BS EN 62504:2014

BSI Standards Publication

General lighting — Light emitting diode (LED) products and related equipment — Terms and definitions

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National foreword

This British Standard is the UK implementation of EN 62504:2014. It is identical to IEC 62504:2014. It supersedes DD IEC/TS 62504:2011 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CPL/34, Lamps and Related Equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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General lighting - Light emitting diode (LED) products and related equipment - Terms and definitions (IEC 62504:2014)

Éclairage général - Produits à diode électroluminescente (LED) et équipements associés - Termes et définitions (CEI 62504:2014)

Allgemeinbeleuchtung - Licht emittierende Dioden (LED) Produkte und verwandte Ausrüstung - Begriffe und Definitionen (IEC 62504:2014)

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Foreword

The text of document 34/200/FDIS, future edition 1 of IEC 62504, prepared by IEC TC 34, "Lamps and related equipment", was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62504:2014.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-04-24
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-07-24

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Endorsement notice

The text of the International Standard IEC 62504:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60061-1	NOTE	Harmonized as EN 60061-1.
IEC 60825-1	NOTE	Harmonized as EN 60825-1.
IEC 61140	NOTE	Harmonized as EN 61140.
IEC TR 61341	NOTE	Harmonized as EN 61341.
IEC 61347-1	NOTE	Harmonized as EN 61347-1.
IEC 611347-2-13	NOTE	Harmonized as EN 61341-2-13.
IEC 62031	NOTE	Harmonized as EN 62031.
IEC 62471	NOTE	Harmonized as EN 62471.
IEC 62612	NOTE	Harmonized as EN 62612.

Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050	series	International Electrotechnical Vocabulary	-	series
CIE 127	-	Measurement of LEDs	-	-

CONTENTS

INTRODUCTION

0.1 Principles of this International Standard

This document is based on IEC TS 62504:2011, General Lighting – LEDs and LED modules – Terms and definitions, which was under the responsibility of SC 34A but this revision as International Standard IEC 62504 transfers responsibility to TC 34.

The objective of this introduction is to help the reader to understand which terms are included and to have an understanding of the LED product overview.

Compared with IEC TS 62504, the main changes are as follows.

0.2 Terms to include

General lighting terms in IEC 60050-845:1987, International Electrotechnical Vocabulary that have not been modified will not be included in this standard.

Alignment with CIE is done. IEC will be the reference for products and related equipment and CIE for lighting terminology. Alignment with ANSI RP16-10, Chapter 6.8 was also considered.

The terms included are as far as possible used in LED standards and manufacturers' literature.,

Process to update IEC 60050-845:1987, the International Electrotechnical Vocabulary for definitions that will be considered as relevant is underway in IEC TC34.

0.3 Alphabetic sequence

In order to find the term in a logical sequence, we have grouped similar terms of a product, example:

LED lamp

– integrated LED lamp ,

– non-integrated LED lamp .

For each term, reference is made to the relevant standard if appropriate.

0.4 LED product tree:

The sequence from the first component, the LED die up to the LED luminaire is drawn.

The term LED does not represent a product, so no technical data can be linked to the term LED.

GENERAL LIGHTING – LIGHT EMITTING DIODE (LED) PRODUCTS AND RELATED EQUIPMENT – TERMS AND DEFINITIONS

1 Scope

This International Standard IEC 62504 is of assistance in the common understanding of terms and definitions, relevant for general lighting with LED technology. The terms included are those already available in IEC LED standards or used in manufacturers' literature.

This standard provides descriptive terms (like “LED light sources”) and measurable terms when modified from IEC 60050-845 (like “colour rendering index”).

NOTE Annex A gives overviews of LED package design and systems composed of LED light sources and controlgear.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>).

CIE Technical Report 127:2007, *Measurement of LEDs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845, with the exception of those modified below, and the following apply.

3.1
ageing
preconditioning period of the LED light source before initial values are taken

3.2
angular subtense
α
angle subtended by an apparent source as viewed from a point in space

Note 1 to entry: Angular subtense is expressed in radians (rad).

Note 2 to entry: The angle extension is determined by the observation distance, but at no distance smaller than the minimum distance of accommodation of the eye.

Note 3 to entry: The location and angular subtense of the apparent source depends on the viewing position in the beam.

Note 4 to entry: The angular subtense of an apparent source is only applicable in the wavelength range from 380 nm to1 400 nm.

Note 5 to entry: IEC TR 62778 gives additional information with regards to beam divergence.

[SOURCE: IEC 60825-1, 3.7, modified – Notes 1, 2 and 5 to entry are added and in the note 4 to entry the value of the wavelength range has been changed from '400 nm to 1 400 nm' to '380 nm to 1 400 nm'; IEC 62471, 3.2, modified.]

3.3
apparent source
for a given evaluation location of the retinal hazard, the real or virtual object that forms the smallest possible retinal image (considering the accommodation range of the human eye)

Note 1 to entry: The accommodation range of the eye is assumed to be variable from 100 mm to infinity. The location of the apparent source for a given viewing position in the beam is that location to which the eye accommodates to produce the most hazardous retinal irradiance condition.

Note 2 to entry: This definition is used to determine, for a given evaluation position, the location of the apparent origin of laser radiation in the wavelength range of 380 nm to 1 400 nm. In the limit of vanishing divergence, i.e. in the case of a well collimated beam, the location of the apparent source goes to infinity.

