

Appendix 5 – Benchmarking LED Questionnaire



LED Luminaries

The following criteria are designed to ensure that the performance claims of a manufacture of an LED luminaire can be match against traceable data. They are also intended to ensure the data provided refers to the luminaire during it operation and not just to the performance of the LED as a light source, this is because:

Optical Losses: A luminaire that use LED's as it primary light source often includes a secondary optic to suit a particular application of the luminaire.

Thermal Losses: The temperature of the p-n junction of the raw LED (die) (T_j) is measured at a temperature in the vicinity of the LED at 25°C where as in a luminaire it will be operating at a much higher temperature.

Driver Electronic Losses: In most cases, an LED driver is used within the luminaire that will lead to further losses compared with the initial LED performance.

The criteria for information required before the use of a luminaire can be approved is split in to two sections 1) Luminaire manufacturers design data, available for traceability & 2) Luminaire manufacturer's performance measurements.

Luminaire manufacturers design data, available for traceability:

- a) The manufacturer of the LED package part number.
- b) Driver current/voltage/power
- c) Lumen depreciation curves, electrical life, CCT, x & y and CRI for the LED package outside the luminaire at an ambient temperature of 25°C
- d) The board temperature T_{board} of the LED package used in the luminaire, when it is operating at an ambient temperature of 25°C
- e) Lumen depreciation curves, electrical life, CCT, x & y and CRI for the LED package at the operating T_{board}
- f) The colour bin, CCT, x & y values and MacAdam ellipse category (eg Cat 1 – 4) of the LED package at the operating T_{board}

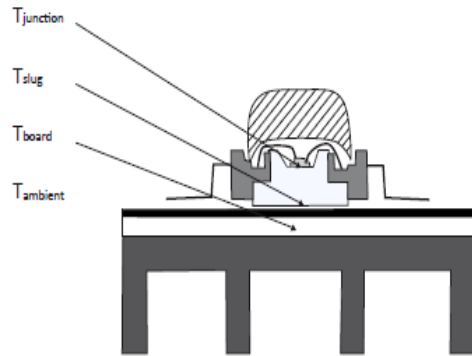


Figure 1: Critical temperature points in a High Power LED

Luminaire manufacturer's performance measurements.

- a) Luminaire lumen output
- b) Luminaire power
- c) Luminaire efficacy
- d) Correlated Colour Temperature, CCT (+shift over life)
- e) Colour coordinates, x & y (+ shift over time)
- f) Luminaire life that should always be qualified by lumen Depreciation and failures over life.
- g) Luminous intensity distribution

Luminaire manufacturer's performance claims will be measured in accordance with the requirements of IEC/PAS 62612: Edition 1:2009-06: Clauses 4, 6, 7, 8, 9, 10, 11, and built to safety standard BS-60598.

Note: Appendix 1 should be completed and returned to the client/lighting engineer for approval/rejection of the luminaire before any design work is completed.

**Appendix 1 of the Benchmarking Questionnaire
LED Questionnaire**

Consideration	Explanation	
Luminaire manufacture		
Name of luminaire		
Does product exist?		
Image of product		
Photometry available for use?		
Luminaire wattages available		
Luminaire lumen output		
Ambient temperature at which main data figures are stated		
Operational Ta range		
LED's used within product		
Manufacture of LED's		
Wattage of each LED		
Number of LED's		
Drive current		
LED lifetime data Lumen depreciation		
Voltage spike capability. What internal protection is provided to protect the driver and LED's against mains voltage spikes?		
When the stated ambient temperature (Ta) is exceeded how is junction temperature maintained?		
Guarantee / warrantee period.	LED's	
	Driver	
	Luminaire	

What LED failure is considered to be valid for a guarantee / warrantee claim?	
If LED's fail how can, they be repaired / replaced?	
Expected driver life at stated Ta	
Driver failure rate at 1,000 hrs operation	
How are the LED's wired? (series / parallel)	
Does the product have an UMSUG / Elexon energy rating, if so please give the reference number.	
Other projects where used.	
Lighting class achieved	
Maintained luminous flux, lux (lx)	
Correlated colour temperature (CCT) kelvin (K)	
Luminaire efficiency (LOR)	
Colour of light (description)	
Colour temperature shift at Lx	
Colour rendering index (CRI) value	at L100
	at Lx
CE marking	Certificate/Test data
	Declaration of Conformity
EMC compliance certification	Certificate/Test data
Rated input power	Watts (W)
Rated luminous flux	Lumens (lm)
LED luminaire efficacy	Lumens per watt (lm/W)
Median useful life, Lx, hours (h)	
Abrupt Failure Value (AFV) at Lx	Per cent (%):
Physical size of luminaire (dimension/depth)	
IP rating of luminaire	
Ik rating of luminaire	
ICEL approved certification	Certificate/Test data:
	Declaration of Conformity: