



Clara AC IP65/67



CLARA AC IP65 Updated version
4W | 6W | 10W

A secure and complete solution for outdoor luminaires.

No Driver is required!

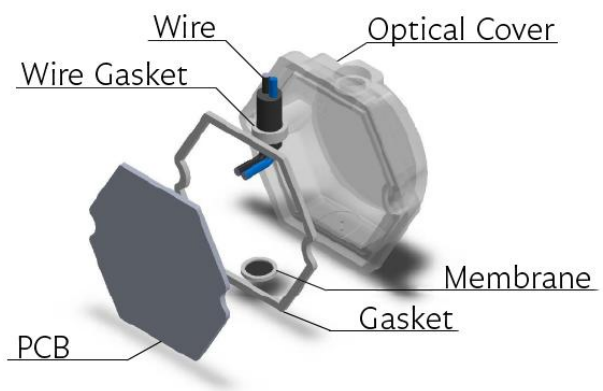


Key features

Story

Clara AC IP65 is designed for bollards, park lighting and bulk heads and can be integrated into environments that previously were not possible, since the LED module itself is water and moisture proof.

The idea is that instead of making the entire luminaire's moisture proof, we only make the places that need moisture barriers safe. It is about not trapping moisture, but always keeping it out of electronics and electricity. The LED module keeps moisture away because its membrane never allows moisture to enter its construction, but it can still breathe to equalize pressure at different temperatures. A very simple and safe design.



Key features

- IP65 and IP67 classed
- Based on Clara AC 24-LED
- No driver required
- No extra encapsulation needed





Clara AC IP65 Flickerfree

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Introduction

Clara package

The LED module and light engine is named Clara and it is a design for light fittings and luminaires aiming for various areas. It has been designed in order to meet the demands on high performance optical solutions in both light emitting and in colour rendering.

The same package is used for Downlight, Spotlight, Tasklight and Medical light fittings etc. The solution is developed to make it easy for the designers and engineers to choose from low to high power, from AC to DC and choose between a variety of lenses in the same luminaire or in similar design.

AC design

All driver and dimmer components are built-in.

The advantage with an AC driver that has been built-in is:

- Lifetime – Connected to a heat sink and therefore has a controlled environment
- Dimming – Dimming via standard trailing edge dimmers
- Small – No extra boxes
- Simple – Easily adapted into to the production line

Light output

Colour stability is important to ensure that the installation has a uniform light output. Parameters such as binning, lifetime and thermal control are vital for good results.

Dimming

Use the latest dimmers from standard manufacturers for LED and make sure that the dimmer has the capacity to manage the low load of the LEDs power consumption. In some cases the dimmer requires more than one LED module connected in order to work as expected due to the minimum load required for the dimmer to function properly.

IP65 / 67

Water and moisture protect LED Engine solution.

Dimmers

Please contact us for the latest test of dimmers.



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Short form Characteristics

MECHANICAL	4W	6W	10W	15W
Module dimension	48.4 mm (1.90 inch) diameter			
Weight	TBD			
Assembly holes	2 x 3.8 mm (2 x 0.15 inch)			
Wire connector	2-wire Cable (60cm / 23.6 inch)			

ELECTRICAL

Power	4 W +/-10% ea.	6 W +/-10% ea.	10 W +/-10% ea.	15 W +/-10%
Input voltage	120VAC or 230VAC			
Input voltage range	100-130VAC 220-240VAC			
Power factor	> 0.95			
Total harmonic distortion	<15%			
Type of current	AC			
Peak inrush current	TBD mA			
Inrush current duration	< 35µs			
Surge protection	1500V			
Over temp. protection	150°C			
Switching Cycles on/off	Tested 1.000.000 at 25°C and 500.000 at 85°C			
Energy class (230VAC)	D, E or F depending on Kelvin version			

PHOTOMETRICAL

Flux nominal	400lm	600lm	1000lm	TBD
Efficiency	D >125lm/W, E >110lm/W (F >85lm/W)			
Number of LED's	28 (120VAC) 32 (230VAC)			
Rendering index	>Ra90			
SDCM (Mac Adam)	3			
SVM	0.3			
PstLM	0.3			
Spread angle lens	100° (IP65/IP67)			
Colour temperatures	2200K, 2700K, 3000K, 4000K			

ENVIRONMENTAL

Temperature range	-25°C to 85°C (-13°F to 185°F) (Absolute maximum temp Tc 85°C)
Relative Humidity	10-75%
Ambient air pressure	500-1060 HPa

LIFE LENGHT

Life length L70B10	>50 000h
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Article number structure

Article number: Clara AC.P.230.N.9yy-H.IP65.D.FF

CLARA AC.P.230.1.8YY-NN.X

AC	AC= VAC, ED=External Driver required, ID=Internal Driver
P*	Power (Watt)*
V	Voltage: 230VAC or 120VAC
N	Amount of LEDs 28 on 120VAC and 32 on 230VAC version
8	CRI: 9=Ra>90
YY	CCT: 22 = 2200K, 27 = 2700K, 30 = 3000K, 40 = 4000K
IP65	Viewing angle code/IP class
X	Additional features as FF - Flickerfree H - Heat-PAD D - Diffused

Packaging Information

Packaging Information Clara AC IP

Description	Qty (pcs)	Dimension (cm)			GW (kg)
		Length	Width	Height	
Inner Box	48	66,0	35,0	8,8	
Outer Box	144	68,0	37,0	28,9	11,9



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Article name and versions in 230VAC