[SOURCE: IEC 60825-1, 3.10, modified – In the note 2 to entry the value of the wavelength range is changed from '400 nm to 1 400 nm' to '380 nm to 1 400 nm'.]

3.4
beam angle
angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the lamp and through points at which the luminous intensity is 50 % of the centre beam intensity

Note 1 to entry: Beam angle is expressed in degrees (°).

Note 2 to entry: This angle is a full angle measure, not a half angle measure.

[SOURCE: IEC TR 61341, 2.4, modified, – The notes to entry are added.]

3.5
bin
restricted range of LED performance characteristics used to delimit a subset of LED dies or LED packages near a nominal LED performance as identified by chromaticity, photometric, radiometric and/or electrical characteristics

3.6 controlgear

3.6.1
controlgear for LED module
LED controlgear
unit inserted between the electrical supply and one or more LED modules, which serves to supply the LED module(s) with its (their) rated voltage or rated current, and may consist of one or more separate components and may include means for dimming, correcting the power factor and suppressing radio interference, and further control functions

Note 1 to entry: The controlgear consists of a power supply and a control unit.

Note 2 to entry: The controlgear may be partly or totally integrated in the LED module.

Note 3 to entry: When no confusion is expected like when used in a LED standard for example, “controlgear” may also be used. Both terms “controlgear” or “control gear” are acceptable.

[SOURCE: IEC 61347-2-13, 3.1, modified – The word 'electronic' is deleted from the term and the words “further control functions” and the notes to entry are added.]

3.6.2
power supply of the controlgear
electronic device, being part of the controlgear, capable of controlling current, voltage or power within design limits, containing no additional LED control capabilities

Note 1 to entry: For LEDsi modules, the power supply of the controlgear is separate from the LED module on a distant location.

Note 2 to entry: The energy source of a power supply can be either a battery or the electrical supply system.

3.6.3
control unit of the controlgear
electronic device, being part of the controlgear, responsible for controlling the electrical energy to the LED light sources as well as colour mixing, response to depreciating luminous flux and further performance features

Note 1 to entry: In LEDsi modules, the control unit of the controlgear is on board of the LED module and separate from the power supply of the controlgear.

3.7
dominant wavelength <of a colour stimulus>
λ_d
wavelength of the monochromatic stimulus that, when additively mixed in suitable proportions with the specified achromatic stimulus, matches the colour stimulus considered in the CIE 1931 x,y chromaticity diagram

Note 1 to entry: Dominant wavelength is expressed in nanometres (nm).

Note 2 to entry: In the case of purple stimuli, the dominant wavelength is replaced by the complementary wavelength.

Note 3 to entry: For characterising LED light sources the reference achromatic stimulus should be illuminant E which has the chromaticity coordinates x_E = 0,3333, y_E = 0,3333.

Note 4 to entry: A value for dominant wavelength should only be stated for LED light sources emitting coloured light. For LED light sources emitting white light no meaningful value for dominant wavelength can be given.

Note 5 to entry: Figure 12 in CIE 127:2007 shows the relationship between chromaticity coordinate C of LED light sources and value of dominant wavelength D. N is the chromaticity coordinate of achromatic stimulus E.

Note 6 to entry: Deviating from the peak wavelength, the dominant wavelength determines perceived colour.

[SOURCE: IEC 60050-845:1987, 845.03.44, modified – The words 'in the CIE 1931 x,y chromaticity diagram' and the notes to entry 3 to 6 have been added; CIE S 017/E:2011, 17-345, modified – The notes to entry 3 to 6 have been added.]

3.8
failure
termination of the ability of an item to perform a required function

Note 1 to entry: After failure the item has a fault.

Note 2 to entry: "Failure" is an event, as distinguished from "fault", which is a state.

Note 3 to entry: This concept as defined does not apply to items consisting of software only.

[SOURCE: IEC 60050-191, 191.04.01]

3.9
failure fraction
F
fraction of the population that lost the ability to perform a required function in a specified time interval

Note 1 to entry: Failure fraction is dimensionless.

3.10
failure fraction at rated life
F_y
ratio *y* of failed LED products of the same type at their rated life to the test quantity

Note 1 to entry: The ratio is expressed in percent.

Note 2 to entry: This failure fraction expresses the combined effect of all components of a LED product including mechanical, as far as the light output is concerned. The effect of the LED could either be less light than claimed or no light at all.

Note 3 to entry: For LED products normally a failure fraction of 10% or/and 50% are being applied, indicated as F_{10} and/or F_{50}.

3.11
family
group of LED light sources or LED luminaires, having the same characteristics and method of control (integrated, semi-integrated, non integrated), the groups are distinguished by common features of materials, components, and/or method of processing

3.12
forward direction
direction of current that results when the P-type semiconductor region connected to one terminal is at positive potential relative to the N-type region connected to the other terminal

Note 1 to entry: If temperature compensation diodes are included, these are ignored in the determination of forward direction.

[SOURCE: IEC 60050-521, 521.05.03, modified – The words 'connected to one terminal', 'potential' and 'connected to the other terminal' as well as note 1 to entry have been added.]

3.13
forward voltage
U_F
potential difference pertaining to the forward direction, dependent on the forward current at a given temperature

Note 1 to entry: Forward voltage is expressed in Volts (V).

