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# Technical application guide

PrevaLED® Core G8  
LED modules



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**Please note:**

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# 1 Introduction

## 1.1 System overview

### Smaller dimensions – larger selection – higher efficiency!

Today, while serving an increasing number of applications, spotlights and downlights are becoming more and more efficient and smaller and smaller in size. Whether in general lighting, shop lighting or special applications, the components must be suitable for use in a variety of luminaires.

The new product design of the PrevaLED® Core G8 enables optimized luminaire designs due to a reduced loss of luminous flux. Thanks to its particularly low optical contact area (OCA) height of just 1.55 mm and its small light-emitting surface (LES) with diameters of only 6, 10 or 15 mm, the reflector can be positioned very close to the light source and enables an improved light coupling and beam control.

Both of these are ideal prerequisites for designing luminaires that feature optimized lighting technology and smaller overall dimensions.

### Take your pick from a very large spectrum of power ranges, color temperatures and light qualities:

- 1000, 2000, 3000 or 5000 lm
- 2700, 3000, 3500 or 4000 K
- CRI > 90

Depending on the application, we recommend the combination of PrevaLED® Core G8 with our OPTOTRONIC® or ICUTRONIC® Compact LED drivers for an optimal system solution (please refer to chapter 3.2).

### Areas of application

- Spotlighting in shops and retail
- Downlighting and wall lighting in offices, corridors, meeting rooms, workplaces
- Decorative and functional lighting in hospitality applications (e.g. hotels, restaurants)
- Functional lighting in public and commercial buildings

### Product benefits

- Easy integration thanks to very compact form factor
- Easy cooling due to optimized efficiency and high maximum operation temperature
- High LED driver flexibility allows cost-effective and intelligent systems
- 5 year guarantee

### Product features

- Complete portfolio with varying luminous flux, color temperature, color rendering
- Available with color temperatures: 2,700 K, 3,000 K, 3,500 K or 4,000 K
- High module efficacy: up to 159 lm/W at a very high temperature of  $t_p = 85\text{ °C}$
- CE-marked
- Lifetime (L80/B10): 70,000 h (temperature at  $t_c = 80\text{ °C}$ )



## 1.2 Ordering information

### PrevaLED® Core G8 LED modules

Product name	Product number (EAN 10) 1 piece	Product number (EAN 20) 40 pieces	Product number (EAN 40) 200 pieces	Pieces per box
PL-CORE-G8-1000HD-927-L06	6977770430570	6977770430587	6977770430594	200 (5 bags inside)
PL-CORE-G8-1000HD-930-L06	6977770430600	6977770430617	6977770430624	200 (5 bags inside)
PL-CORE-G8-1000HD-940-L06	6977770430631	6977770430648	6977770430655	200 (5 bags inside)
PL-CORE-G8-2000-927-L10	6977770430662	6977770430679	6977770430686	200 (5 bags inside)
PL-CORE-G8-2000-930-L10	6977770430693	6977770430709	6977770430716	200 (5 bags inside)
PL-CORE-G8-2000-935-L10	6977770430723	6977770430730	6977770430747	200 (5 bags inside)
PL-CORE-G8-2000-940-L10	6977770430754	6977770430761	6977770430778	200 (5 bags inside)
PL-CORE-G8-3000-927-L15	6977770430785	6977770430792	6977770430808	200 (5 bags inside)
PL-CORE-G8-3000-930-L15	6977770430815	6977770430822	6977770430839	200 (5 bags inside)
PL-CORE-G8-3000-935-L15	6977770430846	6977770430853	6977770430860	200 (5 bags inside)
PL-CORE-G8-3000-940-L15	6977770430877	6977770430884	6977770430891	200 (5 bags inside)
PL-CORE-G8-5000-927-L15	6977770430907	6977770430914	6977770430921	200 (5 bags inside)
PL-CORE-G8-5000-930-L15	6977770430938	6977770430945	6977770430952	200 (5 bags inside)
PL-CORE-G8-5000-940-L15	6977770430969	6977770430976	6977770430983	200 (5 bags inside)

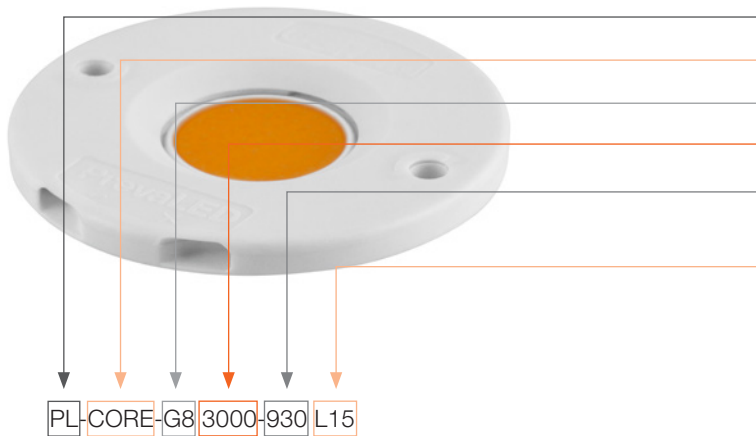
## 1.3 Technical data

### Product Performance, $t_c = 85\text{ °C}$

Product name	Nominal CCT [K]	Min CRI	Flux Output [lm]		Typical Efficacy [lm/W]	Test Cur- rent [mA]	Nominal Power [W]	Max Power [W]	LES [mm]
			Min	Typ					
PL-CORE-G8-1000HD-927-L06	2700	90	874	950	139	200	6.8	11.4	6
PL-CORE-G8-1000HD-930-L06	3000	90	897	975	143	200	6.8	11.4	6
PL-CORE-G8-1000HD-940-L06	4000	90	934	1015	149	200	6.8	11.4	6
PL-CORE-G8-2000-927-L10	2700	90	1830	1990	146	400	13.6	27	9.8
PL-CORE-G8-2000-930-L10	3000	90	1877	2040	150	400	13.6	27	9.8
PL-CORE-G8-2000-935-L10	3500	90	1918	2085	153	400	13.6	27	9.8
PL-CORE-G8-2000-940-L10	4000	90	1946	2115	156	400	13.6	27	9.8
PL-CORE-G8-3000-927-L15	2700	90	2567	2790	149	550	18.7	32.4	14.5
PL-CORE-G8-3000-930-L15	3000	90	2622	2850	152	550	18.7	32.4	14.5
PL-CORE-G8-3000-935-L15	3500	90	2677	2910	156	550	18.7	32.4	14.5
PL-CORE-G8-3000-940-L15	4000	90	2732	2970	159	550	18.7	32.4	14.5
PL-CORE-G8-5000-927-L15	2700	90	4002	4350	142	900	30.6	43.2	14.5
PL-CORE-G8-5000-930-L15	3000	90	4131	4490	147	900	30.6	43.2	14.5
PL-CORE-G8-5000-940-L15	4000	90	4260	4630	151	900	30.6	43.2	14.5

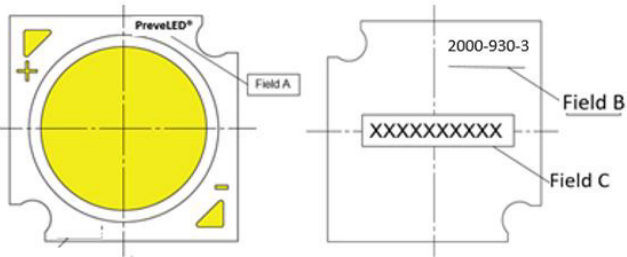
- Nominal performance is measured with pulse current at  $t_c = 85\text{ °C}$
- Tolerance of measurements for the luminous flux, efficacy, CRI and CCT is  $\pm 5\%$
- LES is the diameter of effective light-emitting area
- Maximal power is defined at Max rating current (Table. 4) and the  $t_c$  should be maintained under the Max  $t_c 95\text{ °C}$

### 1.4 Nomenclature



- PL:** PrevaLED® LED module
- Segment CORE:** Round LED module
- G8:** Generation 8
- 3000:** Lumen level
- 930:** Color rendering index (CRI) + color temperature (CCT) = >90 + 3000K
- L15:** LES (= light-emitting surface), diameter: 14.5 mm
- LES**  
L06 = 6 mm / L10 = 9.8 mm / L15 = 14.5 mm

### Marking format definition on substrate



Field A	Field B	Field C
PrevaLED logo	Package name	Date code/Lot number

### Field B: Package name format (back): PPPP - AAA - D

PPP	AAA	
COB package	CCT/CRI	
1000-HD	940	CRI 90, 4000K
2000	935	CRI 90, 3500K
3000	930	CRI 90, 3000K
5000	927	CRI 90, 2700K

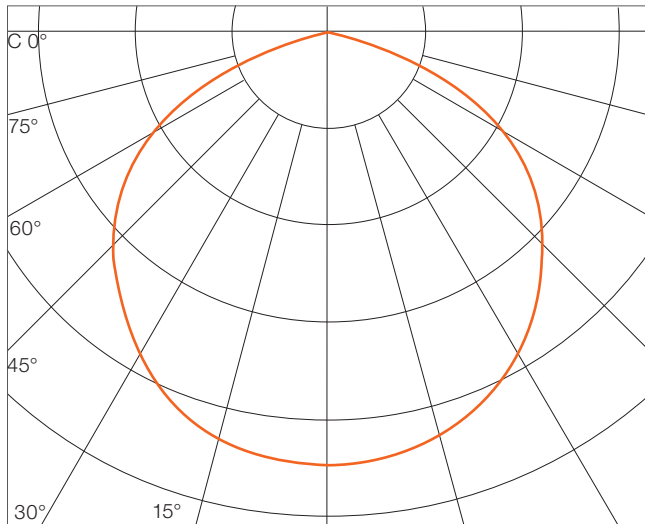
### Holders

Product name	Product number (EAN-010)	Product number (EAN-020)	Product number (EAN-040)
	1 piece	40 pieces	480 pieces
PL-CORE HOLDER H3-1919	6937186141620	6937186144997	6937186141637
PL-CORE HOLDER H1-1919	6937186141606	6937186145000	6937186141613
PL-CORE HOLDER H1-1313	6937186141583	6937186145017	6937186141590

## 2 Optical considerations

### 2.1 Light distribution

The light distribution of the LED module is shown in the graph below. PrevaLED® Core G8 LED modules create a beam angle of 114° FWHM (full width at half maximum).