ARTICLE NAME	POWER	CURRENT	LEDS	CRI	CCT	LENS	LUMEN		ENERGY CLASS*
							25°	65°	
Clara AC.4.230.32.922-IP65.FF	4	230	32	90	2200	IP65	300	280	F
Clara AC.4.230.32.927-IP65.FF	4	230	32	90	2700	IP65	380	350	E
Clara AC.4.230.32.930-IP65.FF	4	230	32	90	3000	IP65	400	380	D
Clara AC.4.230.32.940-IP65.FF	4	230	32	90	4000	IP65	410	390	D
Clara AC.6.230.32.922-IP65.FF	6	230	32	90	2200	IP65	460	430	F
Clara AC.6.230.32.927-IP65.FF	6	230	32	90	2700	IP65	580	550	E
Clara AC.6.230.32.930-IP65.FF	6	230	32	90	3000	IP65	610	575	D
Clara AC.6.230.32.940-IP65.FF	6	230	32	90	4000	IP65	620	590	D
Clara AC.10.230.32.922-IP65.FF	10	230	32	90	2200	IP65	750	710	F
Clara AC.10.230.32.927-IP65.FF	10	230	32	90	2700	IP65	960	920	E
Clara AC.10.230.32.930-IP65.FF	10	230	32	90	3000	IP65	1010	960	D
Clara AC.10.230.32.940-IP65.FF	10	230	32	90	4000	IP65	1030	990	D
Clara AC.4.230.32.922-IP65.D.FF	4	230	32	90	2200	IP65	270	250	F
Clara AC.4.230.32.927-IP65.D.FF	4	230	32	90	2700	IP65	330	310	E
Clara AC.4.230.32.930-IP65.D.FF	4	230	32	90	3000	IP65	370	350	D
Clara AC.4.230.32.940-IP65.D.FF	4	230	32	90	4000	IP65	375	355	D
Clara AC.6.230.32.922-IP65.D.FF	6	230	32	90	2200	IP65	420	390	F
Clara AC.6.230.32.927-IP65.D.FF	6	230	32	90	2700	IP65	510	480	E
Clara AC.6.230.32.930-IP65.D.FF	6	230	32	90	3000	IP65	540	510	D
Clara AC.6.230.32.940-IP65.D.FF	6	230	32	90	4000	IP65	550	520	D
Clara AC.10.230.32.922-IP65.D.FF	10	230	32	90	2200	IP65	670	640	F
Clara AC.10.230.32.927-IP65.D.FF	10	230	32	90	2700	IP65	870	830	E
Clara AC.10.230.32.930-IP65.D.FF	10	230	32	90	3000	IP65	920	880	D
Clara AC.10.230.32.940-IP65.D.FF	10	230	32	90	4000	IP65	930	890	D

*EPREL are measured without lens, Energy Class E are to be over 110 lm/W



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Article name and versions in 120VAC

ARTICLE NAME	POWER	CURRENT	LEDS	CRI	CCT	LENS	LUMEN	
							25°	65°
Clara AC.4.120.28.922-IP65.FF	4	120	28	90	2200	IP65	300	280
Clara AC.4.120.28.927-IP65.FF	4	120	28	90	2700	IP65	380	350
Clara AC.4.120.28.930-IP65.FF	4	120	28	90	3000	IP65	400	380
Clara AC.4.120.28.940-IP65.FF	4	120	28	90	4000	IP65	410	390
Clara AC.6.120.28.922-IP65.FF	6	120	28	90	2200	IP65	460	430
Clara AC.6.120.28.927-IP65.FF	6	120	28	90	2700	IP65	580	550
Clara AC.6.120.28.930-IP65.FF	6	120	28	90	3000	IP65	610	575
Clara AC.6.120.28.940-IP65.FF	6	120	28	90	4000	IP65	620	590
Clara AC.10.120.28.922-IP65.FF	10	120	28	90	2200	IP65	750	710
Clara AC.10.120.28.927-IP65.FF	10	120	28	90	2700	IP65	960	920
Clara AC.10.120.28.930-IP65.FF	10	120	28	90	3000	IP65	1010	960
Clara AC.10.120.28.940-IP65.FF	10	120	28	90	4000	IP65	1030	990
Clara AC.4.120.28.922-IP65.D.FF	4	120	28	90	2200	IP65	270	250
Clara AC.4.120.28.927-IP65.D.FF	4	120	28	90	2700	IP65	330	310
Clara AC.4.120.28.930-IP65.D.FF	4	120	28	90	3000	IP65	370	350
Clara AC.4.120.28.940-IP65.D.FF	4	120	28	90	4000	IP65	375	355
Clara AC.6.120.28.922-IP65.D.FF	6	120	28	90	2200	IP65	420	390
Clara AC.6.120.28.927-IP65.D.FF	6	120	28	90	2700	IP65	510	480
Clara AC.6.120.28.930-IP65.D.FF	6	120	28	90	3000	IP65	540	510
Clara AC.6.120.28.940-IP65.D.FF	6	120	28	90	4000	IP65	550	520
Clara AC.10.120.28.922-IP65.D.FF	10	120	28	90	2200	IP65	670	640
Clara AC.10.120.28.927-IP65.D.FF	10	120	28	90	2700	IP65	870	830
Clara AC.10.120.28.930-IP65.D.FF	10	120	28	90	3000	IP65	920	880
Clara AC.10.120.28.940-IP65.D.FF	10	120	28	90	4000	IP65	930	890



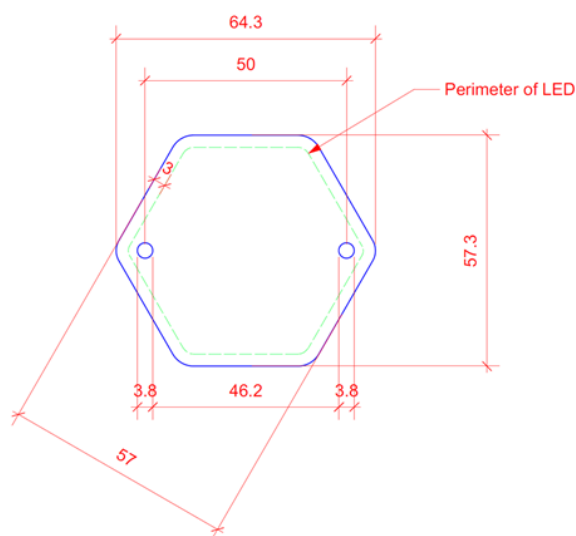
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Optional Heat PAD

This can be used to get out heat better as well as create a second safety barrier to obtain a Class II safety. This is an extra H in the article name.