Note 2 to entry: Forward voltage for LED die is measured normally at 25 °C ambient temperature.

3.14
heat output to the luminaire
P_d
power to be transferred to the luminaire by means of heat-conduction in order to stay below the t_c or t_p temperature

Note 1 to entry: Heat output is expressed in Watts (W).

Note 2 to entry: P_d is below the rated power of a LED module.

Note 3 to entry: For LED modules which do not need heat-conduction to the luminaire for keeping t_c , P_d is equal to zero.

Note 4 to entry: A measurement method is under consideration.

3.15 LED lamp
LED light source provided with (a) cap(s) incorporating one or more LED module(s) and possibly including one or more of the following; electrical, optical, mechanical, and thermal components, interfaces and controlgear

Note 1 to entry: A LED lamp may be integrated (LEDi lamp) or semi-integrated (LEDsi lamp) or non-integrated (LEDni lamp).

Note 2 to entry: Single and double-capped lamps are included.

Note 3 to entry: A LED lamp is designed so that it can be replaced by an ordinary person (as defined in IEC 60050-826, 826.18.03).

3.15.1
integrated LED lamp
LEDi lamp
LED lamp, incorporating controlgear, and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

3.15.2
non-integrated LED lamp
LEDni lamp
LED lamp which needs a separate controlgear to operate

3.15.3
retrofit LED lamp
LED lamp intended as a replacement of a non-LED lamp without requiring internal modification of the luminaire

3.15.4
semi-integrated LED lamp
LEDsi lamp
LED lamp which carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

3.16
LED light source
electrical light source based on LED technology

Note 1 to entry: A luminaire may include LED light sources but is not considered itself as a light source.

Note 2 to entry: LED light source(s) for a LED luminaire represents one or more LED lamp(s) or LED module(s).

3.17
LED luminaire
luminaire designed to incorporate one or more LED light source(s)

3.18
non-repairable, factory-sealed LED luminaire,
luminaire which cannot be dismantled without being permanently damaged, and incorporating LED light source(s) and any additional elements necessary for starting and stable operation of the light source

3.19 LED module
LED light source having no cap, incorporating one or more LED package(s) on a printed circuit board, and possibly including one or more of the following: electrical, optical, mechanical, and thermal components, interfaces and controlgear

Note 1 to entry: A LED module may be integrated (LEDi module, Type 1) or semi-integrated (LEDsi module, Type 2) or non-integrated (LEDni module, Type 3).

Note 2 to entry: The LED module is usually designed to be part of a LED lamp or LED luminaire.

[SOURCE: IEC 62031, 3.2, modified – The definition is reworded and notes to entry are added.]

3.19.1
built-in LED module
LED module, generally designed to form a replaceable part to be built into a luminaire, a box, an enclosure or the like and not intended to be mounted outside a luminaire, etc. without special precautions

[SOURCE: IEC 62031, 3.6, modified – The words ‘to be’ are added.]

3.19.2
independent LED module
LED module designed for mounting or placing separately from a luminaire, from an additional box or enclosure or the like

Note 1 to entry: The independent LED module provides all the necessary protection with regard to safety according to its classification and marking.

Note 2 to entry: An example of an independent LED module is a system where the LED module is connected via a glass fibre with the luminaire head.

[SOURCE: IEC 62031, 3.8, modified – The second sentence in the definition as well as other additional information are transferred into notes to entry replacing the original note.]

3.19.3
integral LED module
LED module, generally designed to form a non-replaceable part of a luminaire

[SOURCE: IEC 62031, 3.4]

3.19.4
integrated LED module
LEDi moduleLED module, incorporating controlgear and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

Note 1 to entry: LEDi modules are designated “Type 1”, see Annex A.

3.19.5
non-integrated LED module
LEDni module
LED module which needs a separate control circuitry or controlgear to operate

Note 1 to entry: LEDni modules are designated “Type 3”, see Annex A.

Note 2 to entry: One or more LED packages on a printed circuit board or substrate in a geometric structure are regarded as a LED array. No further components are included like electrical, optical, mechanical, and thermal.

3.19.6
semi-integrated LED module
LEDsi module
LED module which carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

Note 1 to entry: LED modules with control unit are designated “Type 2”, see Annex A.

3.20
LED package
single electrical component encapsulating principally one or more LED dies, possibly including optical elements and thermal, mechanical, and electrical interfaces

Note 1 to entry: The component does not include the control unit of the controlgear, does not include a cap, and is not connected directly to the supply voltage.

Note 2 to entry: A LED package is a discrete component and part of the LED module or LED lamp. For a schematic built-up of a LED package, see Annex A.

3.21
luminous life time of LED package
$L_x(t_j)$
time period at a specified junction temperature and forward current, determined by a minimum level of x % of the measured initial luminous flux

Note 1 to entry: Luminous life time of LED package is expressed in hours (h).

Note 2 to entry: t_j relates to LED die, but luminous life time of LED package are given with reference to t_j

3.22
luminous life time of LED module related to t_p temperature
$L_x(t_p)$
time period at a specified performance temperature at which x % of the measured initial luminous flux value is reached

Note 1 to entry: Luminous life time of LED module is expressed in hours (h).

Note 2 to entry: The use of forced cooling to achieve the specified t_p temperature should be stated.