### 2.2 Reflector design

High luminances are the key factor for LED-based lamps and luminaires in the area of reflector applications, such as spotlights. For this purpose, light sources with small light-emitting surfaces and a high luminous flux – as realized in the PrevaLED® Core G8 – are required, because in such combinations, the light can be collimated particularly well with reflectors.

The PrevaLED® Core G8 is equipped with a surface that emits light evenly and makes the use of diffuser materials unnecessary due to its high level of homogeneity. The minimized light-emitting surface (with LES 06, 10 or 15) and a positioning of the reflector close to the LES due to the new flat holder allow improved optical handling. Generally, the properties of the PrevaLED® Core G8 help to avoid roughness and facets, allowing for very small total beam angles of 10° or less.

We provide mechanical (3D files) and optical simulation data (ray files as well as EULUMDAT files) to support custom reflector designs. Mechanical files can be downloaded via each product page in our e-catalog under: <https://products.inventronicsglobal.com>

Support for optics and reflector design as well as off-the-shelf solutions are available, e.g., from the following suppliers:

#### ACL-Lichttechnik GmbH

Hans-Boeckler-Strasse 38A  
40764 Langenfeld, Germany  
+49 2173 9753 0  
info@reflektor.com  
www.reflektor.com

#### Almeco S.p.A.

Via della Liberazione, 15  
20098 San Giuliano Milanese (Mi), Italy  
+39 02 988963 1  
info.it@almecogroup.com  
www.almecogroup.com

#### Ledil Oy

Salorankatu 10,  
24240 Salo, Finland  
+358 2 7333804  
ledil@ledil.com  
www.ledil.com

#### Jordan Luxar GmbH & Co. KG

Schneiderstrasse 76  
40764 Langenfeld, Germany  
+49 2173 279 0  
sales@jordan-luxar.de  
www.jordan-luxar.de

#### Jordan Reflektoren GmbH & Co. KG

Schwelmer Strasse 161  
42389 Wuppertal, Germany  
+49 202 60720  
info@jordan-reflektoren.de  
www.jordan-reflektoren.de

#### Nata Lighting Co., Ltd.

380 Jin Ou Road, Jiang Hai District  
Jiang Men City, Guangdong, China  
+86 750 377 0000  
info@nata.cn  
www.nata.cn

### 2.3 Photobiological safety

According to IEC/EN 62471, all PrevaLED® Core G8 LED modules are within risk group (RG) 1 at their nominal operating conditions.

**Please note:**

To avoid any adverse effects on sensitive materials, it is recommended to consider the distance between the LED light source and the illuminated object, depending on the light intensity of the LED source. If in doubt, material compatibility checks should be conducted.

The PrevaLED® Core G8 can be used with secondary optics.

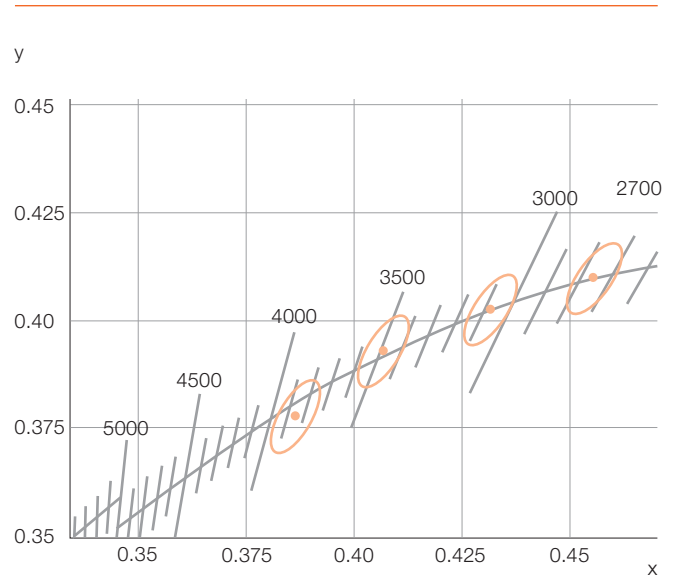
### 2.4 Color temperature

The PrevaLED® Core G8 series is currently available in 2700K, 3000K, 3500K and 4000K. The average values of color coordinates within the CIE 1931 color space are given below (average guiding values for reference only).

	2700 K	3000 K	3500 K	4000 K
<b>Cx</b>	0.4578	0.4338	0.4073	0.3818
<b>Cy</b>	0.4101	0.4030	0.3917	0.3797

Values measured at  $t_p = 85\text{ °C}$

Within each available color temperature, the PrevaLED® Core G8 series provides a maximum color variation of three threshold value units (MacAdam steps). The following diagram shows these threshold values within the CIE 1931 color space.



#### Chromaticity coordinate groups:

Chromaticity coordinates are measured during a current pulse of typically 25 ms, with an internal reproducibility of  $\pm 0.005$  and an expanded uncertainty of  $\pm 0.01$  (according to GUM with a coverage factor of  $k = 3$ ). For testing, the chromaticity coordinate ellipses are approximated with polygons.

### 2.5 Color bin definition

CCT [K]	Color space	CIE x	CIE y	$\theta$	a	b
2700	3SCDM	0.4578	0.4101	53.70	0.0081	0.0042
3000	3SCDM	0.4338	0.4030	53.22	0.0083	0.0041
3500	3SCDM	0.4073	0.3917	54.00	0.0093	0.0041
4000	3SCDM	0.3818	0.3797	53.72	0.0094	0.0040

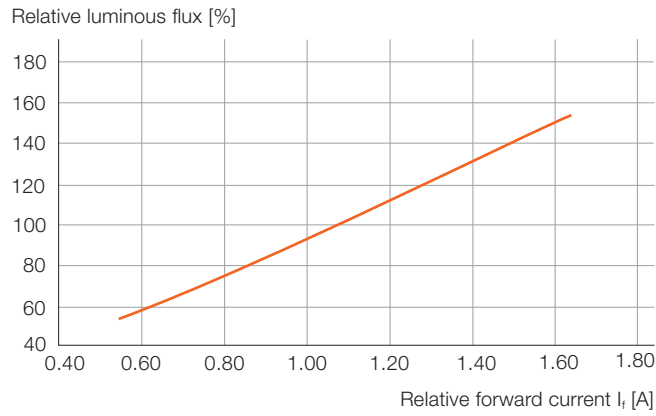
### 2.6 Optical characteristics, $t_c = 85\text{ °C}$

Product name	Nominal CCT [K]	CRI [R <sub>a</sub> ]		Color coordinates		Color consistency	R9	IES TM30-15	
		Min.	Typ.	CIE x	CIE y			RF	Rg
PL-CORE-G8-xxxx-927	2700	90	92	0.4578	0.4101	3SCDM	$\geq 50$	91	100
PL-CORE-G8-xxxx-930	3000	90	92	0.4338	0.4030	3SCDM	$\geq 50$	90	99
PL-CORE-G8-xxxx-935	3500	90	92	0.4073	0.3917	3SCDM	$\geq 50$	91	100
PL-CORE-G8-xxxx-940	4000	90	92	0.3818	0.3797	3SCDM	$\geq 50$	90	99

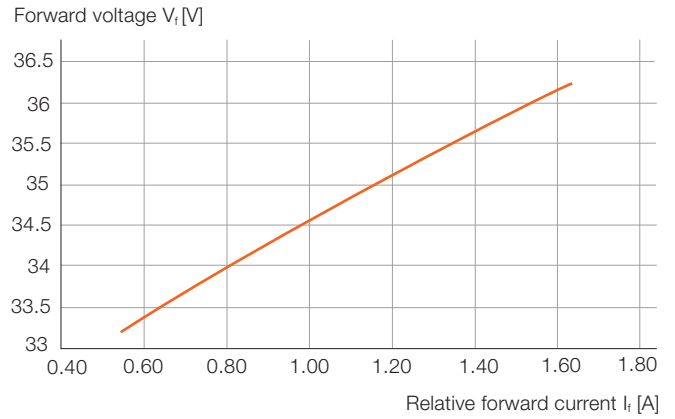
1. Nominal performance is measured with pulse current at  $t_c = 85\text{ °C}$   
 2. Tolerance of measurements for R9 is  $\pm 3$ , TM-30 Rf and Rg is  $\pm 3$ , chromaticity coordinate is  $\pm 0.005$