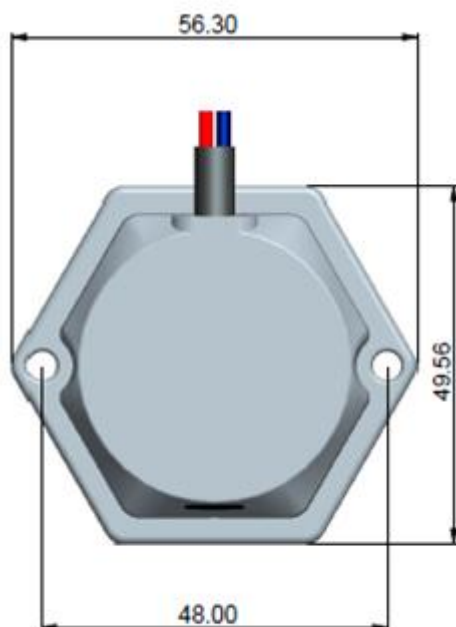
ARTICLE NAME	POWER	CURRENT	LEDS	CRI	CCT	LENS	LUMEN	ENERGY CLASS
Clara AC.10.230.32.922-H.IP65.FF	10	230	32	90	2200	IP65	670	F
Clara AC.10.230.32.927-H.IP65.FF	10	230	32	90	2700	IP65	870	E
Clara AC.10.230.32.930-H.IP65.FF	10	230	32	90	3000	IP65	920	D
Clara AC.10.230.32.940-H.IP65.FF	10	230	32	90	4000	IP65	930	D

You can also purchase the Heat PAD separately and mount this by yourself. The article number of the bare Heat PAD is 105171.

Thermal Transfer & Potential Difference

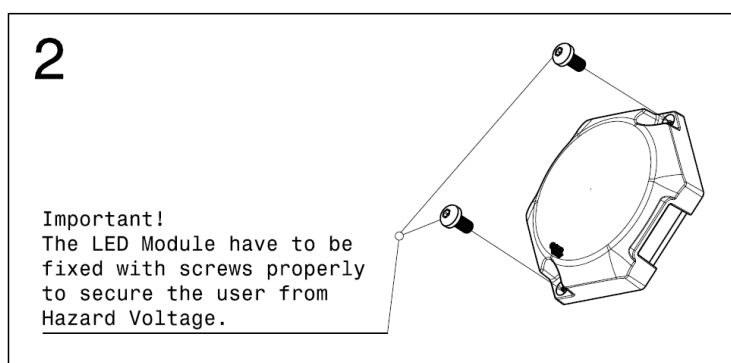
When mounting directly onto copper or brass, a thermally conductive and electrically insulating heat-pad is recommended, especially for Class II or in humid environments. Powder coating and certain aluminum surface treatments may improve heat dissipation. Galvanic corrosion between aluminum and brass/copper should always be considered.

Dimensions LED Module



Dimensions in mm

Mounting instructions



We recommend maximum torque of 0.3 Nm to tighten the screws.

Important: It is not possible to take the LED module apart since it is glued together to be water and moisture protected.

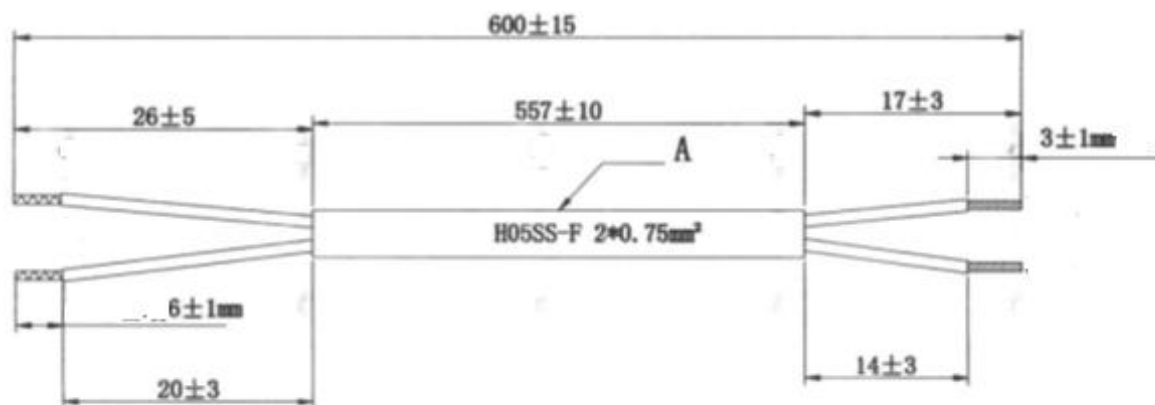
Wire

120VAC Version

TBD

230VAC Version

Rubber cable H05SS-F, 60cm (23.6 inches) 0,75mm²



Conductor	Wire	0,75 mm ²
	Material	Tinned Copper
Insulation	Material	Silicon Rubber
	Colour outer	Black
	Colour inner	Blue and Brown



Parameters of the Lens System

The lens system is mounted and fixated onto the PCB with a double press-fit and glued. The light parameters are according to the following:

VERSION	VIEWING ANGLE	FWHM ANGLE
CLARA IP65 COVER	100°	±65°
CLARA IP COVER DIFUSED	100°	

IP65

Test

Test duration	1 minute per square meter for at least 3 minutes
Water volume	12.5 liters per minute
Pressure	30 kPa at distance of 3 m

Water projected by a nozzle (6.3 mm) against enclosure from any direction shall have no harmful effects.

