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Interested committees:

Title: BS EN IEC 63555 LED Light sources – Performance requirements

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



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2024-07-12

SUPERSEDES DOCUMENTS:

34A/2387/NP, 34A/2393/RVN

IEC SC 34A : ELECTRIC LIGHT SOURCES	
SECRETARIAT: United Kingdom	SECRETARY: Mr Petar Luzajic
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 34,SC 34B,SC 34C,SC 34D	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

LED Light sources – Performance requirements

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LED LIGHT SOURCES – PERFORMANCE REQUIREMENTS

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- IEC 63221 has been prepared by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting. It is an International Standard.
- This first edition cancels and replaces IEC 62612:2013, IEC 62612:2013/AMD1:2015, IEC 62612:2013/AMD2:2018, IEC 62717:2014, IEC 62717:2014/AMD1:2015 and IEC 62717:2014/AMD2:2019.
- This edition constitutes a technical revision.
- This edition includes the following significant technical changes with respect to IEC 62612:2013, IEC 62612:2013/AMD1:2015, IEC 62612:2013/AMD2:2018, IEC 62717:2014, IEC 62717:2014/AMD1:2015 and IEC 62717:2014/AMD2:2019:
- a) IEC 62612 and IEC 62717 have been merged into an LED light source standard;
 - b) the luminous flux maintenance requirements have been fully reviewed and moved to an informative annex (Annex L - Luminous flux maintenance at 3 000 h) and the test time reduced to 3 600 h;
 - c) the lumen maintenance code has been deleted;

- d) sample sizes have been fully reviewed and a new informative Annex N - Verification testing has been introduced;
- e) u' , v' and Duv have been introduced;
- f) Relevancy of the endurance test reviewed and considered no longer relevant for the market as part of this document.

The text of this International Standard is based on the following documents:

Draft	Report on voting
34A/XX/FDIS	34A/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

NOTE In this document, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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219

INTRODUCTION

220 The following LED light source performance standards have been combined to form the basis
221 of this document.

222 • IEC 62612:2013, IEC 62612:2013/AMD1:2015 and IEC 62612:2013/AMD2:2018

223 • IEC 62717:2014, IEC 62717:2014/AMD1:2015 and IEC 62717:2014/AMD2:2019

224

LED LIGHT SOURCES – PERFORMANCE REQUIREMENTS

1 Scope

This document specifies performance requirements for LED light sources connected to a DC supply of up to 1 500 V or an AC supply of up to 1 000 V. This document specifies requirements and test methods for electrical, photometric, colorimetric and dimensional characteristics.

NOTE 1 LED light sources as defined in IEC 60050-845-27-053 can take the form of an LED module or an LED lamp.

This document covers LED light sources that produce light with a correlated colour temperature typically between 2 200 and 6 500 K, based on inorganic LED technology.

NOTE 2 Correlated colour temperature is a quantity used to describe the chromaticity appearance of a light source emitting white light.

NOTE 3 The scope is not limiting for values outside the mentioned CCT range. Therefore, the addition of the word "typically" is important. The CCT preferred values used in this document are specified in Annex C.

NOTE 4 See the definition of correlated colour temperature in IEC 60050-845:2020, 845-23-068.

The requirements of this document relate only to type testing.

This document does not apply to:

- LED packages;
- LED light sources for automotive lighting;
- LED light sources for horticultural lighting;
- OLED light sources.

NOTE 5 Independent LED modules (see IEC 60050, 845-27-064) are considered as luminaires and will be covered by a future revision of IEC 62722-2-1: Luminaire performance - Part 2-1: Particular requirements - LED luminaires.

The lifetime of LED light sources is in most cases much longer than the practical test times. Consequently, verification of manufacturer's lifetime claims cannot be made in a sufficiently confident way because projecting test data further in time is not fully reliable. For that reason the acceptance or rejection of a manufacturer's lifetime claim is out of the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-845, *International Electrotechnical Vocabulary (IEV) – Part 845: Lighting* (available at <http://www.electropedia.org>)

IEC 60068-2-14, *Environmental testing - Part 2-14: Tests - Test N: Change of temperature*

IEC 60068-3-5, *Environmental testing – Part 3-5: Supporting documentation and guidance – Confirmation of the performance of temperature chambers*

IEC 60630, *Maximum lamp outlines for incandescent lamps*

IEC 61000-3-2:2018, *Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)*

IEC 61000-3-2:2018/AMD1:2020

IEC 61000-3-2:2018/AMD2:202X

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) - Part 4-7: Testing and measurement techniques - General guide on harmonics and interharmonics measurements and*