## 2.7 Performance characteristics of light-emitting devices

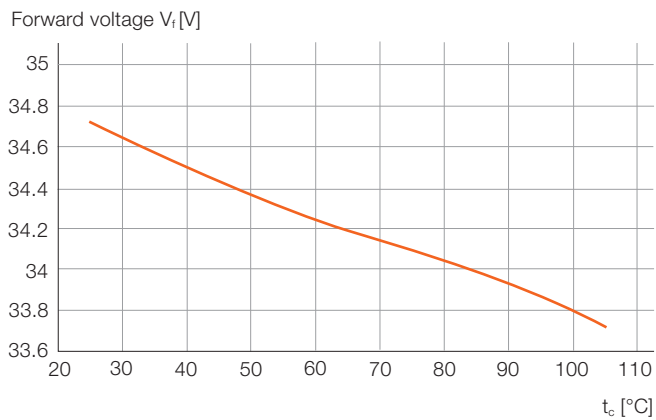
### Light output vs. forward current



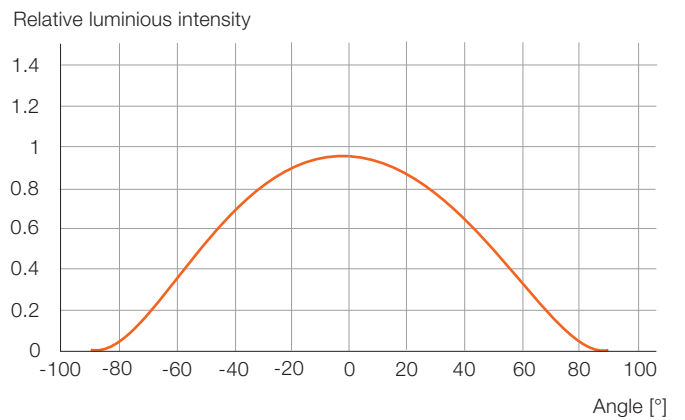
### Forward voltage vs. forward current



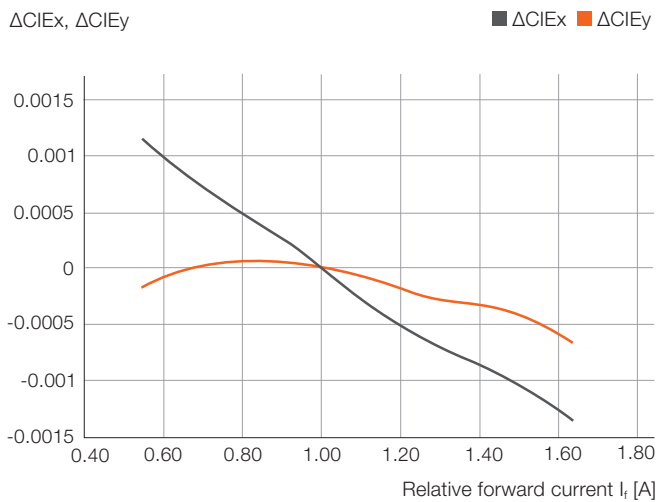
### Forward voltage vs. case temperature



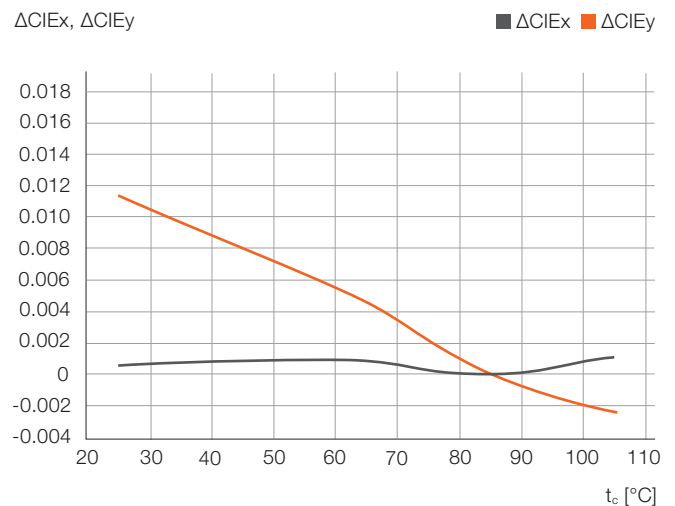
### Radiation pattern



### Color shift vs. forward current



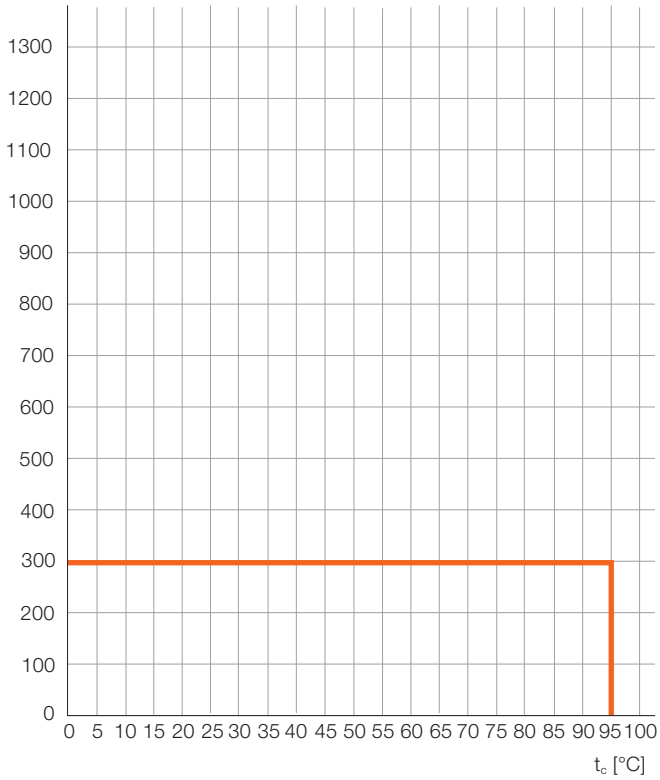
### Color shift vs. case temperature



## 2.8 Permissible working windows

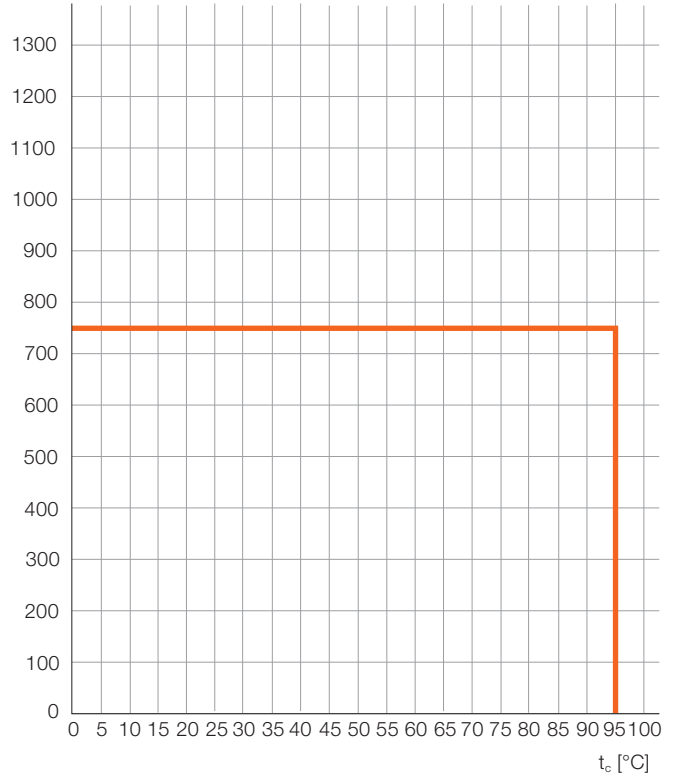
### PL-CORE-G8-1000HD-xxx-L06

Forward current [mA]



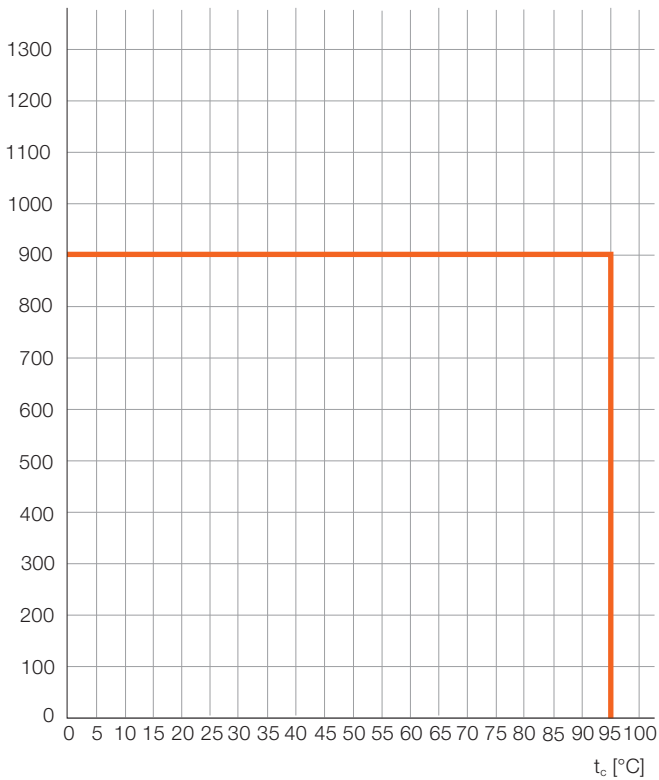
### PL-CORE-G8-2000-xxx-L10

Forward current [mA]



