SLOVENSKI STANDARD
oSIST prEN ISO/CIE 11664-2:2020

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Kolorimetrija - 2. del: Standardizirana osvetljevala (iluminanti) CIE (ISO/CIE DIS 11664-2:2020)

Colorimetry - Part 2: CIE standard illuminants (ISO/CIE DIS 11664-2:2020)

Farbmetrik - Teil 2: CIE Normlichtarten (ISO/CIE DIS 11664-2:2020)

Colorimétrie - Partie 2: Illuminants CIE normalisés (ISO/CIE DIS 11664-2:2020)

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Part 2:
CIE standard illuminants

Colorimétrie —

Partie 2: Illuminants CIE normalisés

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Member bodies are requested to consult relevant national interests in ISO/TC 274 before casting their ballot to the e-Balloting application.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by the International Commission on Illumination (CIE) in cooperation with ISO/TC 274.

This first edition of ISO/CIE 11664-2 cancels and replaces ISO 11664-2:2007/CIE S 014-2:2006, of which it constitutes a minor revision, incorporating minor editorial updates.

A list of all parts in the ISO/CIE 11664 series can be found on the ISO website and CIE website.

Any feedback or questions on this document should be directed to the CIE Central Bureau or to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The illuminants defined in this document are as follows:

a) CIE standard illuminant A

CIE standard illuminant A is intended to represent typical tungsten-filament lighting. Its relative spectral power distribution is that of a Planckian radiator at a temperature of approximately 2 856 K. CIE standard illuminant A should be used in all applications of colorimetry involving the use of incandescent lighting, unless there are specific reasons for using a different illuminant. CIE standard illuminant A is used in photometry as primary reference spectrum for the calibration of photometric devices.

b) CIE standard illuminant D65

CIE standard illuminant D65 is intended to represent average daylight having a correlated colour temperature of approximately 6 500 K. CIE standard illuminant D65 should be used in all colorimetric calculations requiring representative outdoor daylight, unless there are specific reasons for using a different spectral power distribution. Variations in the relative spectral power distribution of daylight are known to occur, particularly in the ultraviolet spectral region, as a function of season, time of day, and geographic location. However, CIE standard illuminant D65 is used pending the availability of additional information on these variations.

c) CIE standard illuminant D50

CIE standard illuminant D50 is intended to represent daylight with a correlated colour temperature of approximately 5 000 K. CIE standard illuminant D50 should be used in colorimetric calculations where the use of such a correlated colour temperature is intended.

Values for the relative spectral power distribution of CIE standard illuminants A, D65 and D50 are given in this document at 1 nm intervals from 300 nm to 830 nm.

The term "illuminant" refers to a defined spectral power distribution, not necessarily realizable or provided by an artificial source. Illuminants are used in colorimetry to compute the tristimulus values of reflected or transmitted object colours under specified conditions of illumination. The CIE has also defined other illuminants, such as illuminant C and other D illuminants. These illuminants are described in Publication CIE 015, but they do not have the status of CIE standard illuminants. It is recommended that one of the three CIE standard illuminants defined in this document be used wherever possible. This will greatly facilitate the comparison of published results.

In most practical applications of colorimetry, it is sufficient to use the values of CIE standard illuminants A, D65 and D50 at less frequent wavelength intervals or in a narrower spectral region than defined in this document. Data and guidelines that facilitate such practice are provided in Publication CIE 015, together with other recommended procedures for practical colorimetry.

The term "source" refers to a physical emitter of light, such as a lamp or the sky. In certain cases, the CIE recommends laboratory sources that approximate the spectral power distributions of CIE illuminants. In all cases, however, the definition of a CIE recommended source is secondary to the definition of the corresponding CIE illuminant, because of the possibility that, from time to time, new developments will lead to improved sources that represent a particular illuminant more accurately or are more suitable for laboratory use.

For laboratory realizations of CIE standard illuminant A, a CIE standard source, the CIE standard source A, is described in this document. At present, there are no CIE recommended sources representing CIE standard illuminants D65 and D50.

Colorimetry — Part 2: CIE standard illuminants

1 Scope

This document specifies three CIE standard illuminants for use in colorimetry: CIE standard illuminant A for the representation of typical tungsten-filament lighting, CIE standard illuminant D65 for the representation of average daylight having a correlated colour temperature of approximately 6 500 K, and CIE standard illuminant D50 for the representation of daylight with a correlated colour temperature of approximately 5 000 K. Values of the relative spectral power distribution of the three illuminants are included in 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.

CIE S 017, *ILV: International Lighting Vocabulary*

ISO 23603/CIE S 012 *Standard method of assessing the spectral quality of daylight simulators for visual appraisal and measurement of colour*

BIPM *The International System of Units (SI), 9th edition, published on May 20, 2019*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CIE S 017 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
chromaticity coordinates, pl
coordinates expressing the ratios of each of a set of three tristimulus values to their sum

Note 1 to entry: As the sum of the three chromaticity coordinates equals 1, two of them are sufficient to define a chromaticity.