270 *instrumentation, for power supply systems and equipment connected thereto*
271 IEC 61000-4-7:2002/AMD1:2008

272 IEC TR 61341, *Method of measurement of centre beam intensity and beam angle(s) of reflector*
273 *lamps*

274 IEC 62722-1:2022, *Luminaire performance - Part 1: General requirements*

275 IEC 63103:2020, *Lighting equipment - Non-active mode power measurement*

276 IEC 63XXX¹:202X, *LED lamps – Safety requirements*

277 IEC 62031²:202X, *LED modules – Safety requirements*

278 IEC 63356-1, *LED light source characteristics - Part 1: Datasheets*

279 IEC 63356-2, *LED light source characteristics - Part 2: Design parameters and values*

280 CIE S025/E:2015, *test method for LED lamps. LED luminaires and LED modules*

281 **3 Terms and definitions**

282 For the purposes of this document, the terms and definitions given in IEC 60050-845 and the
283 following apply.

284 ISO and IEC maintain terminological databases for use in standardization at the following
285 addresses:

- 286 • IEC Electropedia: available at <https://www.electropedia.org/>
- 287 • ISO Online browsing platform: available at <https://www.iso.org/obp>

288 **3.1**

289 **electric light source**

290 primary light source with the means for connecting to the power supply and usually designed
291 to be incorporated into a luminaire

292 Note 1 to entry: In IEC standards, "light source" is also commonly used with the same meaning.

293 Note 2 to entry: An electric light source can be an electric lamp, or LED module designed to be connected by
294 terminals, connectors or similar devices.

295 [SOURCE: IEC 60050-845:2020, 845-27-004]

296 **3.2**

297 **LED light source**

298 electric light source based on LED technology

299 Note 1 to entry: An LED light source can take the form of an LED module or an LED lamp.

300 [SOURCE: IEC 60050-845:2020, 845-27-053]

301 **3.3**

302 **integrated LED light source**

303 **LEDi LED light source**

304 LED light source, incorporating controlgear and any additional elements necessary for stable
305 operation of the light source, designed for direct connection to the supply voltage

306 [SOURCE: IEC 60050-845:2020, 845-27-055 modified – LED lamp replaced by LED light
307 source]

¹ Under preparation.

² Under preparation.

3.4**semi-integrated LED light source****LEDsi light source**

LED light source that carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

Note to entry: The term control unit is specified in IEC 60050-845-28-057.

[SOURCE: IEC 60050-845:2020, 845-27-056 modified – LED lamp replaced by LED light source]

3.5**non-integrated LED light source****LEDni light source**

LED light source that needs a separate controlgear to operate

[SOURCE: IEC 60050-845:2020, 845-27-057 modified – LED lamp replaced by LED light source]

3.6**directional LED light source**

LED light source having at least 80 % luminous flux within a solid angle of π sr (corresponding to a cone with angle of 120°)

3.7**built-in LED module**

LED module, designed to form a replaceable part built into a luminaire, a box, an enclosure or the like and not intended to be mounted outside a luminaire

[SOURCE: IEC 60050-845:2020, 845-27-062]

3.8**integral LED module**

LED module designed to form a non-replaceable part of a luminaire

[SOURCE: IEC 60050-845:2020, 845-27-063]

3.9**scalable LED module**

LED module which is designed according to a certain design rule and can be described by the characteristics proportional to a specific geometrical dimension

EXAMPLE: LED modules are considered scalable, if arranged on one reel or similar bigger unit.

3.10**LED die**

separated part of a wafer intended to perform as an LED in a device

Note 1 to entry: A device can be an LED package.

Note 2 to entry: For a schematic built-up of an LED die, see Figure G.1.

[SOURCE: IEC 60050-845:2020, 845-27-051]

3.11**initial value**

value representing a characteristic measured at the end of the ageing period and stabilization time

Note 1 to entry: The initial value can refer to a photometric, colorimetric or electrical quantity.

Note 2 to entry: No ageing period is applied unless specified by the manufacturer, see Annex A.

[SOURCE: IEC 60050-845:2020, 845-27-107, modified – the text “value representing a” and Note 2 to entry has been added]

3.12**maintained value**

value representing a characteristic measured at an operational time, including stabilization time

Note 1 to entry: The maintained value can refer to a photometric, colorimetric or electrical quantity.