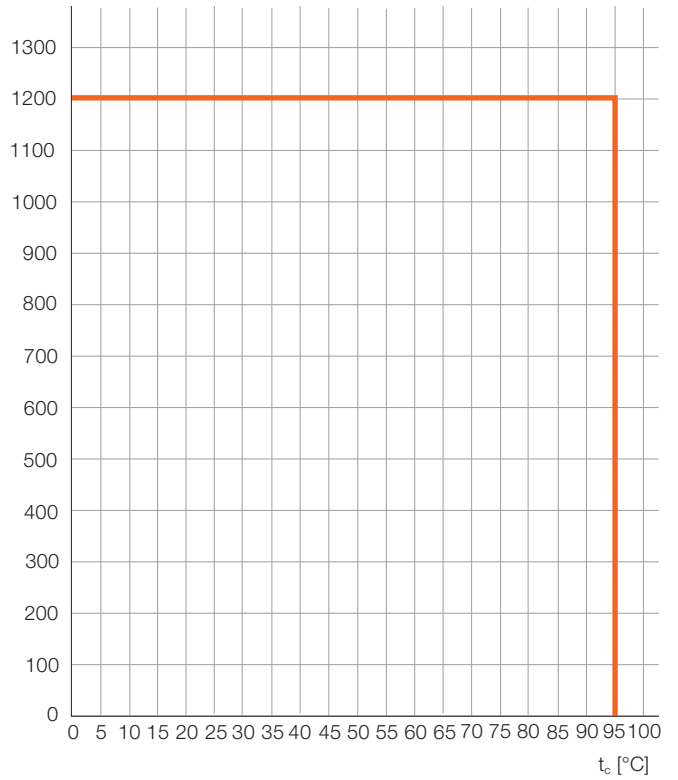
### PL-CORE-G8-3000-xxx-L15

Forward current [mA]



### PL-CORE-G8-5000-xxx-L15

Forward current [mA]



### 2.9 Color rendering

PrevaLED® Core G8 LED modules provide a color rendering index (CRI) of >90. The table below shows the individual  $R_a$  values from R1 to R14 for the available color temperatures.

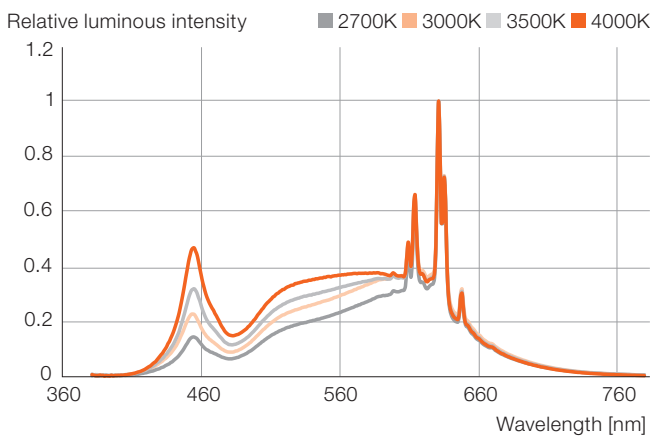
#### $R_a$ values (average guiding values for reference only)

	General CRI	Dusky pink	Mustard yellow	Yellowish green	Light green	Turquoise	Azure	Aster violet	Lilac violet	Red, saturated	Yellow, saturated	Green, saturated	Blue, saturated	Pink, skin color	Leaf green	TM30	TM30
	$R_a$	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	$R_r$	$R_g$
<b>CRI 90</b>																	
<b>CCT = 2700 K</b>	94	96	97	97	96	95	97	91	82	57	91	97	86	96	97	91	100
<b>CCT = 3000 K</b>	93	94	96	96	94	65	96	92	57	55	88	95	81	94	97	91	100
<b>CCT = 3500 K</b>	93	95	96	95	95	94	94	93	85	62	88	95	77	95	96	91	100
<b>CCT = 4000 K</b>	92	94	95	93	93	92	92	94	86	62	84	93	71	94	95	91	99

### 2.10 Spectral distribution

The typical spectral distribution of the PrevaLED® Core G8 LED modules is shown in the following diagrams.

#### CRI 90 (average guiding values for reference only)



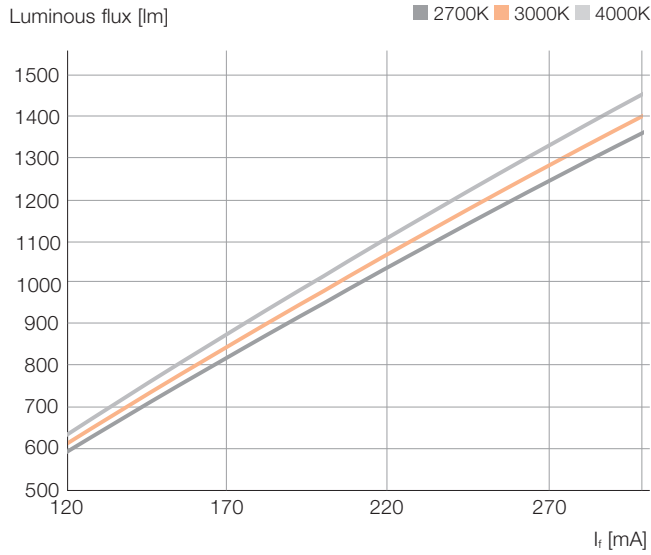
Values measured at  $t_p = 85^\circ\text{C}$

### 2.11 Luminous flux behavior

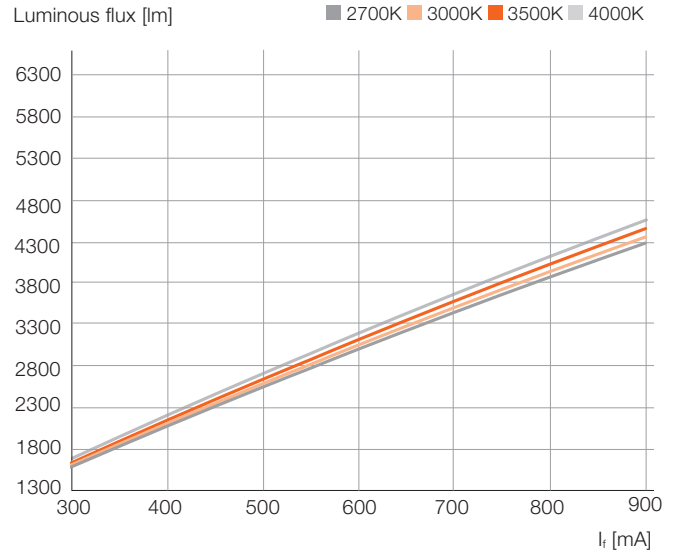
The following diagrams show the luminous flux as a function of the operating current for PrevaLED® Core G8 LED modules with 1000, 2000, 3000 and 5000 lm. Data related to the operating current is derived from a  $t_p$  temperature of 85 °C.

#### Luminous flux as a function of forward current [ $I_f$ ]

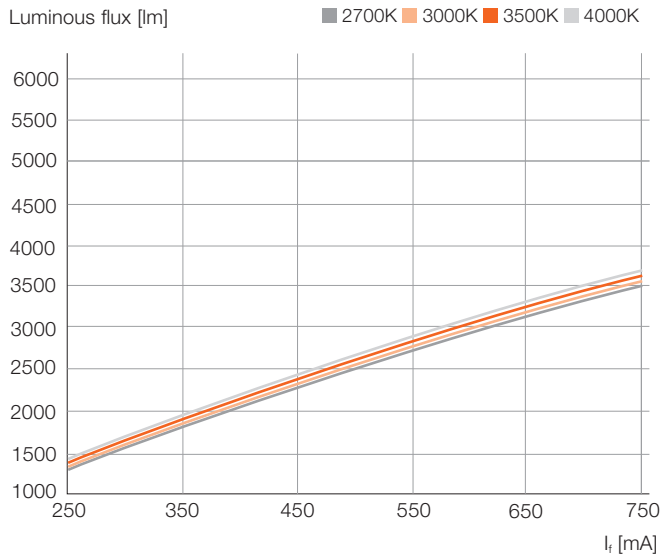
##### PL-CORE-G8-1000



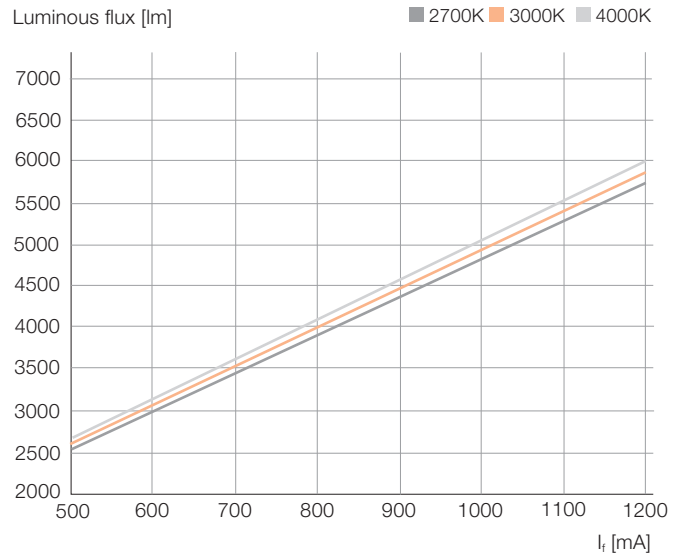
##### PL-CORE-G8-3000



##### PL-CORE-G8-2000



##### PL-CORE-G8-5000

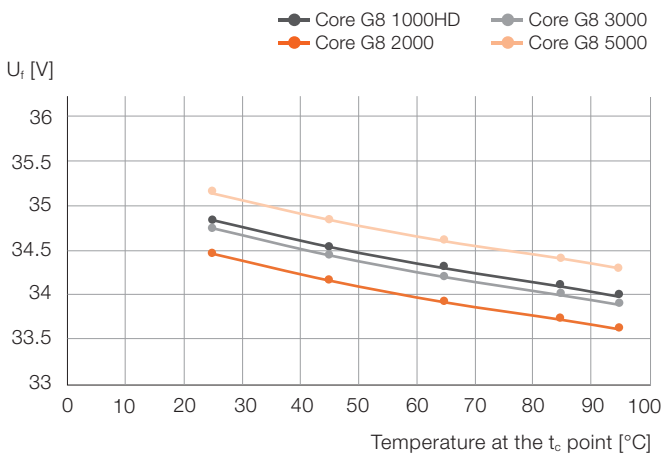


**Please note:**  
Tolerance for optical and electrical data: +/-10 %

# 3 Electrical considerations

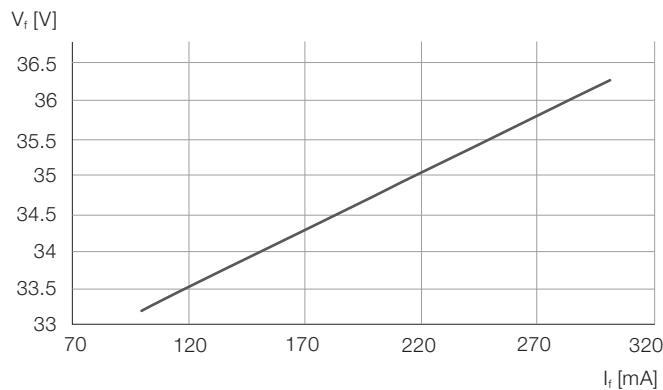
## 3.1 Forward voltage as a function of temperature