The IP Code, International Protection Marking, IEC standard 60529, sometimes interpreted as Ingress Protection Marking, classifies and rates the degree of protection provided against intrusion (body parts such as hands and fingers), dust, accidental contact, and water by mechanical casings and electrical enclosures.

IK08

Test	IK08
Impact	5 joules
Radius of striking element	25mm
Material of striking element	Steel
Mass of striking element	1.7kg

The European standard EN 62262 — the equivalent of international standard IEC 62262 (2002) — relates to IK ratings. This is an international numeric classification for the degrees of protection provided by enclosures for electrical equipment against external mechanical impacts. It provides a means of specifying the capacity of an enclosure to protect its contents from external impacts

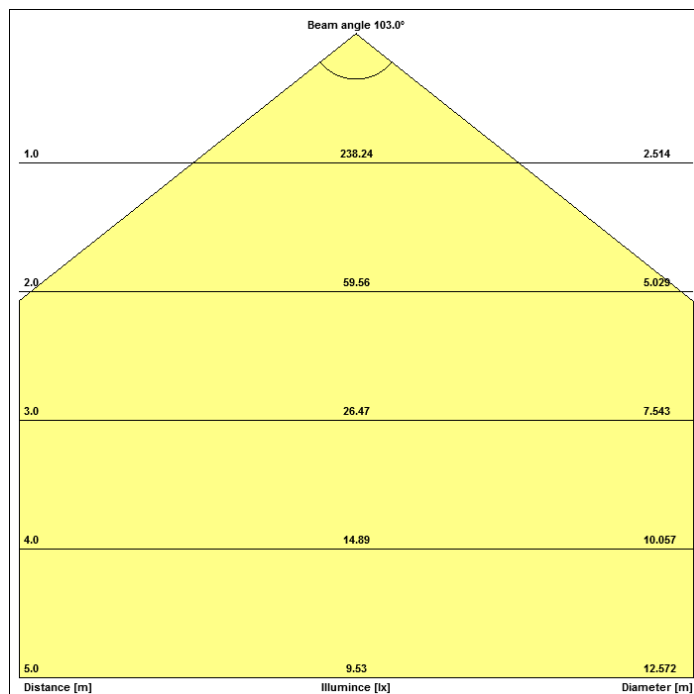


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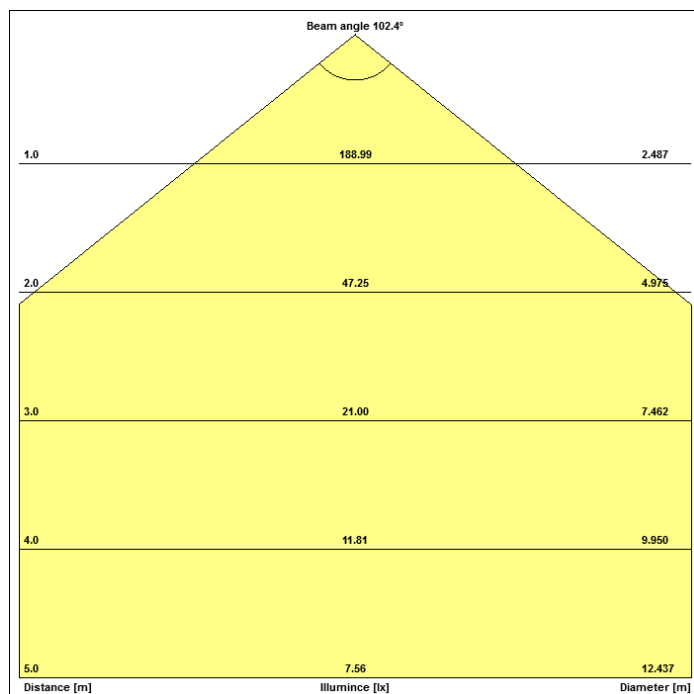
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Beam cone

