED drivers

Please consult the design-in guide for Philips LED drivers

Chemical Compatibility

The LED contains a silicone overcoat to protect the LED chip and extract the maximum amount of light. As with most silicones used in LED optics, care must be taken to prevent any incompatible chemicals from directly or indirectly reacting with the silicone. The silicone overcoat used in the LED is gas sensitive. Consequently, oxygen and volatile organic compound (VOC) gas molecules can diffuse into it. VOCs may originate from adhesives, solder fluxes, conformal coating materials, potting materials and even some of the inks that are used to print the PCBs. A list of commonly used chemicals, that should be avoided as they may react with the silicone material, is provided on the left. 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.

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 Ethyl Ketone)	Solvent
MIBK (Methyl Isobutyl Ketone)	Solvent
Mineral spirits (turpentine)	Solvent
Tetrachlorometane	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

Note on conditions: storage, transportation & operation

- Store in a dark place
- Do not expose to sunlight
- Maintain temperature between -40 and +65 °C
- Relative humidity (RH) between 5% and 95%

During operation

FastFlex IP modules must be operated within the specifications stated in the product data sheet and design-in guide. Please contact your local sales representative for additional information.

Use of circuit breakers: Xitanium LED drivers

Please consult the design-in guide for Xitanium LED drivers at www.philips.com/xitanium

Note:

That warranty is applicable for the Philips Fortimo FastFlex modules for 1 switching cycle per day in combination with a released Philips outdoor driver.

System disposal

We recommend that the FastFlex IP module and its components are disposed of in an appropriate way at the end of their (economic) lifetime. The modules are in effect normal pieces of electronic equipment containing components that are currently not considered to be harmful to the environment. We therefore recommend that these parts are disposed of as normal electronic waste, in accordance with local regulations.

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 the 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.

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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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<http://www.lighting.philips.com.sg/oem-sg>