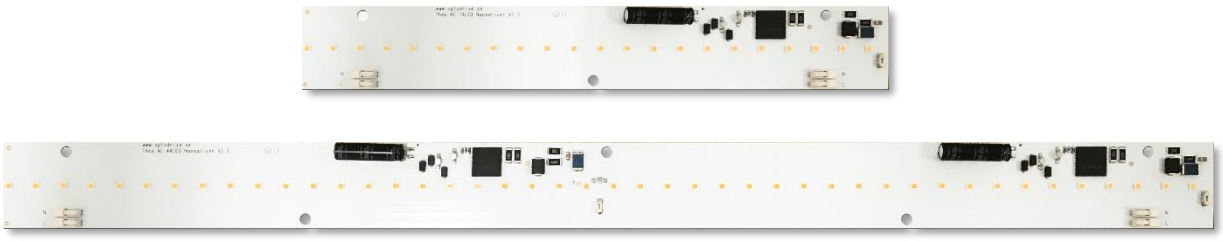
THEO AC FF



THEO AC

FLICKERFREE

L28W4 | L56W4

A driverless solution ceiling and tasklight
in professional fixtures.

No driver is required!

Key features

Story

Designed for downlight and other places where the need is to create a good atmosphere for people to dwell in whether they take care of business or socialize.

These LED modules or LED-light engines for fixtures are designed with internal drivers and are therefore very easy to connect into applications with different dimming scenarios. The light output efficiency is the highest available on the market for these types of applications. Our latest design feature TOD (thin optical device) is integrated in the LED module for a bright and consistent light experience.

Key features

- High efficiency
- Optimized Uniformity
- Lens with Connector
- Architectural Lighting
- Commercial Lighting
- Flickerfree

Content

Introduction

Theo package

The same package can be used for Office light, Retail ambient light, bathroom light and Industrial light fittings etc. The solution is developed to make it easy for the designers. In the design concept there are standard dimmers, that fits the whole Optodrive™ concept.

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.

Flickerfree

OptoDrive Theo FlickerFree has a minimal flicker percent thanks to electronics. This gives a pleasant light for example in tasklights.

Technical attributes

- Energy saving and a very high lumen output
- High Colour Rendering
- Uniform Colour temperature
- Controlled lifetime
- Simple integration
- High Power Factor
- Low Total Harmonic Distortion
- Low Flicker percentage

Köpingsvägen 4
SE-732 31 ARBOGA
Ph: +46 (0)589-490 950
Web: www.optoga.com
E-mail: info@optoga.com

Short form Characteristics

MECHANICAL		L28W4		L56W4		
Module dimension		280x41mm		560x41mm		
Weight						
Assembly holes		4.3 mm				
Wire connector		Terminal Blocks for automatic wiring				
ELECTRICAL						
Power		9W	16W	16W	24W	32W
Input voltage		230VAC				
Input voltage range		220-240VAC				
Power factor		>0.80				
Total harmonic distortion		>15%				
Input current		40mA	70mA	70mA	105mA	140mA
Surge L-N		1500V				
Surge LN-PE		2000V				
Burst EFT L, N, PE		2000V				
Over temp. protection		150°C				
Inrush Current		< 600mA				
Inrush current duration		< 35µs				
Energy class	CRI80 3000K	E		E		
	CRI90 3000K	E		E		
PHOTOMETRICAL						
Flux nominal		1000lm	1700lm	1700lm	2500lm	3200lm
Efficiency		110lm/W		110lm/W		
Number of LED's		22	22	22	44	44
Colour Rendering Index		Ra>80 Ra>90				
SDCM (Mac Adam)		3				
SVM		0.5				
PstLM		0.6				
Spread angle lens		n/a (120° without lens)				
Colour temperatures		2700K, 3000K, 4000K				
ENVIRONMENTAL						
Temperature range		-40°C to 65°C (Absolute maximum temp Tc 65°C)				
Relative Humidity		10-75%				
Ambient air pressure		500-1060 HPa				
LIFETIME						
Life length L70B10*		>50 000h				