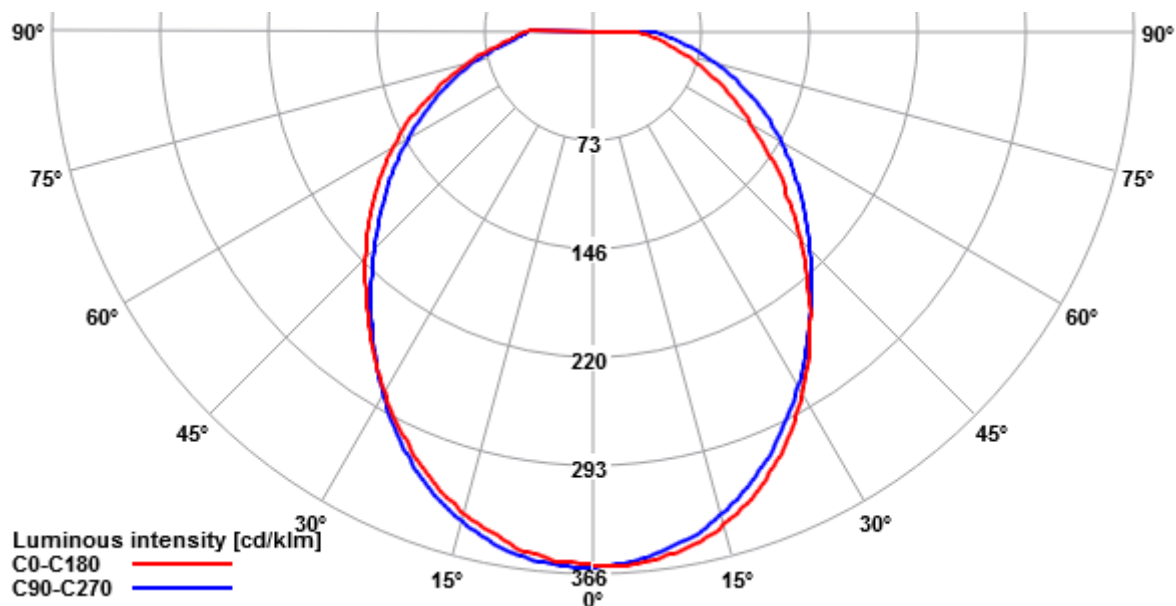
Non-Diffused



Diffused



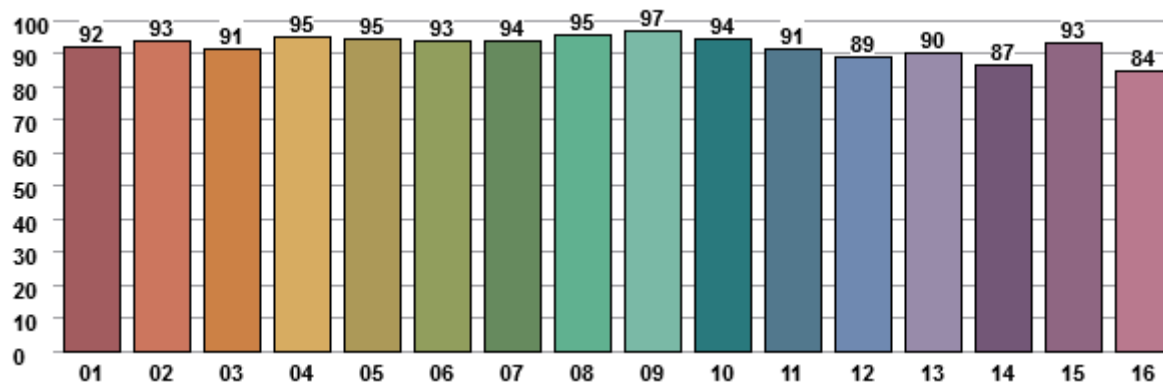
Light Intensity distribution



TM-30-15 Calculations

Main parameters	
Fi	91
Rg	98
Rfskin	95

Hue Bin Fidelity Index (Rfh,j)





Photometrical

Flux

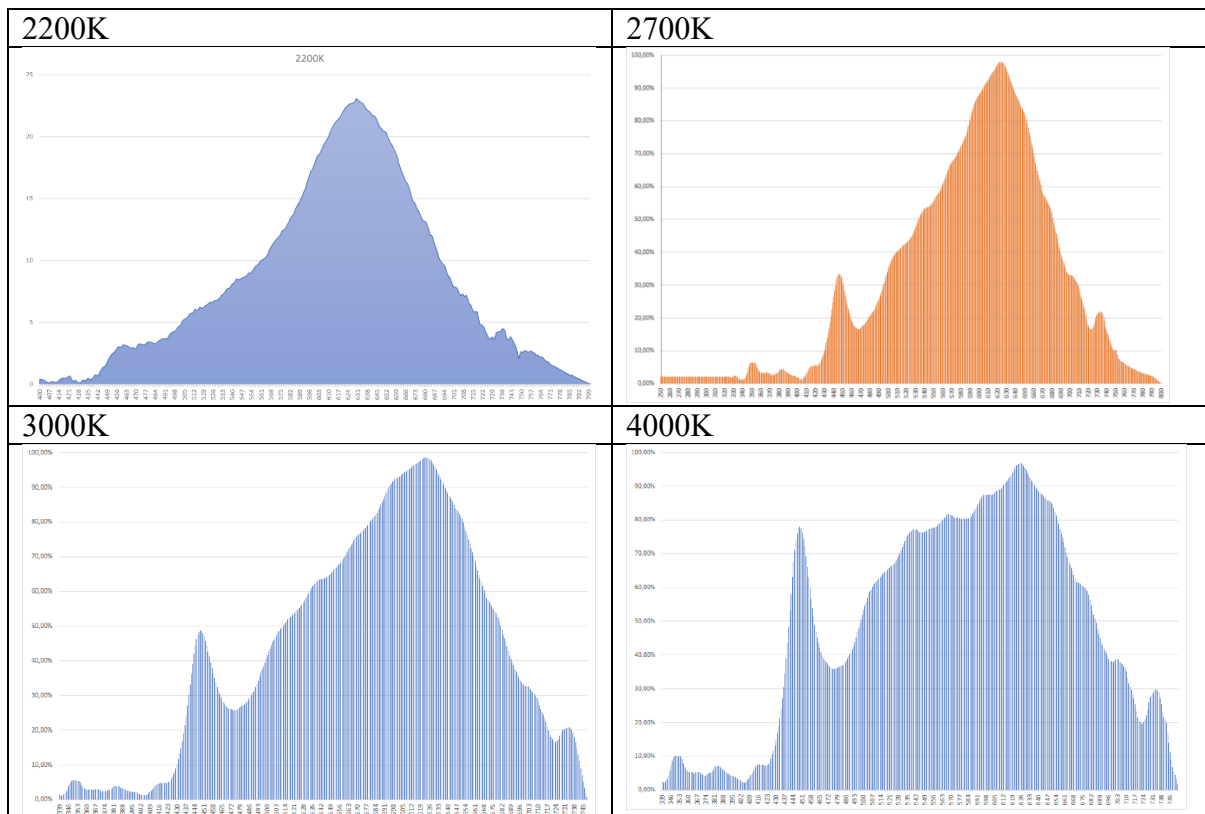
Parameter		Symbol	Value			Unit
			Min	Typ	Max	
Luminous Flux	4W	Φ_V	400	450		lm
	6W	Φ_V	550	700		lm
	10W	Φ_V	900	1100		lm
	16W	Φ_V		TBD		lm
Correlated Colour Temperature	22*(2)	CCT		2200		K
	27*(2)	CCT		2700		K
	30*(2)	CCT		3000		K
	40*(2)	CCT		4000		K
CRI for all versions (Min Value CRI90)		R _a	90	94		