**Forward voltage [ $U_f$ ] as a function of temperature at the  $t_c$  point**

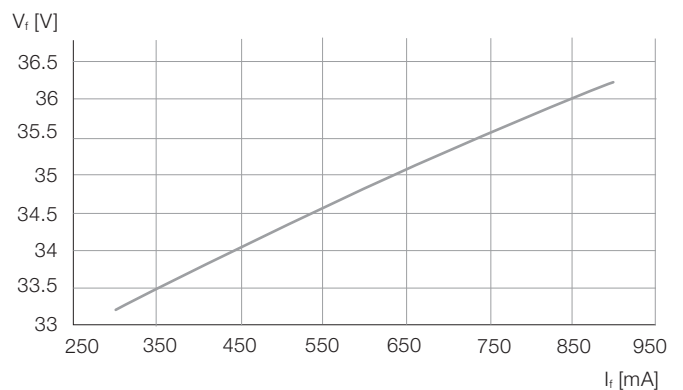


## 3.2 Forward voltage $V_f$ [V] as a function of $I_f$ [mA]

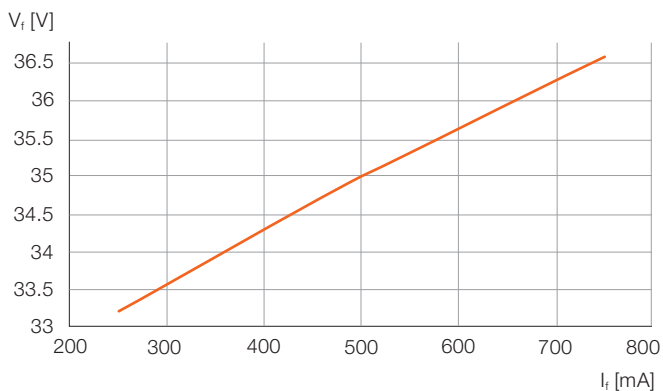
**PL-Core-G8-1000HD**



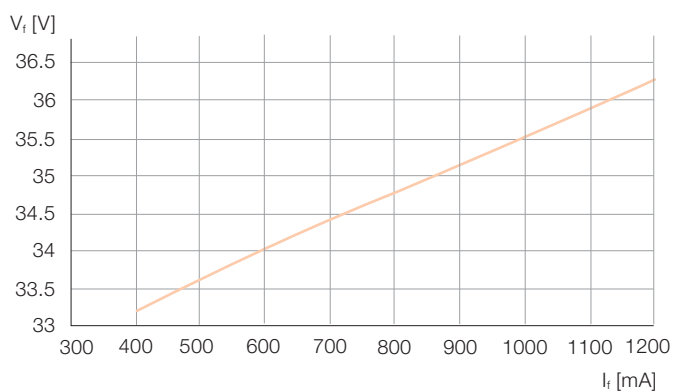
**PL-Core-G8-3000**



**PL-Core-G8-2000**



**PL-Core-G8-5000**



**Please note:**

Tolerance for optical and electrical data: +/- 5 %

### 3.3 Driver Selector & Digital OT-Poster

With the new Driver Selector & Digital OT-Poster, you can easily find your desired LED driver and create your individual driver overview by selecting the product families, characteristics, features and applications. Or simply filter by attributes for your needs – always with the latest product portfolio.

<https://www.inventronics-light.com/driver-selector>



## Driver Selector & Digital OT-Poster

Portfolio of #14-03-24

Constant Current  
COMPACT DRIVER  
Outdoor

Constant Current  
COMPACT DRIVER  
Indoor

Constant Current  
LINEAR LED DRIVER  
Indoor

Constant Voltage  
LED DRIVER  
Indoor

Constant Voltage  
LED DRIVER  
Outdoor

Constant Voltage  
DIMMER

Show only

Characteristics	Features	Applications	Status
<input type="radio"/> Constant Current <input type="radio"/> Constant Voltage	<input type="radio"/> NFC <input type="radio"/> Tunable/White	<input type="checkbox"/> Horticulture <input type="checkbox"/> Shop/Retail <input type="checkbox"/> Streetlighting	<input type="checkbox"/> Office <input type="checkbox"/> Industry <input type="checkbox"/> Robust
<input type="radio"/> Indoor <input type="radio"/> Outdoor	<input type="radio"/> Dimmer <input type="radio"/> Dimmable <input type="radio"/> Non-Dimmable	<input type="checkbox"/> Wireless Intelligent <input type="checkbox"/> Tuner4TRONIC	<input type="checkbox"/> NEW <input type="checkbox"/> PHASE-OUT
<input type="radio"/> Linear/Area <input type="radio"/> Compact	<input type="radio"/> SELV <input type="radio"/> Non isolated		

Filter your result

Nominal output power

● Value

100 W

Nominal output voltage

● Value ○ Range

24 V - 24 V

Nominal output current

● Value ○ Range

200 mA - 200 mA

Dimming Interface (multiple choice\*)

DALI-2  
DEXAL/D4i

Programming Interface (multiple choice\*)

DEXAL/DALI  
NFC

Type of protection (multiple choice\*)

IP20  
IP65

\* Hold CTRL to (de-)select multiple values

Class	Product name	EAN	Isolation	Nominal output power	Nominal output voltage	Nominal output current
<b>Constant Current   Linear / Area   Non-dimmable</b>						
ELEMENT Current Setting Linear	ELEMENT 35/220...240/800 CS L	4052899553132	SELV	11.5...40.8 W	23...51 V	Dipswitches
	ELEMENT 55/220...240/1200 CS L	4052899553156	SELV	21...61 W	23...51 V	Dipswitches
ELEMENT Direct Current Setting Linear	ELEMENT 18/220...240/350 D CS L	4052899553071	Non isolated	5...18 W	25...54 V	Dipswitches
	ELEMENT 40/220...240/350 D CS L	4052899553095	Non isolated	11...42 W	55...120 V	Dipswitches
	ELEMENT 60/220...240/350 D CS L	4052899553118	Non isolated	18...60 W	90...175 V	Dipswitches
	EM FIT Current Setting Linear	EM FIT 18/220...240/350 CS L	4062172219976	SELV	5.4...17.85 W	27...51 V
EM FIT Direct Current Setting Linear	EM FIT 40/220...240/800 CS L	4062172219980	SELV	13.5...40.8 W	27...51 V	Dipswitches
	EM FIT 60/220...240/1A2 CS L	4062172220019	SELV	24.3...61.2 W	27...51 V	Dipswitches
	EM FIT 75/220...240/1A6 CS L	4062172220033	SELV	35.1...81.6 W	27...51 V	Dipswitches
	EM FIT 18/220...240/350 D CS L	4062172219981	Non isolated	5...18.9 W	27...54 V	Dipswitches
	EM FIT 40/220...240/350 D CS L	4062172219914	Non isolated	8...42 W	40...120 V	Dipswitches
	EM FIT 60/220...240/350 D CS L	4062172219938	Non isolated	18...61.25 W	90...175 V	Dipswitches
IT FIT Current Setting Linear	EM FIT 75/220...240/550 D CS L	4062172219952	Non isolated	31.5...75.6 W	90...216 V	Dipswitches
	IT FIT 18/220...240/350 CS L	4062172212663	SELV	4.6...18.9 W	23...54 V	Dipswitches

### 3.4 Lighting Designer

The Lighting Designer online tool helps to identify the right combination of LED modules and LED drivers, based on the technical specifications for your luminaire project.

<https://www.inventronics-light.com/lightingdesigner>

#### Lighting Designer 2.1

**Design Your Light!**  
 OSRAM Lighting Designer is a tool to identify the right combination of LED modules and driver for your luminaire project. With just a few clicks you find the OSRAM lighting system of your choice. Please enter your fixture requirements and press Search.  
*Browser requirements: For best performance please use Firefox, Chrome, Safari or Edge browser.*

1. LED module (set)
2. LED driver
3. Summary

**Fixture Calculation Type**

Calculate with single module type for all modules
  Calculate mixed length types and/or multiple rows of modules

**Fixture LED Module Type**

Module Type: Linear Light Engines

No. of Modules: 1

Wiring of Modules: ---

**Fixture Requirements**

Required System Luminous Flux (lm): |

Fixed Current (mA):

CCT (K): 4000

Optical Efficiency (%): 100

Please enter required Flux or define Fixed Current

**Select LED module**

OSRAM LED module	Voltage Range	CCT (K)	CRI	Nominal Flux (lm)	Length (mm)	Width (mm)	Calculated Module Efficacy (lm/W)*	Calculated Nominal Voltage (V)
Waiting for configuration...								