** Lifetime based on LM80 and interpolatation according to TM21 standard.*

Article number structure Theo AC FF

THEO L56W4 AC.P.230.N.XYY-NN.FF

LxxW4	L28 – 280 mm long, L56 – 560 mm long
AC	AC= 230VAC, ED=External Driver required, ID=Internal Driver
P	Power (Watt)
V	Voltage: 230VAC
N	Amount of LEDs
X	CRI: 8=Ra>80, 9=Ra>90
YY	CCT: 27 =2700K, 30 =3000K, 40 =4000K
NN	Viewing angle code (NN = n/a)
FF	Flickerfree version

Article name and versions

ARTICLE NAME	Description						
	POWER (W)	CURRENT (V)	CRI (Ra)	CCT (K)	LUMEN (Lm)	BEAM ANGLE (Deg)	ENERGY Class
Theo L28W4 AC.9.230.22.830-NN.FF	9	230	80	3000	1150	120	E
Theo L28W4 AC.9.230.22.840-NN.FF	9	230	80	4000	1200	120	E
Theo L28W4 AC.9.230.22.927-NN.FF	9	230	90	2700	900	120	F
Theo L28W4 AC.9.230.22.930-NN.FF	9	230	90	3000	1000	120	E
Theo L28W4 AC.9.230.22.940-NN.FF	9	230	90	4000	9000	120	E
Theo L28W4 AC.16.230.22.830-NN.FF	16	230	80	3000	1800	120	E
Theo L28W4 AC.16.230.22.840-NN.FF	16	230	80	4000	1850	120	E
Theo L28W4 AC.16.230.22.927-NN.FF	16	230	90	2700	1680	120	F
Theo L28W4 AC.16.230.22.930-NN.FF	16	230	90	3000	1760	120	E
Theo L28W4 AC.16.230.22.940-NN.FF	16	230	90	4000	1800	120	E
Theo L56W4 AC.16.230.44.830-NN.FF	16	230	80	3000	1900	120	E
Theo L56W4 AC.16.230.44.840-NN.FF	16	230	80	4000	1950	120	E
Theo L56W4 AC.16.230.44.927-NN.FF	16	230	90	2700	1680	120	F
Theo L56W4 AC.16.230.44.930-NN.FF	16	230	90	3000	1760	120	E
Theo L56W4 AC.16.230.44.940-NN.FF	16	230	90	4000	1800	120	E
Theo L56W4 AC.24.230.44.830-NN.FF	24	230	80	3000	2900	120	E
Theo L56W4 AC.24.230.44.840-NN.FF	24	230	80	4000	3000	120	E
Theo L56W4 AC.24.230.44.927-NN.FF	24	230	90	2700	2520	120	F
Theo L56W4 AC.24.230.44.930-NN.FF	24	230	90	3000	2640	120	E
Theo L56W4 AC.24.230.44.940-NN.FF	24	230	90	4000	2700	120	E

Ordering data

Theo L28W4 AC FF – Packaging information

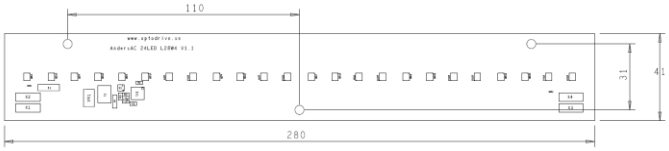
Description	Qty (pcs)	Dimension (cm)			GW (kg)
		Length	Width	Height	
Inner box	TBD	66.0	35.0	8.8	
Outer box	160	68.0	37.0	28.9	TBD

Theo L56W4 AC FF – Packaging information

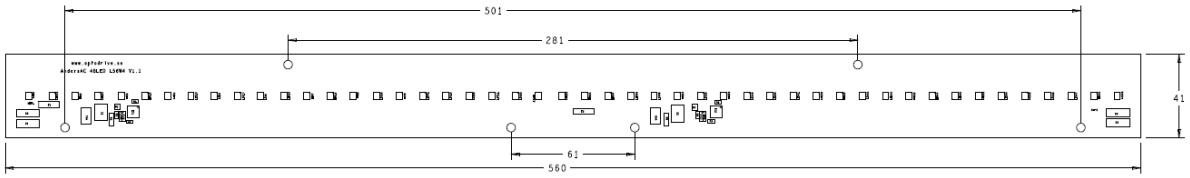
Description	Qty (pcs)	Dimension (cm)			GW (kg)
		Length	Width	Height	
Inner box	36	66.0	35.0	8.8	
Outer box	108	68.0	37.0	28.9	18.5

