SLOVENSKI STANDARD
SIST EN 13032-4:2015+A1:2019

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Svetloba in razsvetljava - Merjenje in podajanje fotometričnih podatkov sijalk in svetilk - 4. del: LED-sijalke, moduli in svetilke

Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 4: LED lamps, modules and luminaires

Licht und Beleuchtung - Messung und Darstellung photometrischer Daten von Lampen und Leuchten - Teil 4: LED-Lampen, -Module und -Leuchten

Lumière et éclairage - Mesure et présentation des données photométriques des lampes et des luminaires - Partie 4 : Lampes, modules et luminaires LED

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Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 4: LED lamps, modules and luminaires

Lumière et éclairage - Mesure et présentation des données photométriques des lampes et des luminaires - Partie 4 : Lampes, modules et luminaires LED

Licht und Beleuchtung - Messung und Darstellung photometrischer Daten von Lampen und Leuchten - Teil 4: LED-Lampen, -Module und -Leuchten

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 13032-4:2015+A1:2019) has been prepared by Technical Committee CEN/TC 169 “Light and lighting”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

〚A1〛 This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (M/495 and M/519), and supports essential requirements of EU Directive(s): No 244/2009, No 874/2012, No 1194/2012 and No 2015/1428 amending 244/2009.

For relationship with EU Directive(s), see informative Annexes ZA, ZB and ZC, which is an integral part of this document. 〚A1〛

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 21 March 2019.

This document supersedes EN 13032-4:2015.

The start and finish of text introduced or altered by amendment is indicated in the text by tags 〚A1〛 〚A1〛.

This standard was developed in collaboration with CIE TC2.71, which developed CIE S 025, to produce two technically-harmonized standards at CEN and CIE level.

Acknowledgement is given to CIE for their support in the preparation of this standard.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This standard provides requirements to perform reproducible photometric and colorimetric measurements on LED lamps, LED modules and LED luminaires (LED devices). It also provides advice for the reporting of the data.

The availability of reliable and accurate photometric data for LED devices is a basic requirement for designing good lighting systems and evaluating performance of products. By obtaining these data through measurements in specific normalized measuring conditions the consistency of the data should be ensured between different laboratories (within the limits of the declared measurement uncertainty) and comparison of different products on the same basis is possible.

This standard aims in particular to cover measurement methods for testing the compliance of LED devices with the photometric and colorimetric requirements of LED performance standards (see Clause 2) issued by IEC/TC 34/CLC/TC 34 “Lamps and related equipment” and/or relevant European regulations.

LED devices offer a large variety of configurations in respect to geometry and/or colour. For each configuration the photometric and colorimetric performances are considered individually.

1 Scope

This European Standard specifies the requirements for measurement of electrical, photometric, and colorimetric quantities of LED lamps, LED modules and LED luminaires, for operation with AC or DC supply voltages, possibly with associated LED control gear. LED light engines are assimilated to LED modules and handled accordingly. Photometric and colorimetric quantities covered in this standard include total luminous flux, luminous efficacy, partial luminous flux, luminous intensity distribution, centre-beam intensity, luminance and luminance distribution, chromaticity coordinates, correlated colour temperature (CCT), colour rendering index (CRI), and angular colour uniformity.

〉A1〈 This document does not cover LED packages. Described measurement methods for LED lamp or luminaires may apply as measurement methods for OLEDs products. 〉A1〈

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.

EN ISO 11664-1:2011, *Colorimetry — Part 1: CIE standard colorimetric observers (ISO 11664-1:2007)*

EN ISO 11664-2:2011, *Colorimetry — Part 2: CIE standard illuminants (ISO 11664-2:2007)*

EN ISO 11664-3:2013, *Colorimetry — Part 3: CIE tristimulus values (ISO 11664-3:2012)*

EN 12665, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

EN 13032-1:2004+A1:2012, *Light and lighting — Measurement and presentation of photometric data of lamps and luminaires — Part 1: Measurement and file format*