**Filter**

EAN:

Voltage Range: --

Length (mm): --

Width (mm): --

CRI: --

Led Rows: --

clear filters

\* Calculation based on a few data points and interpolated at tc temperature test point. Please verify result with official product datasheet.

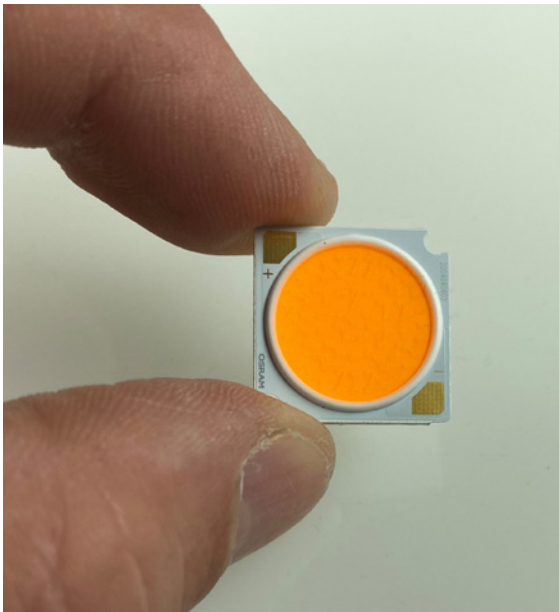
### 3.5 Electrical characteristics, $t_c = 85\text{ °C}$

Product name	Forward voltage [V] (Ra)			Typical power [W]
	Min.	Typ.	Max.	
PL-CORE-G8-1000HD-xxx-L06	32	34	38	6.8
PL-CORE-G8-2000-xxx-L10	32	34	38	13.6
PL-CORE-G8-3000-xxx-L15	32	34	38	18.7
PL-CORE-G8-5000-xxx-L15	32	34	38	30.6

### 3.6 Absolute maximum ratings

Product name	DC forward current [mA]	Case temperature [ $t_c$ ]	Operating temperature [ $t_a$ ]	ESD classification	Storage temperature
PL-CORE-G8-1000HD-xxx-L06	300	95 °C	-40 to 60 °C	2 kV	-40 to 80 °C
PL-CORE-G8-2000-xxx-L10	750	95 °C	-40 to 60 °C	2 kV	-40 to 80 °C
PL-CORE-G8-3000-xxx-L15	900	95 °C	-40 to 60 °C	2 kV	-40 to 80 °C
PL-CORE-G8-5000-xxx-L15	1200	95 °C	-40 to 60 °C	2 kV	-40 to 80 °C

### 3.7 Assembly instructions



1 Take the LED chip out of the packaging. The plus and minus poles are clearly marked on the top side of the LED COB.



2 Turn the LED COB over and insert it into the back of the holder. Make sure that the polarity is correct.



3 Now carefully press on the back of the LED COB until it clicks into place in the holder (at the notch on the side, as shown above).



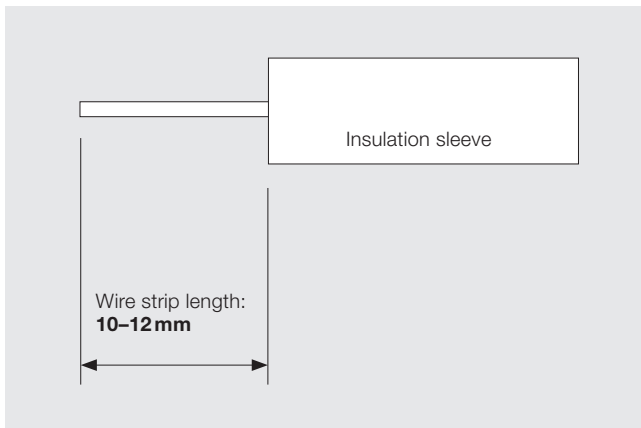
4 The connection between the LED COB and the holder is now established. The LED module is ready for installation.

### 3.8 Wiring

PrevaLED® Core G8 LED modules are equipped with an easy “poke-in” connector. The input clamps used in PrevaLED® Core G8 types can handle solid and stranded wires with a cross section of 0.5–0.8 mm<sup>2</sup> (AWG 20–18).

**Example: H05V-U 1x 0.5 mm<sup>2</sup>**

#### Wire preparation



#### Please note:

- The connector is designed for two “poke-in” and release cycles.
- The installation of LED modules has to be carried out in compliance with all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.
- If you cannot use solid wires, you can use stranded wires with a diameter of 0.5 to 0.75 mm and tin-coat the wire ends before inserting them into the connection clamp. Depending on the wire and/or cable type, other suitable preparations may also be necessary (e.g. cable end contacts).

### 3.9 Maximum allowed number of LED drivers per circuit breaker

For the maximum allowed number of LED drivers per circuit breaker, please refer to the corresponding LED driver data-sheet.

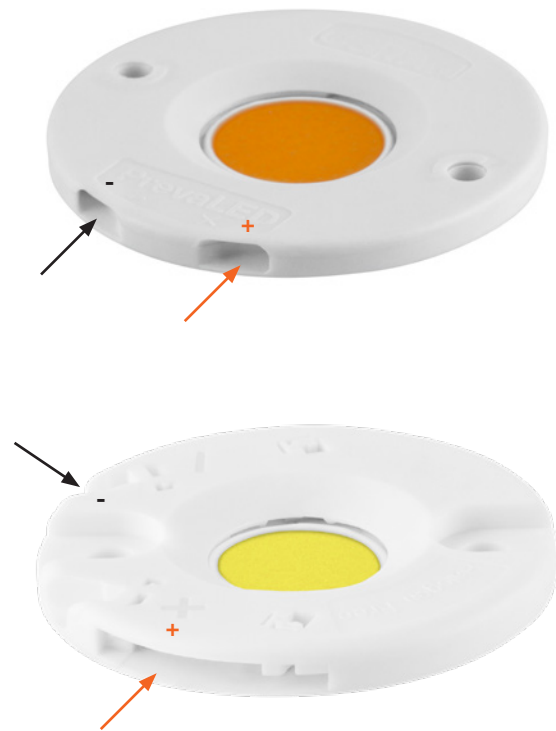
### 3.10 ESD

We recommend to handle and store all PrevaLED® Core G8 COBs using appropriate ESD protection methods. The LED module fulfills the requirement of the immunity standard IEC/EN 61547.

#### Please note:

Be aware that it is mandatory to handle LES 10 components in electrostatic protected areas (EPAs).

#### Easy “poke-in”:



## 4 Thermal considerations

The proper thermal design of an LED luminaire is critical for achieving the best performance and ensuring the longest lifetime of all components. Due to the high efficacy of PrevaLED® Core G8 LED modules, only a partial amount of the introduced electrical power has to be dissipated through the back of the LED module. The thermal power that has to be dissipated for PrevaLED® Core G8 LED modules is shown in the following table.

**Please note:**

To achieve the best possible lifetime of the LED module and to protect it from damage by overheating, the module must not exceed a maximum  $t_c$  of 95 °C.

Moreover, it is mandatory to use TIM (thermal interface materials, e.g. thermal paste) to ensure a proper thermal conductance between the LED module and the heat sink.

### 4.1 Thermal power values

Product	Typ. thermal power at nominal current	Typ. thermal resistance nominal current	Max. thermal power	Max. thermal resistance
	$P_{th\ typ}$ [W]	$R_{th\ typ}$ [K/W]	$P_{th\ max}$ [W]	$R_{th\ max}$ [K/W]
PL-CORE-G8-1000HD-927-L06	3.9	15.4	7.3	10.9
PL-CORE-G8-1000HD-930-L06	3.9	15.6	7.2	11.1
PL-CORE-G8-1000HD-940-L06	3.7	16.3	7.1	11.3
PL-CORE-G8-2000-927-L10	7.5	8.0	17.3	4.6
PL-CORE-G8-2000-930-L10	7.4	8.1	17.0	4.7
PL-CORE-G8-2000-935-L10	7.2	8.3	16.8	4.8
PL-CORE-G8-2000-940-L10	7.1	8.4	16.7	4.8
PL-CORE-G8-3000-927-L10	10.2	5.9	20.1	4.0
PL-CORE-G8-3000-930-L15	10.0	6.0	19.8	4.0
PL-CORE-G8-3000-935-L15	9.8	6.1	19.5	4.1
PL-CORE-G8-3000-940-L15	9.6	6.2	19.3	4.2
PL-CORE-G8-5000-927-L15	17.3	3.5	27.3	2.9
PL-CORE-G8-5000-930-L15	17.0	3.5	26.8	3.0
PL-CORE-G8-5000-940-L15	16.4	3.7	26.3	3.0

**Please note:**

Values are calculated at a reference  $t_c$  point temperature of 65 °C

### 4.2 TIM and other accessories

When mounting a PrevaLED® Core G8 LED module within a luminaire, it is mandatory to use thermal interface material (TIM) between the back of the LED module and the luminaire housing or heat sink. It is recommended to use thermal paste or phase-change material (PCM) because they perform better than thermal foil or pads. In order to balance possible unevenness, the material should be applied with a thickness between 0.15 and 0.30 mm (0.25 mm is recommended) and a maximum size of 25 x 25 mm. In this way, air inclusions, which may otherwise occur, are replaced by TIM and the required heat conduction between the back of the LED module and the contact surfaces of the luminaire housing is achieved. For this purpose, the roughness of the surface should be minimized and the planarity as well as the cleanness of the surface (free from burrs, chips or any other particles) should be optimized.