Dimensions LED-light engine Theo

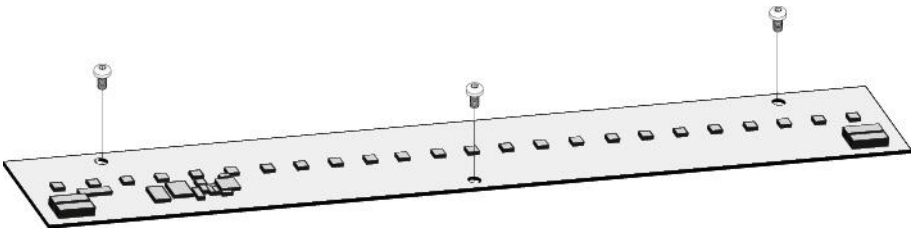
TheoL28W4 AC.P.230.22.8yy-NN

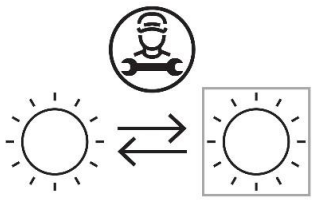


TheoL56W4 AC.P.230.44.8yy-NN



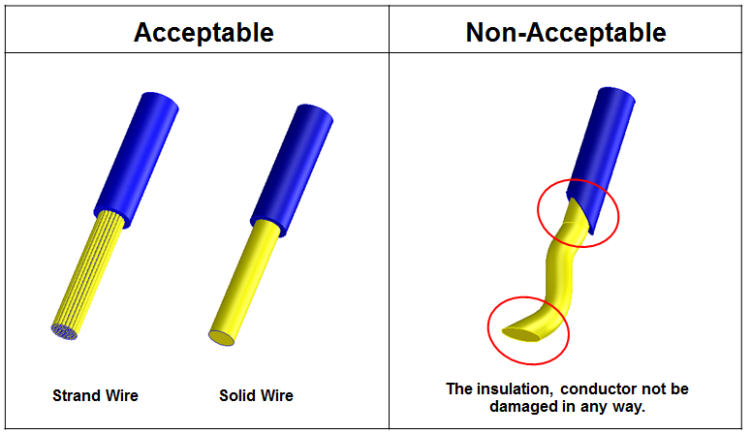
Mounting instructions

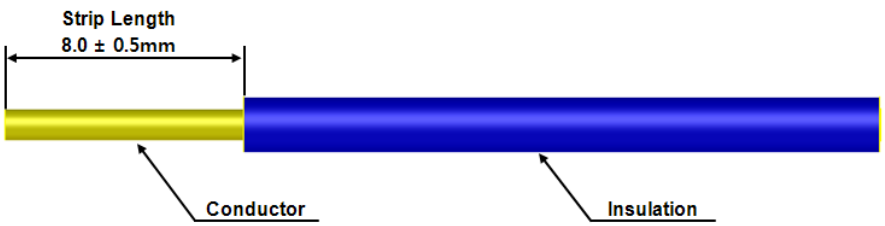




Wiring

Type of wire	AWG	mm²
Stranded	22-18	0.32-0.8mm²
Solid	24-18	0.51-1.02Ø (0.2-0.8mm²)
Insulation diameter	Max 2.1 mm	