[SOURCE: IEC 60050-845:2020, 845-27-113]

3.13**luminous flux maintenance factor****lumen maintenance factor**

x

<of an LED light source> ratio x of the luminous flux of an LED light source at a given time in its operational life to its initial luminous flux, the electric light source being operated under specified conditions

Note 1 to entry: In IEC standards, “lumen maintenance” is also commonly used with the same meaning.

Note 2 to entry: The lumen maintenance factor of an LED light source includes optical parts degradation, the effect of decrease of the luminous flux output of the LED package and failure(s) of individual LED packages if the LED light source contains more than one LED package.

Note 3 to entry: The luminous flux maintenance factor has unit one and is expressed in %.

[SOURCE: IEC 60050-845:2020, 845-27-114, modified – Use <of an LED light source>, Symbol x and unit added, Note 2 to entry removed, New note 2 and 3 to entry added]

3.14**degraded luminous flux**

<of an LED light source> luminous flux value being less than the initial luminous flux emitted by an operating LED light source multiplied by the luminous flux maintenance factor x

Note 1 to entry: This term can also be used with LED luminaires.

3.15**abrupt failure**

failure of an LED light source to operate or to produce luminous flux

Note 1 to entry: The term “complete failure” is commonly used for the same purpose.

3.16**abrupt failure probability**

$F(t)$

<of an LED light source> probability of an LED light source, taken from a population of LED light sources of the same type, to fail to operate after a given time, t expressed in hours.

Note 1 to entry: $LSF(t) = 1 - F(t)$, LSF is Lamp Survival Factor, [IEC 60050-845:2020, 845-29-149]

Note 2 to entry: The abrupt failure probability has unit one.

3.17**abrupt failure value**

AFV

<of an LED module> percentile of LED modules failing to operate at median useful life, L_x

EXAMPLE Given $L_x = 20\,000$ h and $AFV = F(20\,000\text{ h}) \times 100\% = 7\%$ results in $LSF(20\,000\text{ h}) = 1 - 0,07 = 0,93$.

Note 1 to entry: $AFV = F(L_x) \times 100\%$; $LSF(L_x) = 1 - F(L_x)$.

Note 2 to entry: The abrupt failure value has unit one and is expressed in %.

3.18**time to abrupt failure**

C_y

<of an LED module> length of time during which $y\%$ of a population of initially operating LED modules of the same type fail to produce any luminous flux

Note 1 to entry: The time to abrupt failure includes inoperative LED modules only.

Note 2 to entry: $C_{AFV} = L_x$, For more detail see clause D.3.

Note 3 to entry: The time to abrupt failure has unit h.

3.19**combined failure value**

CFV

<of an LED module> percentage of LED modules or LED luminaires having either flux degraded or abruptly failed at median useful life L_x

EXAMPLE Given AFV = 15 % results in CFV = $50 + 0,5 \times 15 = 57,5$ %.

Note 1 to entry: CFV = $50 + 0,5 \times \text{AFV}$.

Note 2 to entry: The combined failure value has unit one and is expressed in %.

3.20**combined life** $M_x F_y$

<of an LED lamp> length of time during which y % (F_y) of a population of initially operating LED lamps of the same type have either flux degraded to initial luminous flux emitted multiplied by the related luminous flux maintenance factor x or abruptly failed

Note 1 to entry: The combined life (of LED lamps) includes operating and non-operating LED lamps.

Note 2 to entry: The combined life has unit h.

3.21**median combined life** M_x

<of an LED lamp> length of time during which 50 % (F_{50}) of a population of initially operating LED lamps of the same type have either degraded luminous flux or abruptly failed

Note 1 to entry: The median combined life (of LED lamps) includes operating and non-operating LED lamps.

Note 2 to entry: By convention, the expression "life of LED lamps" without any modifiers is understood to mean the median combined life.

Note 3 to entry: The median combined life has unit h.

3.22**useful life** $L_x B_y$

<of an LED module> length of time until at maximum a percentage y of a population of operating LED modules of the same type have degraded to the initial luminous flux emitted multiplied by the related luminous flux maintenance factor x

Note 1 to entry: The useful life includes operating LED modules only.

Note 2 to entry: The useful life has unit h.

3.23**median useful life** L_x

<of an LED module> length of operating time during which a total of 50 % (B_{50}) of a population of operating LED modules of the same type have flux degraded to the initial luminous flux emitted multiplied by the related luminous flux maintenance factor x

Note 1 to entry: The median useful life excludes abrupt failures.

Note 2 to entry: By convention, the expression "life of LED modules" without any modifiers is understood to mean the median useful life.