3.23
light colour designation
three digit number, the first digit representing the first digit of the general colour rendering index R_a [IEC 60050-845:1987, 845.02.63], and the second and third digit representing the first two digits (thousands and hundreds) of the CCT of the light source

Note 1 to entry: The light colour designation is detailed in IEC TR 62732.

3.24
light emitting diode
LED
solid state device embodying a p-n junction, emitting incoherent optical radiation when excited by an electric current

Note 1 to entry: This definition is independent from the existence of enclosure(s) and of terminals.

Note 2 to entry: The output is a function of its physical construction, material used and exciting current. The optical emission may be in the ultraviolet, visible, or infrared wavelength regions.

Note 3 to entry: LED term normally represents the LED die (or chip), or LED package. It is also used as a generic term representing the technology.

Note 4 to entry: LED term should not be used for reporting product performance (like luminous flux, colour rendering, life time…) instead use for example “luminous flux of the LED module”

[SOURCE: IEC 60050-845:1987, 845.04.40, modified – The word 'incoherent' and the notes to entry have been added and CIE S 017/E:2011 ILV, 17-662, modified.]

3.25
live part
conductive part which may cause an electric shock in normal use

Note 1 to entry: A process to align with IEC 61140 is underway and the definition will be designated by the term “hazardous live part” in a future amendment.

3.26
luminous efficacy <of a source>
η_V, η
quotient obtained when the emitted luminous flux is divided by the power consumed by the source

Note 1 to entry: Luminous efficacy is expressed in $lm \cdot W^{-1}$

Note 2 to entry: For LED applications, the source may be a LED package, module, lamp, luminaire etc.

[SOURCE: IEC 60050-845:1987, 845.01.55, modified – The words 'obtained when' and 'is divided' and the notes to entry have been added and CIE S 017/E:2011 ILV, 17-730, modified]

3.27
luminous flux
Φ*V, *Φ
quantity derived from radiant flux Φ_e by evaluating the radiation according to its action upon the CIE standard photometric observer

Note 1 to entry: Luminous flux is expressed in lumen (lm).

Note 2 to entry: For photopic vision $\Phi_V = K_{m\,360}\int^{830} (d\Phi_e(\lambda)/d\lambda) \times V(\lambda)d\lambda$ where $(d\Phi_e(\lambda)/d\lambda)$ is the spectral distribution of the radiant flux and $V(\lambda)$ is the spectral luminous efficiency.

Note 3 to entry: For the values of K_m (photopic vision) and K'_m (scotopic vision), see IEC 60050-845, 845.01.56.

Note 4 to entry: The luminous flux of LED dies is usually expressed in groups into which they are sorted.

[SOURCE: IEC 60050-845:1987, 845.01.25, modified – Second sentence become note 2 to entry and note 4 to entry is added and CIE S 017/E:2011 ILV, 17-738, modified.]

3.28
luminous flux maintenance factor
lumen maintenance factor
ratio of the luminous flux emitted by the light source at a given time in its life to its initial luminous flux emitted, the light source being operated under specified conditions

Note 1 to entry: This ratio is generally expressed in percent.

Note 2 to entry: The lumen maintenance factor of a LED light source is the effect of decrease of the luminous flux output of the LED package or a combination of this with failure(s) of LED package if the LED light source contains more than one LED package

[SOURCE: IEC 60050-845:1987, 845.07.65, modified – The words 'of a lamp' have been replaced by 'emitted by the light source' and the notes to entry have been added and CIE S 017, 17-636, modified]

3.29
luminous intensity <of a source, in a given direction>
I*V; *I
quotient of the luminous flux $d\Phi_V$ leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle

$I_V = d\Phi_V/d\Omega$

Note 1 to entry: Luminous intensity is expressed in candela, cd=lm·sr^{-1}

Note 2 to entry: The definition holds strictly only for a point source.

Note 3 to entry: The luminous intensity of LED is reported according to CIE 127:2007 measurement procedure.

[SOURCE: IEC 60050-845:1987, 845.01.31 and CIE S 017/E:2011 ILV, 17-739, modified – The notes to entry have been added.]

3.30
photometric code
under consideration

3.31
peak wavelength
***λ*p**
wavelength of radiation at the highest intensity of the spectral distribution

Note 1 to entry: Peak wavelength is expressed in nanometres (nm).

[SOURCE: CIE 127, 7.2.1, modified – The definition has been simplified.]

3.32
rated life
length of time during which a population of LED light sources provides at least the claim for maintained luminous flux percentage and at most the claim for failure fraction percentage F_y, as declared by the manufacturer or responsible vendor

Note 1 to entry: Rated life is expressed in hours (h).

3.33
rated value
value of a quantity used for specification purposes, established under standard test conditions as declared by the manufacturer or responsible vendor

Note 1 to entry: The standard test conditions are given in the relevant standard.

[SOURCE: IEC 60050-151:2001, 151.16.08, modified – The text ‘for a specified set of operating conditions of a component, device, equipment, or system’ has been replaced by ‘under standard test conditions as declared by the manufacturer or responsible vendor’ and note 1 to entry has been added.]

3.34
rated emergency lighting charging power
electrical power from the mains supply consumed by the charging circuit of emergency luminaires

Note 1 to entry: Rated emergency lighting charging power is measured in Watts (W).