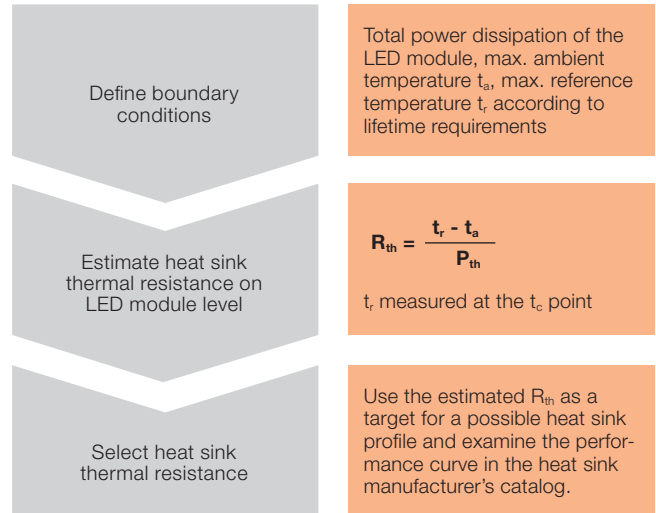
The list below is a selection of suppliers of thermal interface materials.

#### Thermal interface materials

Alfatec	<a href="http://www.alfatec.de">www.alfatec.de</a>
Kerafol	<a href="http://www.kerafol.de">www.kerafol.de</a>
Laird	<a href="http://www.lairdtech.com">www.lairdtech.com</a>
Bergquist	<a href="http://www.bergquistcompany.com">www.bergquistcompany.com</a>
Arctic Silver	<a href="http://www.arcticsilver.com">www.arcticsilver.com</a>
Wakefield	<a href="http://www.wakefield.com">www.wakefield.com</a>

### 4.3 Cooling system and heat sink

For the selection of a suitable heat sink, several points regarding thermal resistance have to be considered. The selection is usually carried out through the following necessary steps.



#### Please note:

A thermal design must always be confirmed by performing a thermal measurement in steady-state condition. The whole area of the metal-core PCB must be in full contact with the heat sink.

The list below is a selection of suppliers of different cooling solutions.

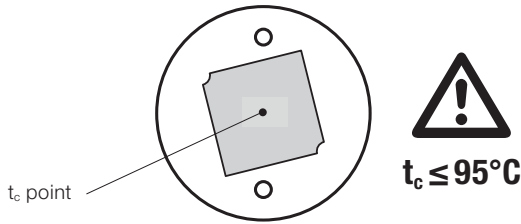
#### Cooling systems

Nuventix	<a href="http://www.nuventix.com">www.nuventix.com</a>
Sunon	<a href="http://www.sunoneurope.com">www.sunoneurope.com</a>
Cooliance	<a href="http://www.cooliance.eu">www.cooliance.eu</a>
AVC	<a href="http://www.avc-europa.de">www.avc-europa.de</a>
SEPA	<a href="http://www.sepa-europe.com">www.sepa-europe.com</a>
Fischer Elektronik	<a href="http://www.fischerelektronik.de">www.fischerelektronik.de</a>
Wakefield	<a href="http://www.wakefield.com">www.wakefield.com</a>
MechaTronix	<a href="http://www.mechatronix-asia.com">www.mechatronix-asia.com</a>

#### 4.4 $t_c$ point location and temperature measurement

The  $t_c$  point is the location where to check if the chosen cooling solution (heat sink and TIM) is sufficient to ensure the LED module performance. The  $t_c$  point is located on the back of the LED module under the center of the light-emitting surface (see following image).

##### Location of the $t_c$ point



To enable lifetimes of up to 79000 hours (L80B10), the reference temperature ( $t_r$ ) at the  $t_c$  point must not exceed 80 °C. The maximum temperature reached at the  $t_c$  point must not exceed 95 °C. A correct temperature measurement can, for example, be performed with a thermocouple.

#### 4.5 Thermocouple

Use a thermocouple that can be glued onto the LED module. Make sure that the thermocouple is fixed with direct contact to the  $t_c$  point. Examples of suitable thermocouples:



#### Different thermocouples

Illustration	Description	Temperature range [°C]
	PVC-insulated thermocouple	-10 ... +105
	PFA-insulated thermocouple	-75 ... +260
	Sprung thermocouple	-75 ... +260

To measure the temperature and to ensure a good thermal coupling between the LED module and the heat sink, you should drill a hole into the heat sink and push the thermocouple through it. To ensure a direct contact between the thermocouple and the PCB, it is recommended to glue the thermocouple onto the PCB. You can, for example, use an acrylic adhesive (e.g. type Loctite 3751).

It is also possible to use a sprung thermocouple. A suitable type is: Electronic Sensor FS TE-4-KK06/09/2m. Please note that a good thermal contact between the thermocouple and the PCB is required. Please refer to the data-sheet and the application guideline of the manufacturer to ensure correct handling.

Another possible way is to create a small groove along the top surface of the heat sink and run the thermocouple to the  $t_c$  point inside the groove.

##### Please note:

Keep in mind that you need a direct contact between the thermocouple and the PCB. It is mandatory to use TIM (e.g. thermal paste) for a proper thermal coupling!

If you use TIM, you should cut out a small area where the thermocouple has direct contact to the metal-core PCB.

$t_p$ : 75 °C enables all performance data (steady state)

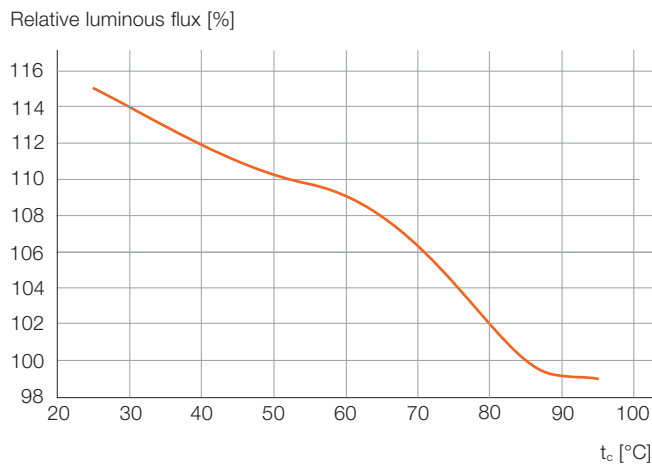
$t_p$ : 80 °C enables lifetimes of up to 79000 hours (L80B10)

## 5 Lifetime and thermal behavior

### 5.1 Luminous flux as a function of temperature

The luminous flux of a PrevaLED® Core G8 LED module depends on its temperature. 100 % of the luminous flux is usually achieved at the performance temperature of 85 °C. The following exemplary diagram shows the behavior of the luminous flux output as a function of the temperature at the  $t_c$  point for PrevaLED® Core G8.

#### Light output vs. case temperature (@nominal current)



### 5.2 Lifetime

Inventronics PrevaLED® Core G8 LED modules have a specific lifetime at a performance temperature ( $t_p$ ), which you can find in the lifetime tables below. As an example, according to these tables, an installation of PL-CORE-G8-1000-HD-927-L06 modules, operated at 80 °C and 0.2 A each, will reach 70000 hours, with only max. 10 % of the modules emitting less than 80 % of the initial luminous flux.

		LxBy					
		70		80		90	
x	y	10	50	10	50	10	50
$t_p$ [°C] = 75	I = 0,2 A	100,000	100,000	76,000	82,000	36,000	39,000

If you operate the module at a lower temperature, the lifetime of the module will rise significantly. For more details, please refer to the following tables which present the respective lifetimes at certain performance temperatures ( $t_p$ ).

#### Please note:

Higher  $t_c$  temperatures lead to a shorter lifetime of the PrevaLED® Core G8 LED module.

To enable a lifetime of 70000 hours (L80B10), the reference temperature ( $t_r$ ) at the  $t_c$  point must not exceed 80 °C.

### 5.3 Lifetime tables

#### PL-CORE-G8-1000HD-927-L06

		LxBy						
		x	70		80		90	
		y	10	50	10	50	10	50
$t_p$ [°C] = 75	I = 0.2 A	>100,000	>100,000	>75,000	>80,000	>35,000	>35,000	
	I = 0.3 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
$t_p$ [°C] = 80	I = 0.2 A	>100,000	>100,000	>70,000	>75,000	>30,000	>35,000	
	I = 0.3 A	>90,000	>95,000	>55,000	>60,000	>25,000	>25,000	
$t_p$ [°C] = 85	I = 0.2 A	>100,000	>100,000	>65,000	>70,000	>30,000	>30,000	
	I = 0.3 A	>85,000	>90,000	>50,000	>55,000	>25,000	>25,000	
$t_p$ [°C] = 90	I = 0.2 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
	I = 0.3 A	>75,000	>85,000	>50,000	>50,000	>20,000	>25,000	
$t_p$ [°C] = 95	I = 0.2 A	>90,000	>95,000	>55,000	>60,000	>25,000	>25,000	
	I = 0.3 A	>70,000	>80,000	>45,000	>50,000	>20,000	>20,000	