Photometrical

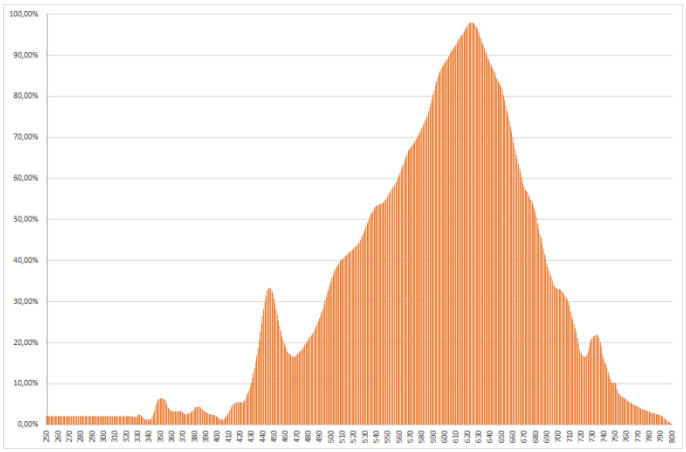
Flux

Parameter		Symbol	Value			Unit
			Min	Typ	Max	
Luminous Flux	9W	Φ_V		1000		lm
	16W	Φ_V		1700		lm
	24W	Φ_V		2400		
Correlated Colour Temperature	27*(2)	CCT		2700		K
	30*(2)	CCT		3000		K
	40*(2	CCT		4000		K
CRI		R_a	80	84	-	-
		R_a	90	94		
Power		Po		9		W
		Po		16		W
				16		W
				32		W

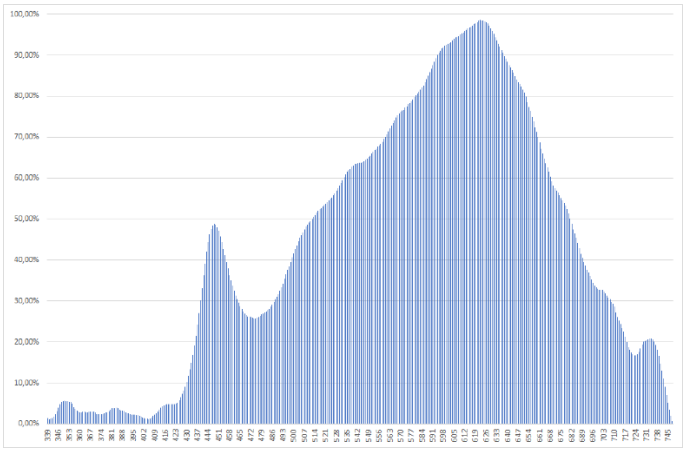
Electro-Optical characteristics LED module at I_F=xxmA, 230VAC, T_A=25ºC
(2)See detailed information in chapter" Binning structure graphical representation"