Electro-Optical characteristics LED module at I_F=xxmA, 230VAC, T_A=25°C

Electro-Optical characteristics LED module at I_F=xxmA, 230VAC, T_A=25°C

(2)See detailed information in chapter” Binning structure graphical representation”

Colour Spectrum



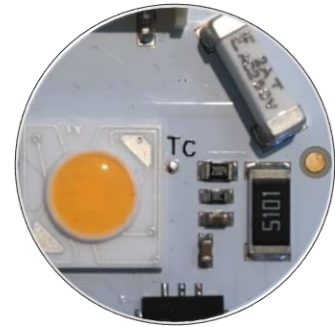
Lifetime (Calculated)

Measurement control

At verification, the temperature at the designated Tc measurement points shall be confirmed to remain within the specified limits. Compliance with these limits determines the expected operational lifetime of the module. This verification shall be performed only after proper attachment of the heat sink.

Lifetime Calculation at Tc

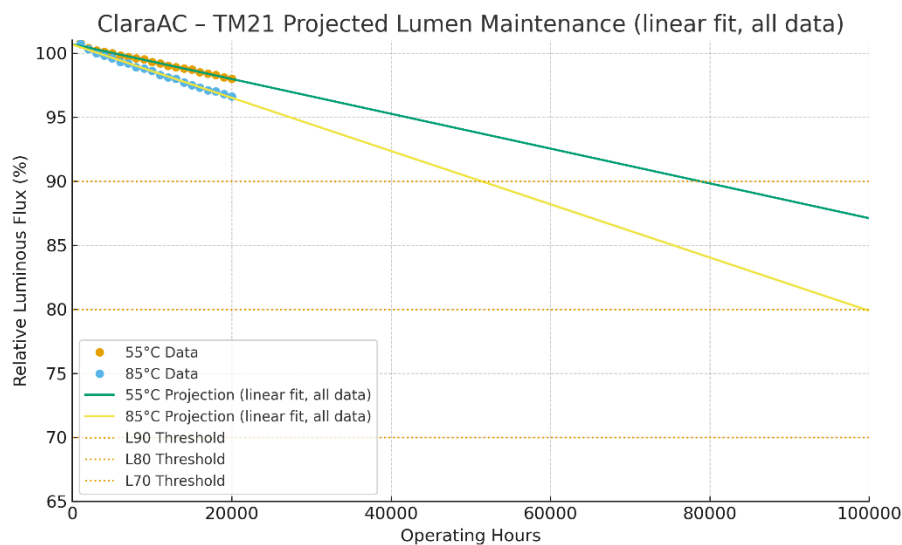
The calculated lifetime is based on the maximum recommended temperature at the Tc measurement point. The absolute maximum Tc is 85 °C, and this limit shall not be exceeded. For reliable design margins and extended service life, a recommended Tc of 65 °C should be applied in luminaire design.



Projected lifetime based on TM-21

The applied power load for the LED module is defined in accordance with the lumen maintenance projection. Lifetime projections are based on LM-80 test data from discrete LEDs operated under the specified thermal conditions at a drive current of 30 mA.

Metric	55 °C	65 °C	75 °C	85 °C
L90B10	78 000 h	66 000 h	58 000 h	51 000 h
L80B10	> 100 000 h	> 100 000 h	> 100 000 h	99 000 h
L70B10	> 100 000 h	> 100 000 h	> 100 000 h	> 100 000 h





Lifetime and Reliability

The projected lifetime values presented are based on TM-21 extrapolation of LM-80 test data for the LEDs used in the module. These figures represent lumen maintenance of the LED packages only.

An LED module, however, consists of several additional components such as PCB substrates, solder joints, driver electronics, optical materials and connectors. The overall service life of the module may therefore be influenced by these elements, depending on the application environment and operating conditions.

Optoga modules are designed and verified to ensure that supporting components are selected and dimensioned to match the LED lifetime at the recommended T_c values. This means that the projected lumen maintenance according to TM-21 is complemented by robust module design, providing customers with reliable long-term performance in real installations.

Thermal performance and lifetime correlation

The lifetime projections above are valid only when the module operates within its specified thermal limits. Since the LED junction temperature is directly dependent on the case temperature (T_c) and the luminaire's heat dissipation capability, proper thermal design is essential to maintain the expected lumen maintenance and reliability values.

Thermal Design

Clara AC IP65 Thermal Design ($T_a = 25\text{ °C}$, $T_{c,target} = 65\text{ °C}$)

Input Power	Required R_{th} (sink–ambient)	Typical Metal Area*
2W	$\leq 28\text{ K/W}$	$\approx 40\text{--}50\text{ cm}^2$
4W	$\leq 14\text{ K/W}$	$\approx 80\text{--}100\text{ cm}^2$
6W	$\leq 9.3\text{ K/W}$	$\approx 130\text{--}150\text{ cm}^2$
10W	$\leq 5.5\text{ K/W}$	$\approx 220\text{--}250\text{ cm}^2$
15W	$\leq 3.6\text{ K/W}$	$\approx 330\text{--}360\text{ cm}^2$

* Free convection, $T_a = 25\text{ °C}$. Effective metal area thermally connected to the module, all sides exposed to air (not only the module footprint).