3.35
stabilisation time
time that is required for the LED light source or LED luminaire to obtain stable photometric output and electrical power consumption with constant electrical input

3.36
standby power <of the luminaire>
electrical power consumed by the luminaire during the period when the light source(s) is(are) not operating

Note 1 to entry: Standby power is expressed in Watts (W).

Note 2 to entry: For emergency lighting luminaires, this does not include the emergency lighting charging power.

3.37
supply voltage
voltage applied to the complete unit of LED light source or LED luminaire

[SOURCE: IEC 61347-1, 3.5, modified – The words 'circuit of lamp(s) and lamp controlgear' have been replaced by 'unit of LED light source or LED luminaire'.]

3.38 temperature

3.38.1
ambient temperature
t_{amb}
temperature of air or another medium in the vicinity of the product under test

Note 1 to entry: Ambient temperature is expressed in degrees Celsius (°C).

Note 2 to entry: During the measurement of the ambient temperature, the measuring instrument/probe should be shielded from draughts and radiant heating.

[SOURCE: IEC 60050-826, 826.10.03, modified – The word 'average' is omitted and the word 'equipment' is replaced by 'product under test' and 2.2.5 of CIE 127:2007.]

3.38.2
ambient performance temperature
ambient temperature related to the performance of the LED light source or LED luminaire

Note 1 to entry: Ambient performance temperature is expressed in degrees Celsius (°C).

3.38.3
board temperature
t_b
temperature of LED package or LED module between the printed circuit board and the thermal interface

Note 1 to entry: Board temperature is expressed in degrees Celsius (°C).

3.38.4
heat transfer temperature
t_d
temperature occurring on a relevant part of the LED module (or any heat-conducting foil or paste provided as for insertion if delivered with the LED module) (at the indicated position if marked) which is intended for the passing of heat to the lampholder or to other parts of the luminaire under normal operating conditions and at the rated voltage/current/power or the maximum of the rated voltage/current/power range

Note 1 to entry: The temperature measured at the specified point gives information on the interface in which the heat is to be transferred to the luminaire. An improper designed LED module does not pass the heat to the surface where it should be transferred to the luminaire. As a result the t_c point will not stay below its maximum level and the t_d point in the interface area remains cold.

Note 2 to entry: A measurement method is under consideration.

[SOURCE: IEC 62031, 3.11, modified – The word 'representative' is replaced by the word 'relevant' and the words 'provided' and 'which is' as well as the notes to entry have been added'.]

3.38.5
junction temperature
t_j
temperature at the p-n junction

Note 1 to entry: Junction temperature is expressed in degrees Celsius (°C).

3.38.6
performance temperature
t_p
temperature related to performance of the LED module

Note 1 to entry: Performance temperature is expressed in degrees Celsius (°C).

Note 2 to entry: Temperature is measured at a given location t_p-point.

3.38.7
rated maximum performance ambient temperature
$t_{q,nn}$
highest ambient temperature around the luminaire related to a rated performance of the luminaire under normal operating conditions, both as declared by the manufacturer or responsible vendor

Note 1 to entry: Rated maximum performance ambient temperature is expressed in degrees Celsius (°C).

Note 2 to entry: For a given life time, the $t_{q,nn}$ temperature is a fixed value, not a variable, where nn, the number in the suffix indicates the related lifetime claim in khours, example; $t_{p,60}$ where nn = 60 represent 60 000 h lifetime claim.

Note 3 to entry: There can be more than one $t_{q,nn}$ temperature, depending on the life time claim.

3.38.8
rated maximum performance temperature
$\boldsymbol{t_{p,nn}}$
highest temperature at t_p-point, related to a rated performance of the LED module, both as declared by the manufacturer or responsible vendor

Note 1 to entry: Rated maximum performance temperature is expressed in degrees Celsius (°C).

Note 2 to entry: The location of t_p and t_c can be different.

Note 3 to entry: For a given performance, the $t_{p,nn}$ temperature is a fixed value, not a variable, where nn, the number in the suffix indicates the related lifetime claim in khours, example; $t_{p,60}$ where nn = 60 represent 60 000 h lifetime claim.

Note 4 to entry: There can be more than one $t_{p,nn}$, depending on the performance claim.

3.38.9
rated maximum temperature
$\boldsymbol{t_c}$
highest permissible safety related temperature which may occur on the outer surface of the component (LED module or controlgear) (at the indicated position, if marked) under normal operating conditions and at the rated voltage/current/power or the maximum of the rated voltage/current/power range

Note 1 to entry: Rated maximum temperature is expressed in degrees Celsius (°C).

[SOURCE: IEC 61347-1, 3.16, modified and IEC 62031, 3.10, modified – Both definitions have been combined]

3.38.10
storage temperature range
ambient temperature range within which a non-operated LED light source or LED luminaire can be stored, when the claims of the specification are maintained

Note 1 to entry: Storage temperature range is expressed in degrees Celsius (°C).

3.38.11
temperature coefficient of the forward voltage
$\boldsymbol{k_{FV}}$
change in forward voltage at a fixed current as a function of the junction temperature

Note 1 to entry: Temperature coefficient of the forward voltage is expressed in $mV \cdot K^{-1}$

3.39
thermal resistance of a LED module
$\boldsymbol{R_\Theta}$
thermodynamic temperature difference divided by the corresponding heat flow rate from the LED module to the heat sink

Note 1 to entry: Thermal resistance of a LED module is expressed in $K \cdot W^{-1}$

Note 2 to entry: Measurement points should be at the junction, board or ambient, the location of which is to be determined by the manufacturer or responsible vendor.