Note 3 to entry: An LED module can have a different median useful life depending on the applied performance temperature.

Note 4 to entry: The median useful life has unit h.

3.24 **t_p -point**

<of an LED module> designated location of the point on the surface of an LED module where to measure the t_p -temperature

3.25 **t_p -temperature**

<of an LED module> temperature at the t_p -point, related to the performance of the LED module

Note 1 to entry: If the t_p -point and t_c -point are at the same location, then t_p -temperature $\leq t_c$ -temperature. For t_c -point and t_c -temperature, see IEC 62031.

Note 2 to entry: The performance temperature has unit °C.

3.26**rated performance temperature $t_{p \text{ rated}}$**

<of an LED module> reference temperature to which the rated performance characteristics are declared by the manufacturer or responsible vendor

Note 1 to entry: If the t_p -point and t_c -point are at the same location, then $t_{p \text{ rated}} \leq t_{c \text{ rated}}$. For t_c -point and $t_{c \text{ rated}}$, see IEC 62031.

Note 2 to entry: The performance temperature has unit °C.

Note 3 to entry: For a given rated lifetime, the performance temperature is a fixed value $t_{p \text{ rated}}$, not a variable.

Note 4 to entry: There can be more than one lifetime claim, each with its own rated performance temperature. See 7.3.

3.27**displacement factor**

<of LED light sources> factor expressed by $\cos \varphi_1$, where φ_1 is the phase angle between the fundamental of the mains supply voltage and the fundamental of the mains current

3.28**family**

<of an LED light source> set of light sources characterized by common features

[SOURCE: IEC 60050-845:2020, 845-27-135, modified. <of light sources> replaced by <of LED light sources>]

3.29**standby mode**

<of an LED light source> mode when the light source is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger not being a trigger from a network

Note 1 to entry: Examples of external triggers are sensing, timing or remote control.

[SOURCE: IEC 63103:2020, 3.10, modified – The domain "<of lighting equipment>" has been replaced with "<of LED light sources>"]

3.30**networked standby mode**

<of an LED light source> mode when the equipment is connected to a supply voltage with the illumination function off, while capable of being activated by an external trigger being a trigger from a network

[SOURCE: IEC 63103:2020, 3.11, modified – The domain "<of lighting equipment>" has been replaced with "<of LED light sources>"]

3.31**standby power**

<of an LED light source> average power consumption in the standby mode

3.32**networked standby power**

<of an LED light source> average power consumption in the networked standby mode

3.33**Duv** D_{uv}

closest distance from the Planckian locus on the $(u', 2/3v')$ diagram, with a positive value for above and a negative value for below the Planckian locus

[SOURCE: ANSI C78.377:2017 “Electric Lamps – Specifications for the Chromaticity of Solid-State Lighting Products”, clause 4.1]

4 General requirements

LED light sources for which compliance with this document is claimed shall also comply with the requirements of IEC 63XXX and IEC 62031.

For explanation of recommended lifetime metrics, see Annex D.

For examples of LED dies and packages see Annex G.

Information for luminaire design is given in Annex H.

NOTE: When LED light sources are operated in a luminaire, the claimed performance data can deviate from the values established via this document due to e.g. luminaire components that impact the performance of the LED light source.

5 General conditions for tests**5.1 General test conditions**

Test conditions for testing electrical and photometric characteristics are given in Annex A.

Recommendations for testing lumen maintenance are given in Annex L.

LED light sources with dimming control shall be adjusted to the maximum luminous flux for all tests.

LED light sources with adjustable colour point shall be adjusted and set to one fixed value as indicated by the manufacturer or responsible vendor.

NOTE Often referred to as “reference control setting”.

Initial tests are performed on one single unit. Recommendations for verification testing are given in Annex N.

LED modules which are scalable, for example LED modules of linear geometry, but of very long length, shall be tested at a length of 50 cm or, if not scalable there, at the nearest value to 50 cm. The LED module manufacturer shall indicate which controlgear is suitable for this length.

5.2 Creation of LED light source families to reduce test effort

The optional creation of family groups allows manufacturers with platform designs to use existing data of a baseline product that has already been tested. The baseline product is considered to be the first LED light source complying with this document and designated to be part of the family.

For identification of a family see Annex K.

6 Classification

LED light sources are classified according to the level of controlgear integration, as:

- integrated LED light sources;
- semi-integrated LED light sources;
- non-integrated LED light sources.

For an overview see Annex J.