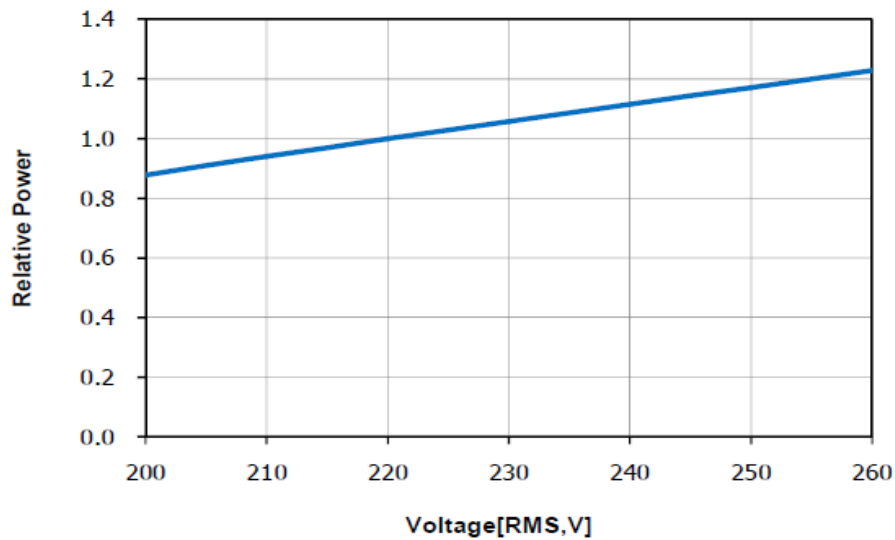
The table below provides indicative thermal requirements for different power levels of the Clara AC IP65 LED module. The values are based on a design case with ambient temperature $T_a = 25\text{ °C}$ and target case temperature $T_c = 65\text{ °C}$. To achieve this, the luminaire's metal construction should be used as the primary heatsink.

The specified $R_{th_{th}}$ (sink–ambient) represents the maximum allowable thermal resistance between the luminaire surface and the surrounding air. Lower values (larger effective metal area or better ventilation) will result in lower T_c and longer lifetime. At higher ambient temperatures, or if the luminaire is enclosed or mounted close to a ceiling, the available temperature difference ($T_c - T_a$) decreases. In such cases, reduce the required $R_{th_{th}}$ by approximately 25 % for each 10 °C increase in T_a , or verify T_c by measurement during worst-case operation.

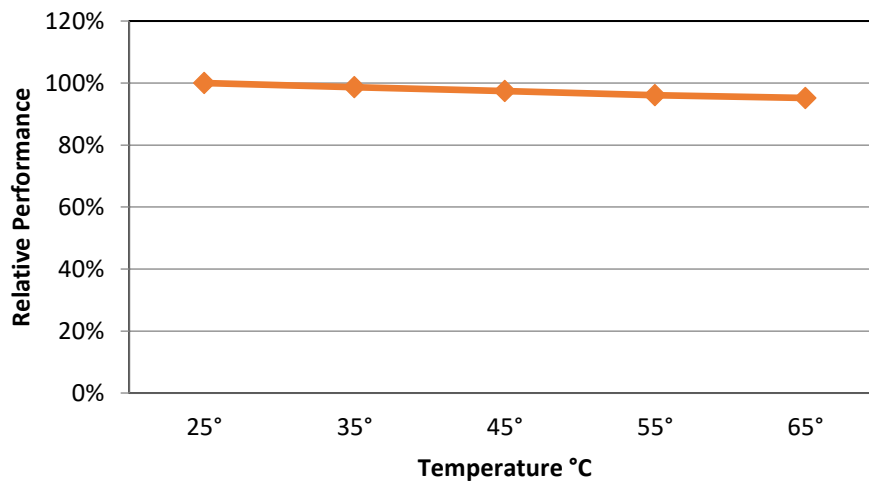
Performance

Current vs. Voltage

With increasing voltage the light output and the heat increases.

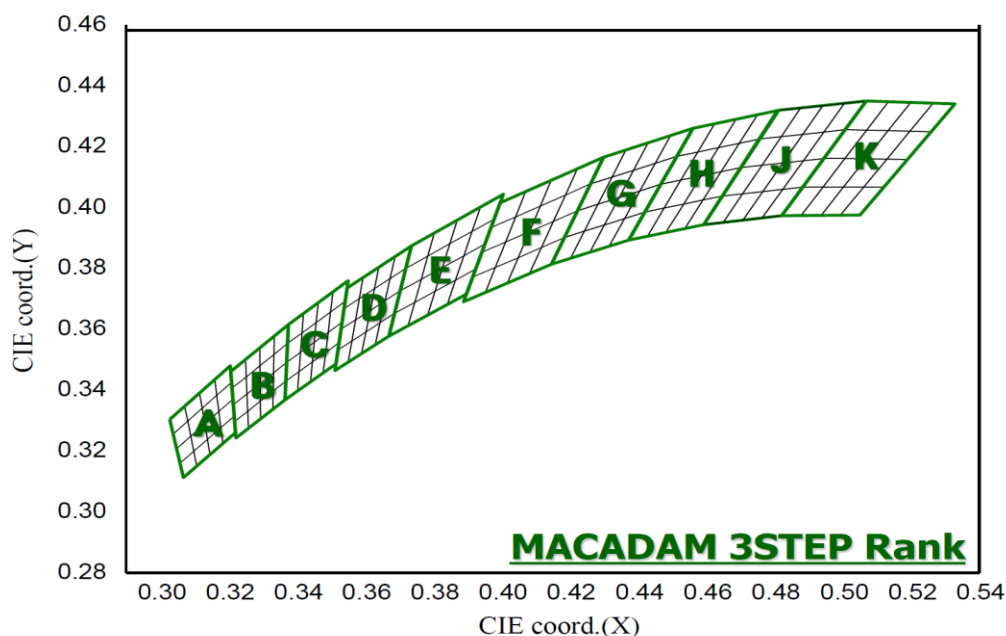


Temperature Characteristics



Consider the thermal capabilities of where the LED module is to be fitted. The temperature is an important factor for light output as well as for long time light output degradation.

