

Glossary of Terms

Analogue Dimming A dimming system employing analogue input signals initiating and defining the dimming level that an LED driver or control gear will react to. Typical protocols include 1-10V, 0-10V, and trailing edge dimming (triac dimming). Such systems benefit from simplicity but lack the flexibility of customisation.

Candela (cd) The base unit of luminous intensity.

Colour Rendering Index (Ra %) A quantitative measure of the ability of a light source to reproduce the colours of various objects faithfully in comparison with an ideal or natural light source. Values of 100-90 are very good, 90-80 good and LEDs with an Ra below 80 should not be used where people are working continuously.

Colour Temperature T(K) Black bodies (like most others) when heated to sufficiently high temperatures emit red light, when the temperature is increased further the emitted light becomes white. The colour co-ordinates derived from this heated black body (a full spectral, or perfect radiator) when plotted on a diagram lie on a smooth curve known as the full radiator locus, and are shown on the CIE Chromatic Diagram.

The colour appearance of a given light source can be compared to a position on the full radiator locus by reference to its colour temperature, referred to in degrees Kelvin.

DALI and DSI Digital Addressable Lighting Interface is a technical standard for network based systems that control lighting in buildings. The open standard was established as a successor to analogue 0-10V lighting control systems.

Further technical information may be found on dali.org.

Digital Signal Interface (DSI) is also a protocol for controlling lighting in buildings. It was created in 1991 and is the basis of the more sophisticated DALI protocol. DALI adds more complex features such as ability to address individual luminaires as well as information reporting back from the lighting to the control system.

The DALI standard is specified in the IEC 60929 standard for fluorescent lamp ballasts and encompasses the communication protocol and electrical interface for lighting control networks.

Digital Dimming A dimming protocol employing digital input signals initiating and defining the dimming level that an LED driver or control gear will respond to. Some digital protocols may also benefit from luminaire addressing and information reporting. Typical protocols include push dim, centre retractive dimming, DALI, DSI and DMX.

DMX DMX is a standard for digital communication networks that is commonly used to control stage lighting and effects. However, more recently the protocol has gained more interest in the commercial and architectural lighting space. The protocol was originally devised for controlling light dimmers.

The DMX512 digital bus network can support no more than 32 devices on a single bus. More devices may be installed if DMX splitters are employed on the bus. Please consult PhotonStar LED for further technical information and specific installation requirements.

Emergency BLF Ballast Lumen Factor is the ratio of the light output of the LED light engine or luminaire in emergency operation compared with the light output of the same LED light engine operated at normal lighting conditions. Please refer to the appropriate LED light engine pages for actual BLF values.

Emergency Luminaires All PhotonStar Emergency Luminaires comply to the relevant parts of EN61000:200 and EN55015:2006. All emergency luminaires are rated for 3 hour autonomous battery operation. The control gear enclosures are also UL94-V0 rated.

All PhotonStar emergency luminaires operate in “maintained” mode of operation until otherwise stated or specified. In maintained mode the LED light engine operates with a normal power supply and switches to the emergency power supply when there is a failure.

It is recommended that emergency lighting applications comply with EN1838 and EN60598-2-22.

Glare Glare is the discomfort caused by high luminances in the field of vision.

Light Level The incidence of light flux on a surface per unit of area, measured in lux. There is a difference between the vertical and horizontal light levels.

Light Output Ration (LOR) The ratio of the luminaire light output to lamp light output. The efficiency of the luminaire.

Lumen (lm) Unit of luminous flux used to describe a quantity of light emitted by a source or received by a surface.

Luminaire Efficiency How well a luminaire uses the luminous flux of the lamp used. The ratio is calculated by dividing the total luminaire lumens by the total circuit watts.

Luminance The measure of brightness with which the eye perceives an illuminated surface from a certain direction. The luminous intensity per unit of visible surface of a light source (direct) or an illuminated surface (reflection). Luminance is indicated in candelas per square metre (cd/m²).

Luminous Efficacy (lm/W) Indicates how efficiently a lamp converts electrical energy to light.

MacAdam Ellipse The technique was developed by MacAdam in 1943 to determine boundaries around target colour points on the CIE chromaticity diagram whereby the source can deviate before the observer can perceive a difference in target colour.

MacAdam ellipses were evolved to describe the “steps”, which define standard deviations from the target colour point. A 2-step ellipse defines 2 standard deviations from the target point in all colour directions.

Due to the non-conformal CIE 1931 XYZ chromaticity space, the deviations are defined as ellipses.

ANSI recommends that light engine manufacturers stay within a “4-step” ellipse. A point on the boundary of a 4-step ellipse is 8 standard deviations from a point on the opposite side of that same boundary.

It is also important to note that the perceived differences in colour can also depend on the correlated colour temperature, viewing angle, luminance, and size of object.

Ra Colour Rendering Index is either Ra8 or Ra14. Ra8 usually shortened too just Ra, this is the average of the first 8.