Note 3 to entry: For better understanding, drawings of a part of the LED module and a schematic chain of thermal resistors are shown in Figure 1.

[SOURCE: IEC 60050-113:2011, 113.04.45, modified – The words ‘the corresponding’ and ‘from the LED module to the heat sink’ and the notes to entry have been added.]

t_j, junction temperature

t_b, board temperature

t_q, ambient performance temperature (LED luminaire)

X example of possible location of t_p-point

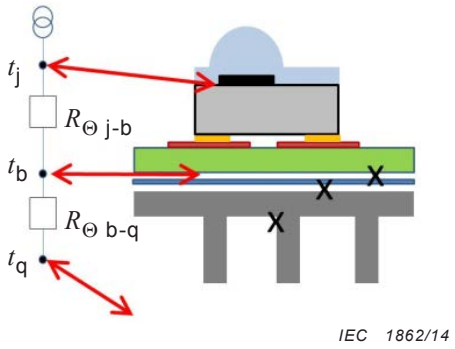


Figure 1 – Schematic drawing of the chain of thermal resistors

3.40
type
LED product representative of the production

3.41
type test
conformity test on one or more LED product(s) representative of the production

[SOURCE: IEC 60050-151:2001, 151.16.16, modified – The word 'items’ is replaced by the word ‘LED product(s)’.]

3.42
type test sample
one or more LED product(s) submitted by the manufacturer or responsible vendor for the purpose of the type test

Annex A
(informative)

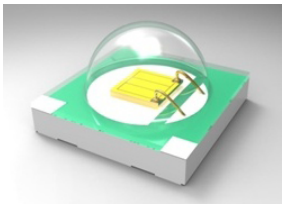
Overview of LED products and terms under consideration

A.1 Overview of LED packages

Figure A.1 provides examples of LED package.