Colour Spectrum

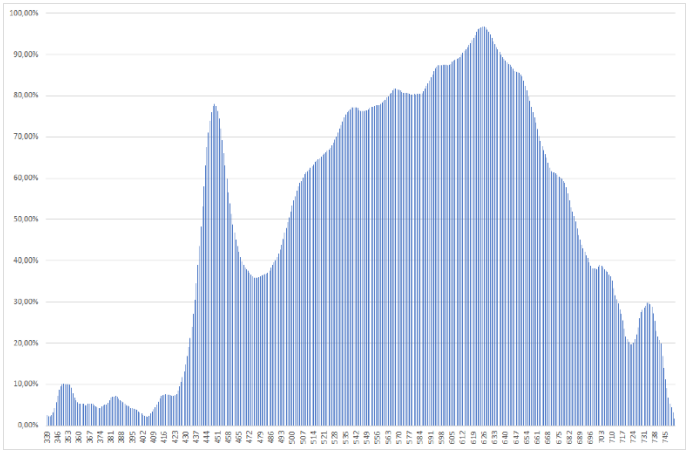
2700K



3000K

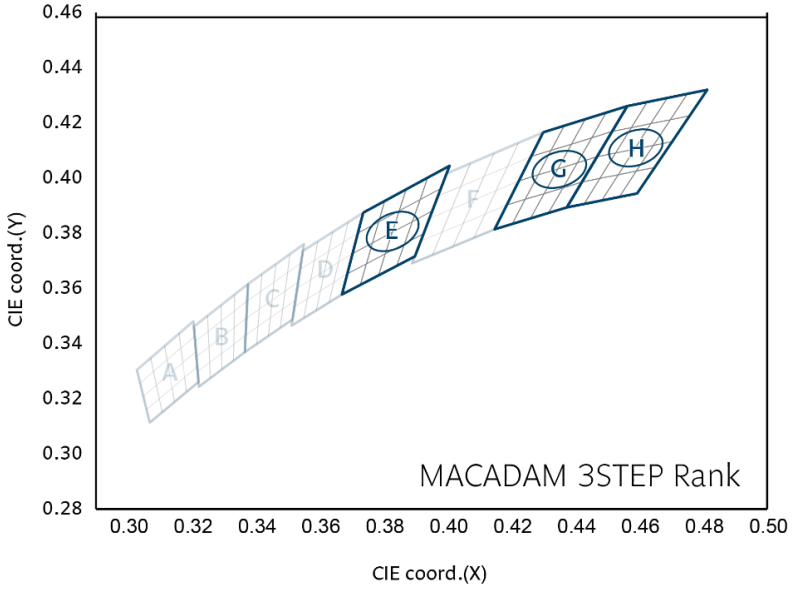


4000K



CCT structure graphical representation

Binning structure graphical representation IEC 1976



* Note that the Blue boxes represent Energy Star Rank

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

Colour Rendering Index (CRI)

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

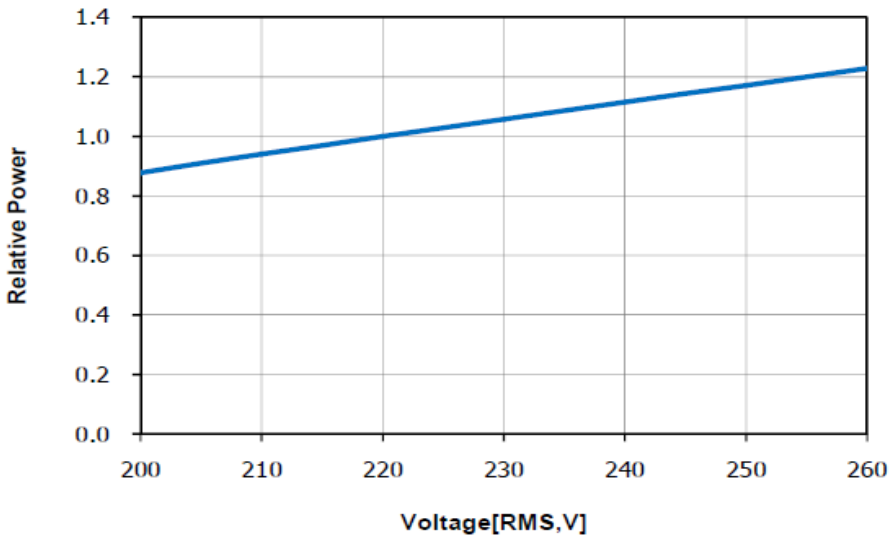
Short form letters for CCT (K)

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

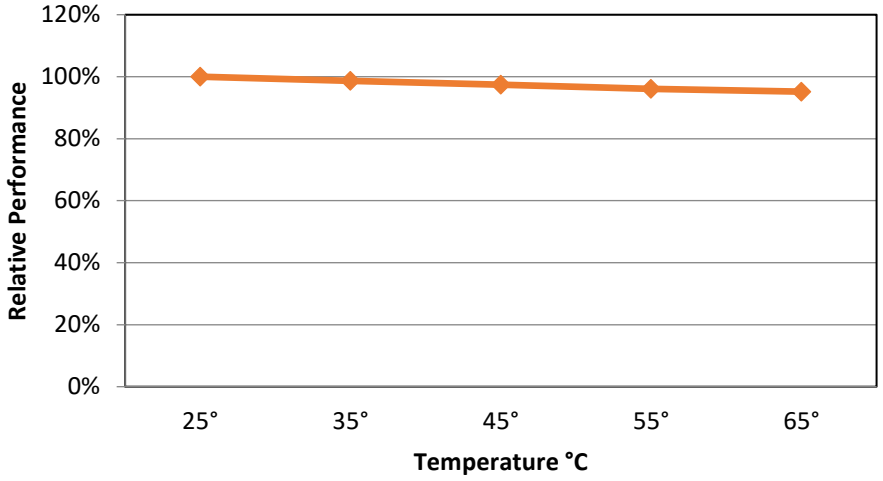
Electrical Optical Data

Current vs. Voltage

With increasing voltage the light output and the heat increases.