(All values are typical unless stated)

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Measurement and Sample Preparation In assessing the safety of an LED light engine, it is necessary to determine the spectral distribution of the LEDs at maximum irradiance (W/m^2) or radiance ($W/m^2\text{-sr}$). The wavelength measurement must cover 200nm to 3000nm.

RISK FACTOR	RISK GROUP RESULT
Actinic UV, E_s (200 – 400nm)	Exempt
Near UV, E_{UVA} (315 – 400nm)	Exempt
Blue Light, L_b (300 – 700nm)	Risk Group I (Low Risk)
Retinal Thermal, L_r (380 – 1400nm)	Exempt
Retinal Thermal Weak Stimulus, L_{rw} (780 – 1400nm)	Exempt
IR Radiation Eye, E_{IR} (780-3000nm)	Exempt

Risk group categories of a typical PhotonStar Warm White 3000K LED light engine.

The LED light engine is tested at the maximum permissible constant current to provide constant emission and in accordance to the IEC 62471 guidelines.

Photobiological Damage The European standard, IEC 62471:2006 (and the closely associated ANSI/IESNA RP-27 in the USA) for Photobiological Safety of Lamps and Lamp Systems, is used to evaluate LED photobiological safety. The scope of this standard applies to lamps and lamp systems safety, including the safety of LED light engines and luminaires. The following information is provided by PhotonStar to assist customers to identify the viability of the LED light engine and luminaire in the end application. The information in this section can be used to help evaluate luminaire level safety and provide customers some indication of the risk factor classification of PhotonStar LED light engines and luminaires.

Luminous Flux (lm) The total light output of a lamp measured in lumen.

Luminous Intensity (cd) The power of a source or illuminated surface to emit light in a particular direction, measured in candela.

Lux (lux) The unit of illuminance, equal to one lumen per square metre (lm/m^2).

Maintenance Factor Lighting levels decrease in time due to soiling and lamp deterioration. Mean values are 0.7 or 0.8 for a normal interior, depending on cleaning cycles for traditional sources. For LED luminaires the mean value is 0.9.

Part L1 & L2 UK Building Regulations for conservation of fuel and power, see further details on pages 176-177.

Performance Cone Shows whether the luminaire emits a narrow or wide beam of light and indicates the lighting level measured at the centre of the beam. The beam diameter and angle indicated where half the light is measured in relation to the centre of the beam. It gives only a rough guide of the size of beams narrower than 40°.

Polar Curve The graphic representation of the luminous intensity in different directions. If two curves are plotted, the distributions are in two vertical planes. The value is indicated in candelas per 1000 lumen (cd/klm) and therefore must be multiplied by the nominal luminous flux of the lamp used. The polar curve graph also indicates luminaire efficiency.

UGR The UGR method relates to glare from ceiling fixtures that are placed in a regular pattern. European standard EN 12461, Lighting of Indoor Work Places, contains a table in which the maximum allowed UGR value is prescribed per type of room and per type of activity. The UGR method produces a scale figure:
 below 13 no glare
 13–16 suited for accurate eye tasks
 16 –19 suited for average eye tasks
 19–22 suited for moderate eye tasks
 22–28 suited for simple eye tasks above
 28 not suited for work lighting.

Utilisation Factor The ratio of the light flux which the reference surface receives to the totalled luminous fluxes of the installed lamps. This is influenced by the shape and size of the room and selected luminaire and is expressed in the form of UF tables.

CLE Compact Light Engines. LED modules with compact light emission surface. Unified footprint and mechanical assembly LED module providing high efficiency, high CRI solution.

SLLE Spot LED Light Engines. Industry standard, unified footprint. Mechanically assembled LED module providing colour stable high efficiency, high CRI solution.

VCCT Variable Correlated Colour Temperature. User definable white colour tuneable light sources. PhotonStar LED VCCT light engines typically comprise of proprietary multiple LEDs or a chip on board module, a colour mix cavity and an active control system to monitor and prolong the lifetime and colour quality of the light engine.

Tungsten H Compact LED light engine that warms when dimmed.

Tungsten+ Compact LED light engine that warms when dimmed, with cool white “boost”.

RGB Red Green Blue colour tuneable compact LED light engine.

Pastel Tuneable high CRI pastel light source with wide Cx Cy range.

LumenLoc™ LumenLoc™ technology ensures that the luminous intensity of the module is always maintained. This active direct measurement of the light output is achieved through the use of a light level sensor embedded in the module and control is achieved through the use of a microprocessor based feedback loop.

CRILoc™ CRILoc™ technology ensures that the spectral performance of the module is maintained during operation. This active direct measurement of the light output is achieved through the use of a colour sensor embedded in the module and control is achieved through the use of a microprocessor based feedback loop.

ColourLoc™ ColourLoc™ technology constantly monitors and corrects the output from the module, providing active colour stability.

ThermaLoc™ ThermaLoc™ technology actively monitors the junction temperature to ensure that safe operating ranges are not exceeded.

Innovate™ High thermal performance “Chip On Board” technology.