EN 61341:2011, *Method of measurement of centre beam intensity and beam angle(s) of reflector lamps (IEC/TR 61341:2010)*

EN 62504:2014, *General lighting — Light emitting diode products and related equipment— Terms and definitions (IEC 62504:2014)*

〉A1〈 EN 62717:2017, *LED modules for general lighting — Performance requirements (IEC 62717:2014, modified + A1:2015, modified)* 〉A1〈

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 98-4:2012, *Uncertainty of measurement — Part 4: Role of measurement uncertainty in conformity assessment*

ISO/IEC Guide 99:2007, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

CIE/DIS 024/E:2013, *Light Emitting Diodes (LEDs) and LED Assemblies — Terms and Definitions*

CIE 13.3, *Method of Measuring and Specifying Colour Rendering of Light Sources*

CIE 15, *Colorimetry*

CIE 84:1989, *Measurement of Luminous Flux*

CIE 198:2011, *Determination of Measurement Uncertainties in Photometry*

CIE 198:2011-SP1, Determination of Measurement Uncertainties in Photometry – Supplement 1: Modules and Examples for the Determination of Measurement Uncertainties

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665, EN 13032-1 and the following apply.

3.1
electric light source
primary light source that transforms electrical energy into optical radiation

[SOURCE: CIE/DIS 024/E:2013, 3.3]

3.2 A1
directional light source
electric light source having at least 80 % luminous flux within a solid angle of π sr

Note 1 to entry: A cone with angle of 120° is usually considered for the solid angle of π sr. Other shape of solid angle may apply for non-circular shaped beams e.g. elliptical or rectangular shaped beam. A1

3.3
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 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, lifetime…) instead use for example "luminous flux of the LED module".

[SOURCE: EN 62504:2014, 3.24]

3.4
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 control gear, 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.

[SOURCE: EN 62504:2014, 3.20]

3.5
LED light source
electric 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 represent(s) one or more LED lamp(s) or LED module(s).

[SOURCE: EN 62504:2014, 3.16]

3.6
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 control gear

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 60050–18–03, 826)

[SOURCE: EN 62504:2014, 3.15]

3.7
integrated LED lamp (LEDi lamp)

LED lamp, incorporating control gear, and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

Note 1 to entry: In some documents the term self-ballasted LED lamp is still used.

[SOURCE: EN 62504:2014, 3.15.1 modified by note1, added]

3.8
semi-integrated LED lamp (LEDsi lamp)
LED lamp which carries the control unit of the control gear, and is operated by the separated power supply of the control gear

Note 1 to entry: In some documents the term semi-self-ballasted LED lamp is still used.

[SOURCE: EN 62504:2014, 3.15.4 modified by note 1, added]

3.9
non-integrated LED lamp (LEDni lamp)
LED lamp which needs a separate control gear to operate

Note 1 to entry: In some documents the term non-self-ballasted LED lamp is still used.

[SOURCE: EN 62504:2014, 3.15.2 modified by note1, added]

3.10
retrofit LED lamp
LED lamp, intended as a replacement of a non-LED lamp without requiring any internal modification of the luminaire

[SOURCE: EN 62504:2014, 3.15.3]

3.11
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 control gear

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

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

[SOURCE: EN 62504:2014, 3.19]

3.12
integrated LED module (LEDi module)
LED module, incorporating control gear and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

Note 1 to entry: In some documents the term self-ballasted LED module is still used.

[SOURCE: EN 62504:2014, 3.19.4 modified by note 1, added]

3.13
semi-integrated LED module (LEDsi module)
LED module which carries the control unit of the control gear, and is operated by the separated power supply of the control gear

Note 1 to entry: In some documents the term semi-self-ballasted LED module is used.

[SOURCE: EN 62504:2014, 3.19.6 modified by note 1 added]

3.14
non-integrated LED module (LEDni module)
LED module which needs a separate control circuitry or control gear to operate

Note 1 to entry: In some documents the term non-self-ballasted LED module is used.