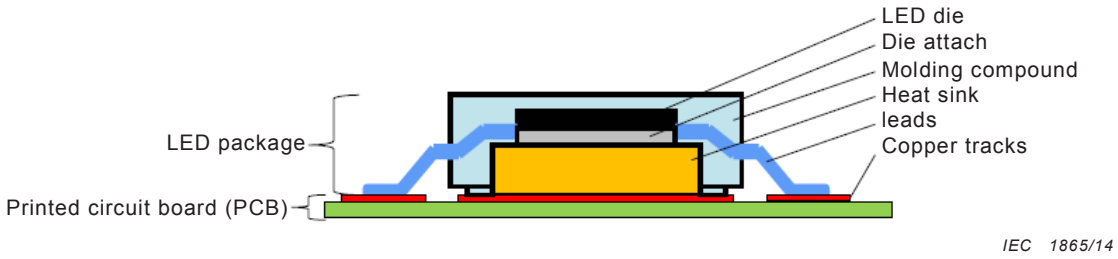
IEC 1863/14

a) LED package



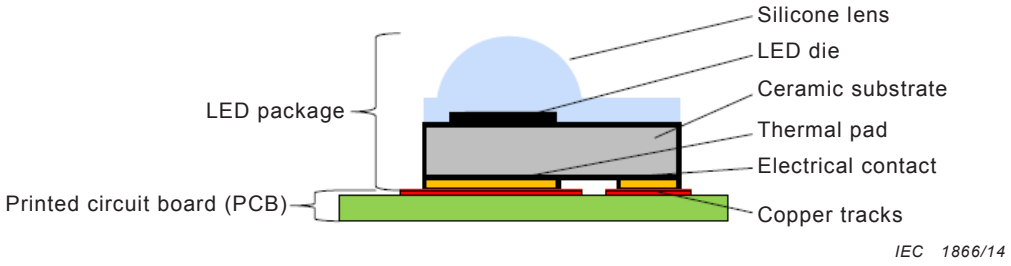
IEC 1864/14

b) LED package



IEC 1865/14

c) *Surface mounted LED package with lead in wires*



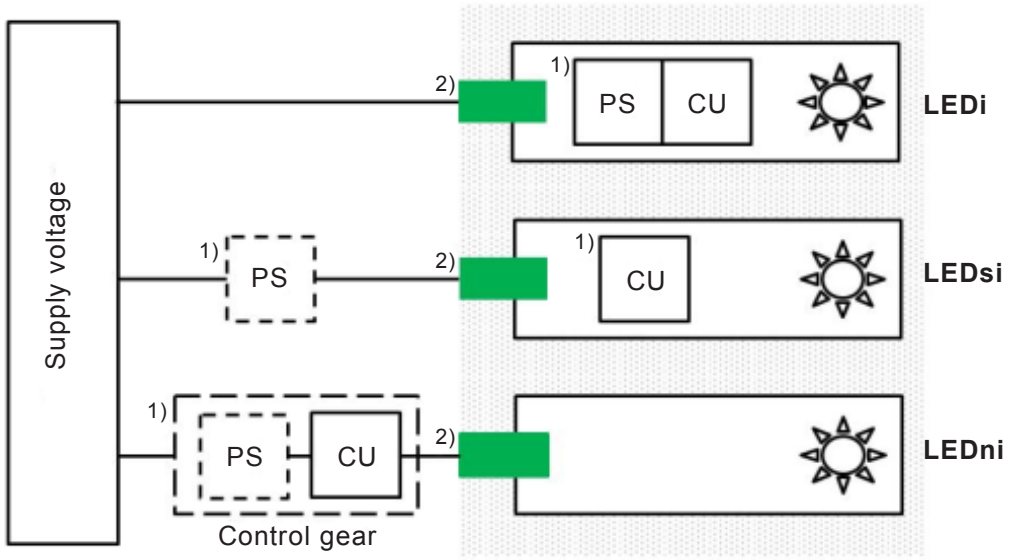
IEC 1866/14

d) *Surface mounted LED package without lead in wires*

Figure A.1 – Overview of LED packages

A.2 Overview of systems composed of LED light sources and LED controlgear

Figure A.2 provides an overview of systems composed of LED light sources and LED controlgear.



Key

1)		2)	
PS	power supply	In case of LED lamp	cap/holder for user replacement/retrofit
CU	control unit	In case of LED module	interface which may or may not allow luminaire manufacturer replacement/upgrade
	optional		
	one or more LED package(s)		

IEC 1867/14

NOTE Supply voltage does not mean necessarily mains voltage, e.g. 230 V / 50 Hz. An “Integrated LED lamp” can also be driven on a supply voltage with 12 V a.c. or d.c.(may be provided by a power supply or batteries). The “LED controlgear” mentioned in the above sketch of an “Integrated LED lamp” then provides the conversion of 12 V a.c. or d.c. to a special current and voltage to power up the LED or LED module inside the “Integrated LED lamp”.

Figure A.2 – Overview of systems composed of LED light sources and LED controlgear

A.3 Overview of LED light sources

A.3.1 Examples of retrofit LED lamps – White or coloured light, bulb or reflector type, with caps according IEC 60061 (as shown in Figures A.3 and A.4)

NOTE LED lamp shape can be different from lamps of other technology to be replaced

Figure A.3 – Examples of retrofit LED lamps

A.3.2 Examples of LED lamps with new shapes

a) Double-capped LED lamp, side a

b) Double-capped LED lamp, side b

Figure A.4 – Examples of LED lamps with new shapes

A.3.3 Examples of LED modules

A.3.3.1 General

LED module requires a performance temperature (t_p).

A.3.3.2 LEDi module

(no picture available)

A.3.3.3 LEDsi module

(no picture available)

A.3.3.4 LEDni module

Examples of LEDni modules are given in Figure A.5.

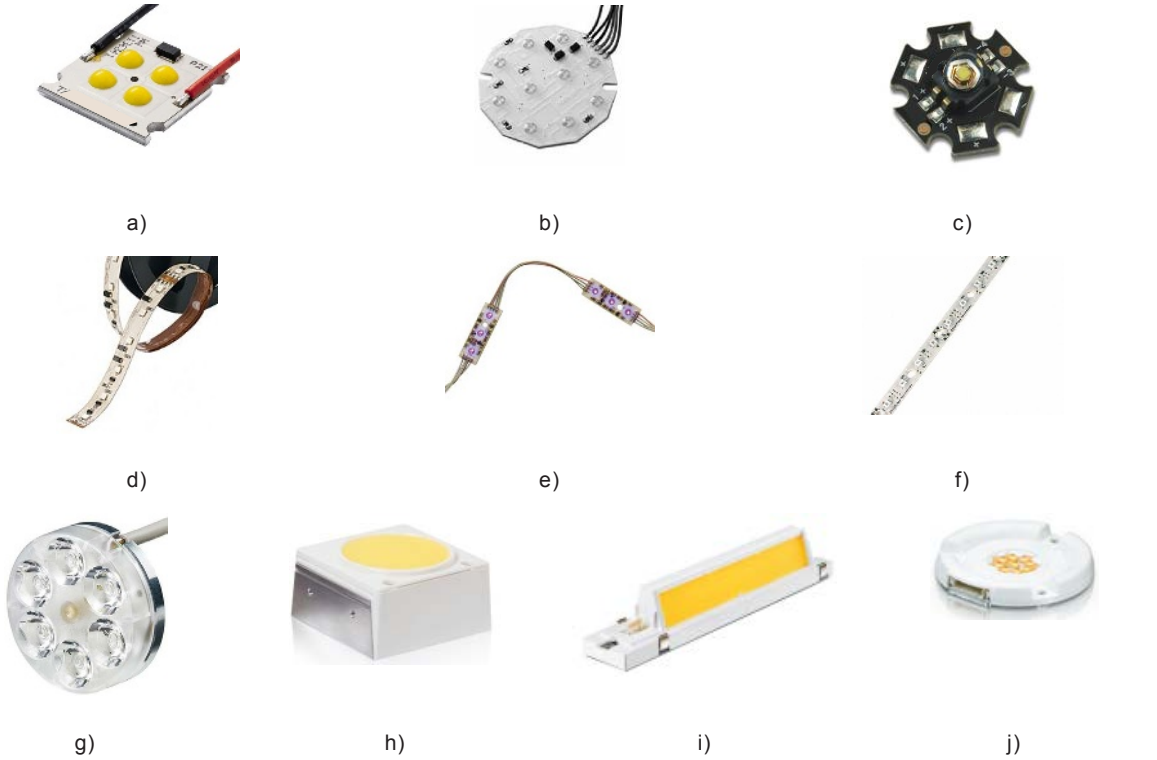


Figure A.5 – Examples of LEDni modules

A.4 Terms under consideration

A.4.1 LED light engine

The scope of this term is not clear enough to be part of this document at present. A universal definition is under consideration.