Note 2 to entry: In the CIE 1931 and 1964 standard colorimetric systems, the chromaticity coordinates are represented by the symbols x, y, z and x_{10}, y_{10}, z_{10}.

Note 3 to entry: The chromaticity coordinates are a quantity of unit one.

[SOURCE: CIE S 017:–[1], entry 17-23-053]

3.2
chromaticity diagram
plane diagram in which points specified by chromaticity coordinates represent the chromaticities of colour stimuli

Note 1 to entry: In the CIE standard colorimetric systems y is normally plotted as ordinate and x as abscissa, to obtain an x, y chromaticity diagram.

[SOURCE: CIE S 017:–[1], entry 17-23-054]

3.3
CIE standard illuminant
illuminant standardized by the CIE for the purpose of harmonization

[SOURCE: CIE S 017:– [1], entry 17-23-021, modified – notes to entry omitted]

3.4
CIE standard source
artificial source specified by the CIE whose radiation approximates a CIE standard illuminant

[SOURCE: CIE S 017:– [1], entry 17-23-022, modified – notes to entry omitted]

3.5

CIE 1976 uniform chromaticity scale diagram
CIE 1976 UCS diagram
uniform chromaticity scale diagram produced by plotting in rectangular coordinates v' against u', quantities defined by the equations

$$u' = 4\,X \,/\, (X + 15\,Y + 3\,Z) = 4\,x \,/\, (-2\,x + 12\,y + 3)$$

$$v' = 9\,Y \,/\, (X + 15\,Y + 3\,Z) = 9\,y \,/\, (-2\,x + 12\,y + 3)$$

where X, Y, Z are the tristimulus values in the CIE 1931 or 1964 standard colorimetric systems, and x, y are the corresponding chromaticity coordinates of the colour stimulus considered

Note 1 to entry: The CIE 1976 uniform-chromaticity-scale diagram is a modification of, and supersedes, the CIE 1960 UCS diagram in which v was plotted against u in rectangular coordinates. The relationships between the two pairs of coordinates are: $u' = u$; $v' = 1{,}5\,v$.

[SOURCE: CIE S 017:–[1], entry 17-23-073]

3.6
colour temperature
T_c
temperature of a Planckian radiator whose radiation has the same chromaticity as that of a given stimulus

Note 1 to entry: The colour temperature is expressed in kelvin (K).

[SOURCE: CIE S 017:–[1], entry 17-23-067]

[1] Under preparation. Stage at the time of publication: CIE DIS 017:2016

3.7
correlated colour temperature
CCT
T_{cp}
temperature of a Planckian radiator having the chromaticity nearest the chromaticity associated with the given spectral distribution on a modified 1976 UCS diagram where u', $2/3v'$ are the coordinates of the Planckian locus and the test stimulus

Note 1 to entry: The concept of correlated colour temperature should not be used if the chromaticity of the test source differs more than $\Delta C = \left[\left(u'_t - u'_p\right)^2 + \frac{4}{9}\left(v'_t - v'_p\right)^2\right]^{1/2} = 5 \times 10^{-2}$ from the Planckian radiator, where u'_t, v'_t refer to the test source, u'_p, v'_p to the Planckian radiator.

Note 2 to entry: Correlated colour temperature can be calculated by a simple minimum search computer program that searches for that Planckian temperature that provides the smallest chromaticity difference between the test chromaticity and the Planckian locus, or e.g. by a method recommended by Robertson, A.R. "Computation of correlated color temperature and distribution temperature", J. Opt. Soc. Am. 58, 1528-1535, 1968.
(Note that the values in some of the tables in this reference are not up-to-date).

Note 3 to entry: The correlated colour temperature is expressed in kelvin (K).

[SOURCE: IEC 60050-845:–[2], Term 17-23-068]

3.8
daylight illuminant
D illuminant
illuminant having the same or nearly the same relative spectral power distribution of the radiant flux as a phase of daylight

[SOURCE: CIE S 017:–[3], entry 17-23-020]

3.9
illuminant
radiation with a relative spectral power distribution defined over the wavelength range that influences object colour perception

[SOURCE: CIE S 017:–[3], entry 17-23-018, Note 1 to entry omitted.]

3.10
Planckian radiator
blackbody
ideal thermal radiator that absorbs completely all incident radiation, whatever the wavelength, the direction of incidence or the polarization

Note 1 to entry: A Planckian radiator has, for any wavelength and any direction, the maximum spectral distribution of radiance for a thermal radiator in thermal equilibrium at a given temperature.

[SOURCE: CIE S 017:–[3], entry 17-24-004]

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2 Under preparation. Stage at the time of publication: IEC CDV 60050-845:2018.

3 Under preparation. Stage at the time of publication: CIE DIS 017:2016