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

[SOURCE: EN 62504:2014, 3.19.5 modified by note 1, added]

3.15
integral LED module
LED module, generally designed to form a non-replaceable part of a luminaire

[SOURCE: EN 62504:2014, 3.19.3]

3.16
control gear for LED module
LED control gear
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. The unit 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 control gear consists of a power supply and a control unit.

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

Note 3 to entry: When no confusion is expected like used in a LED standard, “control gear” may also be used.

Note 4 to entry: Both terms “controlgear” or “control gear” are acceptable.

[SOURCE: EN 62504:2014, 3.6.1, modified, Note 4 to entry added]

3.17
LED light engine
integrated assembly or set consisting of LED module(s) and LED control gear for direct connection to the electrical supply system

Note 1 to entry: A LED light engine typically shall have defined electrical, mechanical, thermal and control interfaces, and specific photometric properties.

Note 2 to entry: A LED light engine may incorporate a heat sink or not.

[SOURCE: CIE/DIS 024/E:2013, 3.13]

3.18
LED luminaire
luminaire designed to incorporate one or more LED light source(s)

Note 1 to entry: The LED light sources(s) may be an integral part of a LED luminaire

[SOURCE: EN 62504:2014, 3.17 modified by note1, added]

3.19
LED device
generic term to designate LED lamps, LED modules, LED light engines or LED luminaires for the purpose of this standard

3.20
beam angle
the angle between two lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the device and through points at which the luminous intensity is 50 % of the centre beam intensity, where the centre beam intensity is the value of luminous intensity measured on the optical beam axis

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.

Note 3 to entry: The optical beam axis is the axis about which the luminous intensity distribution is substantially symmetrical.

[SOURCE: EN 62504:2014, 3.4 modified by note 3, added]

3.21
tuneable LED devices
device with independent channels where the spectra of the emitted light can be deliberately modified

Note 1 to entry: This means chromaticity coordinates are changeable.

Note 2 to entry: For devices with independent channels and changeable chromaticity coordinates the colorimetric figures are usually determined for the gamut corners, for changeable correlated colour temperature devices the minimum and maximum correlated colour temperature and for any additional setup (defined by applicant).

3.22
type test
conformity test on one or more LED product(s) representative of the production

[SOURCE: EN 62504:2014, 3.41]

3.23
type test sample
one or more LED product(s) submitted by the manufacturer or responsible vendor for the purpose of the type test

[SOURCE: EN 62504:2014, 3.42]

3.24
applicant
the responsible person who commissions a test

Note 1 to entry: The applicant can be for example a manufacturer, responsible vendor, customer or regulator.

Note 2 to entry: The applicant will normally provide all information required to correctly perform the test.

3.25
device under test
DUT
LED device submitted for testing

Note 1 to entry: A DUT (device under test) is not a type test sample unless it is declared so.

3.26
supply voltage (for a LED device)
voltage applied to the complete unit of LED light source or LED luminaire

[SOURCE: EN 62504:2014, 3.37]

3.27
supply power (for a LED device)
electrical power consumed by the light source(s), control gear and any control circuit in the device which includes any parasitic power when the light source is turned on

3.28
rated value
value of a quantity used for specification purposes 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: EN 62504:2014, 3.33]

3.29
initial values
photometric and electrical characteristics measured at the end of the ageing period and stabilisation time

Note 1 to entry: Ageing period can be specified as zero.

[SOURCE: A1 EN 62717:2017, 3.3 A1]

3.30
ageing (for a LED source)
preconditioning period of LED light source before initial values are taken

Note 1 to entry: In some documents the term seasoning is used.

[SOURCE: EN 62504:2014, 3.1 modified by note 1, added]

3.31
stabilisation time (for a LED device)
time that is required for the LED light source or LED luminaire to obtain stable photometric output and electric power with constant electrical input

[SOURCE: EN 62504:2014, 3.35]

3.32
ambient temperature
t_{amb}
temperature of air or another medium in the vicinity of the device under test

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

[SOURCE: EN 62504:2014, 3.38.1 modified]

3.33
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).

[SOURCE: EN 62504:2014, 3.38.2]