A.4.2 Chip on board (CoB)

This new technology is emerging and this component can be considered as LED package or LED module when used as such. The definition is under consideration.

Examples of chip on board are given in Figure A.6.

a) b)

IEC 1872/14

Figure A.6 – Examples of chip on board

A.5 Schematic of built-in, independent, integral LED module

Figure A.7 provides a schematic of built in, independent and, integral modules.

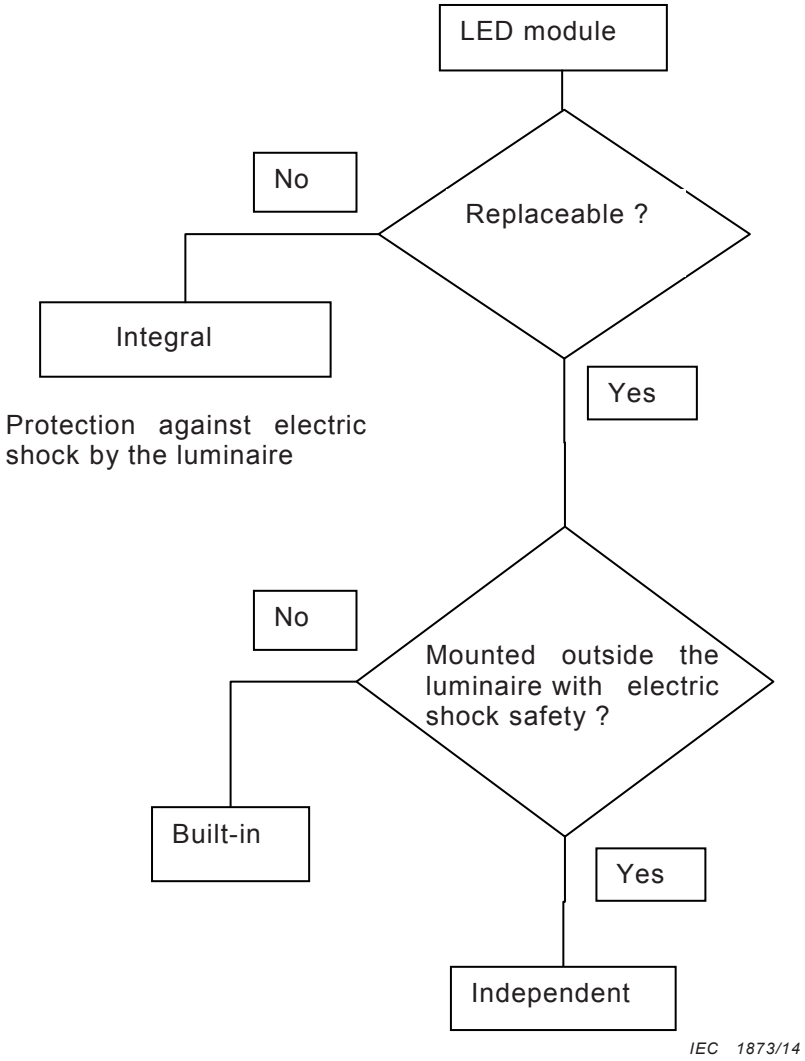


Figure A.7 – Schematic of built in, independent, integral modules

A.6 LED product tree overview

Figure A.8 provides the overview of the LED product tree.

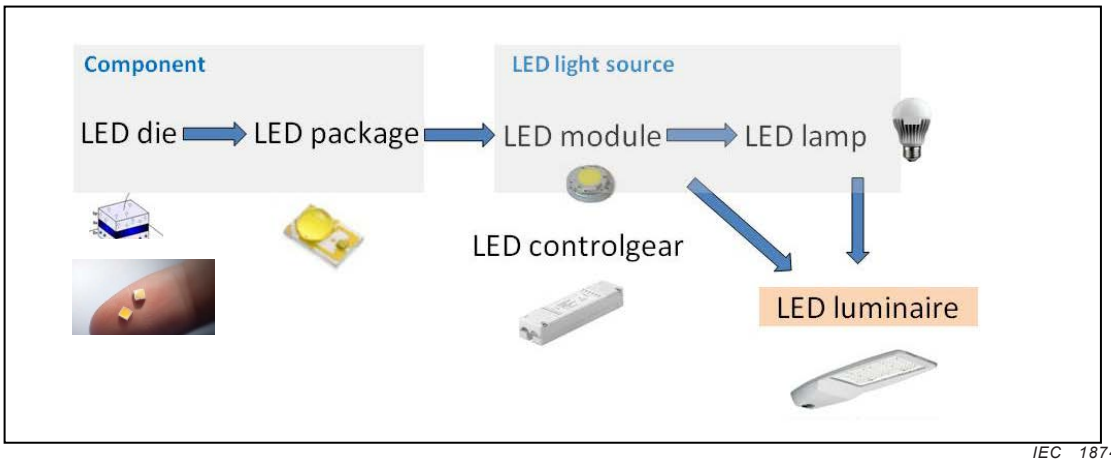


Figure A.8 – LED product tree overview

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