Temperature Characteristics



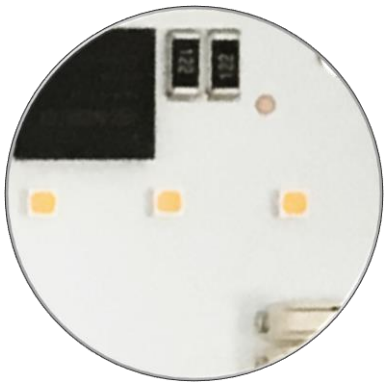
Consider the thermal capabilities of where the LED module is to be fitted. The temperature is an important factor for light output as well as for long time light output degradation.

Lifetime (Calculated)

Measurement points

When the measurement takes place you verify that the temperature on the marked measurement points is satisfying. Pending on the result you know what lifetime to expect from the module. This step will be implemented after the heat sink has been connected properly!

The lifetime is calculated at the maximum temperature recommended at the Tc (measuring point). It is important not to exceed this recommendation.



The lifetime is calculated at the maximum temperature recommended at the Tc (measuring point). It is important not to exceed this recommendation.

Projected lifetime based on TM-21

The power load used with the LED module is according to the “lumen maintenance projection”. It is a LM80 projected lifetime based on discreet LEDs tested in the stated temperature environment at a 30mA power load.

	55°C	65°C	75°C	85°C
L70B10	>50 000h	>50 000h	>50 000h	>50 000h
L80B10	>50 000h	47 000h	38 000h	33 000h
L90B10	28 000h	24 000h	20 000h	18 000h

Measurement Control

The recommended maximum value is 65°C on Tc or measuring point. If this value is exceeded we cannot guarantee the function and the lifetime of the product. The purpose of the measurement is to control the Junction (Tj) temperature of the LED and also in order to control the performance on the complete setup. By measuring the junction temperature (Tj) the average lifetime of the product is known.

The thermal connection is measured in temperature vs. Power.

Maximum Temperature

Secure the temperature in your application not to exceed 65°C. Read more in the section "Measurement control".

EMC

The substantial cost of industrial downtime with lamp and luminary failures and claim costs due to malfunctions caused through electrical over-stress makes it necessary to protect LED Engines against electrical transients caused by electrostatic discharge, inductive switching and lightning strikes.

ESD Electrostatic Discharge Immunity IEC61000-4-2

Contact Discharge		Air Discharge	
Level	Test Voltage (+/- kV)	Level	Test Voltage (+/- kV)
2	4	3	8

The *ESD* test simulates the electrostatic discharge of a human onto electronic equipment.

Electrical Fast Transient (EFT) Immunity / Burst Immunity IEC61000-4-4

- Fast Transient Burst L, N, PE 2000V

The Burst test simulates every day's switching transients caused by inductive switching, relay contact bounce, etc. In comparison to the ESD test with single test pulses, a burst generator produces an entire sequence of test pulses, called a burst.

Surge Immunity IEC61000-4-5

- Surge L-N 1500V
- Surge LN-PE 2000V

The Surge test is the most severe test of all, as it simulates transients caused by lightning strikes. The transients produced by a surge generator are approximately 1000-times longer than ESD or Burst transients.

ON/OFF test with fluorescent lightfitting

- Test verdict: PASS (100 cycles) *(10s. ON, 10s. OFF)*

In general, heavy pulses are typically produced by power systems switching (load changes, capacitor bank switching, power system shorting events). Mainly we see magnetic ballasts, LED Drivers and other equipment on the same line as the biggest threats to the LED Engines.

Verification of Conformity

The module are under testing at Intertek Semco according to IEC 62031.

Radio Disturbance	IEC 55015:2006 + A1:2007 + A2:2009	
SURGE	IEC 61000-4-5	1 kv
Fast transient BURST	IEC 61547	2 kv
SAFETY	IEC 62031:2008	
Photo Biological Safety	IEC 62471:2008	
Radio Disturbance	IEC 55015:2006 + A1:2007 + A2:2009	
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

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

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.

Light fitting routine tests

According to EN/IEC 60598-1 should the routine test be performed as a dielectric strength test or insulation test. Only the insulation test of 500Vdc should be performed according to standard, 1s with min 2MΩ.

No dielectric tests are allowed to be performed on OptoDrive LED Modules.

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 (Cr^{6+})
- 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 developes 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.

Köpingsvägen 4 • SE-732 31 Arboga • SWEDEN
Tel +46 (0) 589 490 950
info@optoga.com • www.optoga.com