CCT structure graphical representation



Short form in diagram	Colour Code	CCT
K	22	2200K
H	27	2700K
G	30	3000K
E	40	4000K

Colour Rendering Index (CRI)

CRI Code	CRI (min) Ra
8	>80
9	>90

Short form letters for CCT (K)

Colour Code	CCT
22	2200K
27	2700K
30	3000K
40	4000K



Verification of Conformity

The Clara IP65 has been tested at Intertek Semco according to IEC 62031 for Europe.

Radio Disturbance	IEC 55015:2006 + A1:2007 + A2:2009	
SURGE	IEC 61000-4-5	1,5 kv
Fast transient BURST	IEC 61547	2 kv
SAFETY	IEC 62031:2008	
Photo Biological Safety	IEC 63171:2008	
EMC	IEC 61000-3-2:2006	
EMC	IEC 61000-3-3:2008	
ESD*	IEC 61000-4-2	8 kv Air discharge 4 kv Contact discharge
IK class	IEC 62262	IK08
IP class	IEC 60529	IP65 / IP67

* Please consult the document ESD standards on Optodrive ED, ID and AC

IEC Protection Classes

The Clara Optodrive module is designed to be built in directly to a Class I (EU) fixture.

For Class II (EU) fixture use, an electrical insulating pad is needed between the module and the fixture. The pad needs to be minimum 2.5mm wider than the module in all directions; insulating screws such as nylon or plastic must be used when assembling the module to the fixture.



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Production Setup

Production in accordance with IPC-6012-B and IPC-A-600G class 2

The LED Module is in accordance to EU Directive 2002/95/EC(ROHS)

The bare PCB is isolation tested with 3000VDC/10mA for 10 seconds

PCB Material Setup

In all questions regarding the bare PCB please use "Material Data sheet Optodrive" as a guideline.



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Precautions for use

- This device should not be used in any type of fluids such as water, oil, organic solvent etc.
- When cleaning is required, use only water together with mild soap on the outside of the lens. Cleaning inside of the LED module is strictly prohibited.
- The appearance and specifications of the product may be modified for improvement without notice.
- Long time exposure of sunlight or occasional UV exposure will cause lens discoloration.
- Opening of the LED module is prohibited due to risk of EMC, dust, grease and other exposures that will damage it.
- The LED Module should always be mounted to a proper heat sink before it's connected with its proper leads.

Handling in regards to static electricity

- The Optodrive products have integrated circuits (IC) on board that may be damaged if exposed to static electricity. Please handle the products only while using equipment that prevents static electricity. Do not handle them without having ESD protection.
- The Optodrive products are not be installed into the end product without proper ESD protection.
- Optodrive LED Modules meet IEC61547:2009 and IEC61000-4-2. We recommend the light fixture manufacturer to take the mentioned standards under consideration.

Storage before use

- Use only properly rated test equipment and tools for the rated voltage and current of the product being tested.
- It is strongly suggested to wear rubber insulated gloves and rubber bottom shoes while handling the product.
- Do not wear any conductive items (such as jewelry) which could accidentally contact electric circuits.
- Faults, lightning, or switching transients can cause voltage surges in excess of the normal ratings.
- Internal component failure can cause excessive voltages.
- Stored or residual electricity in long wire could be hazardous.



ROHS III Compliant

All our LED modules meet the Restrictions of Hazardous Substances (RoHS III)!

There has been a growing consensus that Lead Free Systems should increase for the safety of our environment. It is a very serious problem that lead and other harmful materials are being used in commercial and industrial products, causing more and more environmental problems. This has led to regulations such as RoHS (Restriction of the use of certain Hazardous Substances) from the EU and the Japan Ministry of Trade and Industry (MITI). All LED module makers providing products to these countries should comply with these restrictions. In order to meet the RoHS III regulation, Optoga is strictly implementing a ban on lead and other hazardous materials in its products. This is in compliance with our responsibilities as good corporate citizens.

Design for Environment:

According to the EU-directive (RoHS III) the following substances must not be used in this product

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Chromium VI (Cr⁶⁺)
- Polybrominated biphenyls PBB
- Polybrominated diphenyl ethers PBDE
- Bis(2-ethylhexyl) phthalate DEPH
- Butyl benzyl phthalate BBP
- Dibutyl phthalate DBP
- Diisobutyl phthalate DIBP

Do you want to know more about benefits of OptoDrive LED?

Read more about OptoDrive at www.optoga.com.

You can contact us via info@optoga.com.

You can also call us on +46 (0)589 490 950.

Optoga AB

Optoga was founded in November 2004 in Arboga, Sweden and has many years of experience in electronics design. The company develops and supplies LEDs and LED-module solutions for the lighting industry, vehicle manufacturers and electronics companies.

With the OptoDrive LED-module, Optoga has taken the initiative to replace strip lights, incandescent and halogen bulbs with LED-based sources.



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