#### PL-CORE-G8-2000-927-L10

		LxBy						
		x	70		80		90	
		y	10	50	10	50	10	50
$t_p$ [°C] = 75	I = 0.4 A	>100,000	>100,000	>80,000	>85,000	>35,000	>40,000	
	I = 0.75 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
$t_p$ [°C] = 80	I = 0.4 A	>100,000	>100,000	>75,000	>80,000	>35,000	>35,000	
	I = 0.75 A	>90,000	>95,000	>55,000	>60,000	>25,000	>25,000	
$t_p$ [°C] = 85	I = 0.4 A	>100,000	>100,000	>65,000	>75,000	>30,000	>35,000	
	I = 0.75 A	>85,000	>90,000	>50,000	>55,000	>25,000	>25,000	
$t_p$ [°C] = 90	I = 0.4 A	>100,000	>100,000	>60,000	>70,000	>30,000	>30,000	
	I = 0.75 A	>75,000	>85,000	>50,000	>50,000	>20,000	>25,000	
$t_p$ [°C] = 95	I = 0.4 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
	I = 0.75 A	>70,000	>80,000	>45,000	>50,000	>20,000	>20,000	

#### PL-CORE-G8-3000-927-L15

		LxBy						
		x	70		80		90	
		y	10	50	10	50	10	50
$t_p$ [°C] = 75	I = 0.55 A	>100,000	>100,000	>85,000	>90,000	>40,000	>40,000	
	I = 0.9 A	>100,000	>100,000	>60,000	>70,000	>30,000	>30,000	
$t_p$ [°C] = 80	I = 0.55 A	>100,000	>100,000	>75,000	>85,000	>35,000	>40,000	
	I = 0.9 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
$t_p$ [°C] = 85	I = 0.55 A	>100,000	>100,000	>70,000	>80,000	>35,000	>35,000	
	I = 0.9 A	>85,000	>95,000	>55,000	>60,000	>25,000	>25,000	
$t_p$ [°C] = 90	I = 0.55 A	>100,000	>100,000	>65,000	>70,000	>30,000	>35,000	
	I = 0.9 A	>80,000	>90,000	>50,000	>55,000	>20,000	>25,000	
$t_p$ [°C] = 95	I = 0.55 A	>100,000	>100,000	>60,000	>65,000	>30,000	>30,000	
	I = 0.9 A	>75,000	>80,000	>45,000	>50,000	>20,000	>20,000	

### 5.3 Lifetime tables

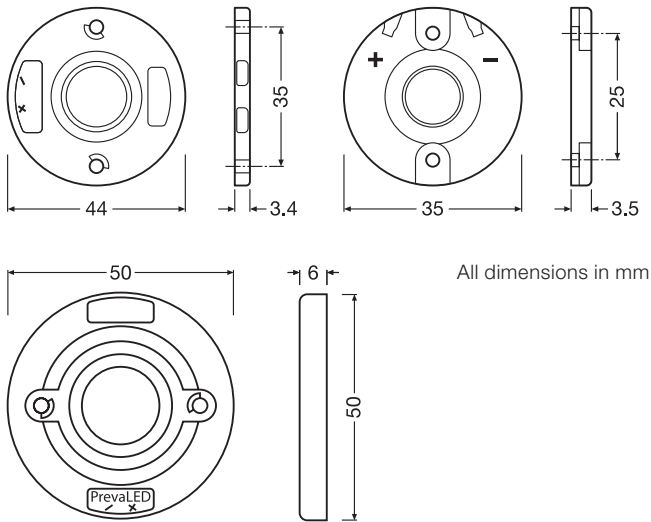
#### PL-CORE-G8-5000-927-L15

		LxBy						
		x	70		80		90	
		y	10	50	10	50	10	50
<b>t<sub>p</sub> [°C] = 75</b>	I = 0.9 A	>100,000	>100,000	>75,000	>85,000	>35,000	>40,000	
	I = 1.2 A	>100,000	>100,000	>70,000	>75,000	>30,000	>35,000	
<b>t<sub>p</sub> [°C] = 80</b>	I = 0.9 A	>100,000	>100,000	>70,000	>80,000	>35,000	>35,000	
	I = 1.2 A	>100,000	>100,000	>65,000	>70,000	>30,000	>30,000	
<b>t<sub>p</sub> [°C] = 85</b>	I = 0.9 A	>100,000	>100,000	>65,000	>70,000	>30,000	>35,000	
	I = 1.2 A	>95,000	>100,000	>60,000	>65,000	>25,000	>30,000	
<b>t<sub>p</sub> [°C] = 90</b>	I = 0.9 A	>100,000	>100,000	>60,000	>65,000	>30,000	>30,000	
	I = 1.2 A	>90,000	>95,000	>55,000	>60,000	>25,000	>25,000	
<b>t<sub>p</sub> [°C] = 95</b>	I = 0.9 A	>90,000	>100,000	>55,000	>60,000	>25,000	>30,000	
	I = 1.2 A	>85,000	>90,000	>50,000	>55,000	>25,000	>25,000	

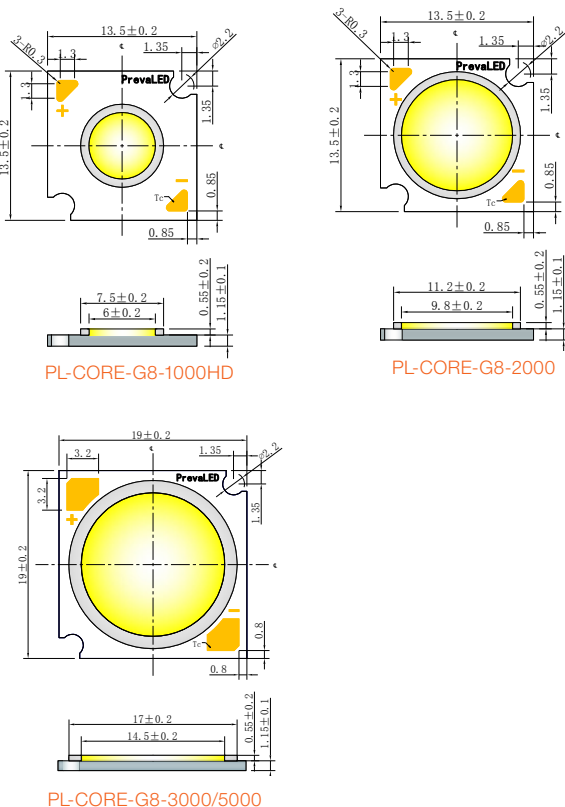
# 6 Mechanical considerations

The following schematic drawing provides further details on the dimensions of PrevaLED® Core G8 LED modules. For 3D files of the LED modules, please go to [www.inventronicsglobal.com](http://www.inventronicsglobal.com)

## 6.1 Outline drawings H1 and H3



## 6.2 Outline drawings for COB units

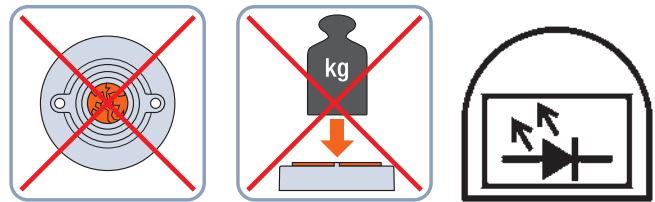


## 6.3 Mechanical protection of the PrevaLED® Core G8 LED module

The housing of a PrevaLED® Core G8 LED module should not be exposed to strong mechanical stress. Please apply force only to the dedicated mounting positions. Strong mechanical stress can lead to irreversible damage of the LED module.

### Please note:

Please do not touch or mechanically stress the yellow chip-on-board (CoB) surface. This could damage the module.



For operation in damp, wet or dusty environments, the user has to make sure that an adequate ingress protection (IP) is chosen. The LED module has to be protected by a suitable IP rating of the luminaire housing. Please observe the luminaire standard IEC 60598-1 as well as the different requirements.

This product is **not** designed for usage under the following conditions:

- In places where the product might directly and indirectly get wet due to rain and/or moist air.
- In places where the product might be damaged by water.

The LEDs may not be able to maintain their specified performance if they are used in a high-humidity environment.

## 6.4 Mounting

To fix a PrevaLED® Core G8 LED module onto a heat sink, you can use either M3 screws with pan head or counter-sunk M3 screws (with minimum depth). Flat head and oval head screws, which have no horizontal contact zone toward the LED holder, must not be used. The allowed torque using pre-tapped holes is 0.4 to 0.6 Nm.

## 7 Norms and standards

Safety:	IEC/EN 62031
Photobiological safety:	IEC/EN 62471
Risk group:	RG1
Ingress protection:	–
Approvals:	CE



### Safety information

- Indoor use only.
- Connecting multiple modules in parallel on one LED driver is not permitted.
- Connecting multiple modules in series on one LED driver is not recommended.
- The resin area is very sensitive, please do not handle, press, touch or clean.
- Please observe standard ESD precautions when installing the COB.
- The  $t_c$  value is the maximum temperature for safety, higher  $t_c$  application is not recommended.
- Blue light hazard classification: RG1 unlimited.
- The soldering temperature should be 350 °C or lower, the soldering time should be less than 3 seconds.

### Disclaimer

All information contained in this document has been collected, analyzed and verified with great care by Inventronics. However, Inventronics is not responsible for the correctness and completeness of the information contained in this document and Inventronics cannot be made liable for any damage that occurs in connection with the use of and/or reliance on the content of this document. The information contained in this document reflects the current state of knowledge on the date of issue.

Modules perfectly matched to Inventronics OPTOTRONIC® and ICUTRONIC® LED drivers. For current photometric data and important safety, installation and application information, see [www.inventronicsglobal.com](http://www.inventronicsglobal.com). All the technical parameters apply to the entire module. In view of the complex manufacturing process for light-emitting diodes, the typical values given above for the technical LED parameters are merely statistical values that do not necessarily correspond to the actual technical parameters of an individual product; individual products may vary from the typical values.

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