



**SLOVENSKI STANDARD**  
**oSIST prEN ISO/CIE 11664-5:2023**  
**01-maj-2023**

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**Kolorimetrija - 5. del: Barvni prostor  $L^*u^*v^*$  in diagram enakomerne barvnosti  $u', v'$  po CIE 1976 (ISO/CIE DIS 11664-5:2023)**

Colorimetry - Part 5: CIE 1976  $L^*u^*v^*$  colour space and  $u', v'$  uniform chromaticity scale diagram (ISO/CIE DIS 11664-5:2023)

Farbmetrik - Teil 5: CIE 1976  $L^*u^*v^*$ -Farbenraum und gleichabständige  $u', v'$ -Farbtafel (ISO/CIE DIS 11664-5:2023)

Colorimétrie Partie 5: Espace chromatique  $L^*u^*v^*$  et diagramme de chromaticité uniforme  $u', v'$  CIE 1976 (ISO/CIE DIS 11664-5:2023)

**Ta slovenski standard je istoveten z: prEN ISO/CIE 11664-5**

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**ICS:**

17.180.20 Barve in merjenje svetlobe Colours and measurement of light

**oSIST prEN ISO/CIE 11664-5:2023 en,fr,de**



# DRAFT INTERNATIONAL STANDARD

## ISO/CIE DIS 11664-5

CIE

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### Colorimetry —

## Part 5: CIE 1976 $L^*u^*v^*$ colour space and $u', v'$ uniform chromaticity scale diagram

Colorimétrie —

Partie 5: Espace chromatique  $L^*u^*v^*$  et diagramme de chromaticité uniforme  $u', v'$  CIE 1976

ICS: 17.180.20

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## ISO/CIE DIS 11664-5:2023(E)

### 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](http://www.iso.org/directives)).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 274, *Light and lighting*.

This second edition cancels and replaces the first edition (ISO 11664-5:2009), of which it constitutes a minor revision.

ISO 11664 consists of the following parts, under the general title *Colorimetry*:

- *Part 1: CIE standard colorimetric observers*
- *Part 2: CIE standard illuminants*
- *Part 3: CIE tristimulus values*
- *Part 4: CIE 1976  $L^*a^*b^*$  Colour space*
- *Part 5: CIE 1976  $L^*u^*v^*$  Colour space and  $u', v'$  uniform chromaticity scale diagram*
- *Part 6: CIE-DE2000 Colour-difference formula*

## Introduction

The three-dimensional colour space produced by plotting CIE tristimulus values ( $X, Y, Z$ ) in rectangular coordinates is not visually uniform nor is the ( $x, y, Y$ ) space nor the two-dimensional CIE  $x, y$  chromaticity diagram. Equal distances in these spaces and diagrams do not represent equally perceptible differences between colour stimuli. For this reason, in 1976, the CIE introduced and recommended two new spaces (known as CIELAB and CIELUV) whose coordinates are non-linear functions of  $X, Y$  and  $Z$ . The recommendation was put forward in an attempt to unify the then very diverse practice in uniform colour spaces and associated colour difference formulae<sup>[2][8]</sup>. Both these more-nearly uniform colour spaces have become well accepted and widely used. Numerical values representing approximately the relative magnitude of colour differences can be described by simple Euclidean distances in the spaces or by more sophisticated formulae that improve the correlation with the relative perceived size of differences. The purpose of this part of ISO/CIE 11664 is to define procedures for calculating the coordinates of the CIE 1976  $L^*u^*v^*$  (CIELUV) colour space and the Euclidean colour difference values based on these coordinates. This part of ISO/CIE 11664 also defines a related chromaticity diagram that is a projection of the CIE  $x, y$  chromaticity diagram maintaining straight lines of dominant and complementary wavelengths. This part of ISO/CIE 11664 does not cover the alternative uniform colour space, CIELAB<sup>[5]</sup>, nor does it cover more sophisticated colour difference formulae based on CIELAB, such as the CMC formula<sup>[3]</sup>, the CIE 94 formula<sup>[1]</sup>, the DIN 99 formula<sup>[4]</sup>, and the CIEDE2000 formula<sup>[6]</sup>.

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# Colorimetry —

## Part 5:

# CIE 1976 $L^*u^*v^*$ colour space and $u', v'$ uniform chromaticity scale diagram

## 1 Scope

This part of ISO/CIE 11664 specifies the method of calculating the coordinates of the CIE 1976  $L^*u^*v^*$  colour space including correlates of lightness, chroma, saturation and hue. It includes two methods for calculating Euclidean distances in this space to represent the relative perceived magnitude of colour differences. It also specifies the method of calculating the coordinates of the  $u', v'$  uniform chromaticity scale diagram.

This part of ISO/CIE 11664 is applicable to tristimulus values calculated using the colour-matching functions of the CIE 1931 standard colorimetric system or the CIE 1964 standard colorimetric system. This part of ISO/CIE 11664 may be used for the specification of colour stimuli perceived as belonging to a reflecting or transmitting object, where a three-dimensional space more uniform than tristimulus space is required. This includes self-luminous displays, like computer, television and smart-phone displays, if they are being used to simulate reflecting or transmitting objects and if the stimuli are appropriately normalized. This part of ISO/CIE 11664, as a whole, does not apply to colour stimuli perceived as belonging to an area that appears to be emitting light as a primary light source or that appears to be specularly reflecting such light. Only the  $u', v'$  uniform chromaticity scale diagram defined in 4.1 and the correlates of hue and saturation defined in 4.3 apply to such colour stimuli.

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## 2 Normative references

The following referenced documents are indispensable for the application 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.

ISO/CIE 11664-1, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO/CIE 11664-2, *Colorimetry — Part 2: CIE standard illuminants*

## 3 Terms, definitions, symbols and abbreviated terms

### 3.1 Terms and definitions

No terms and definitions are listed in this document.

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

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

— IEC Electropedia: available at <https://www.electropedia.org>

CIE maintains a terminological database for use in standardization at the following address:

— ILV: International Lighting Vocabulary: available at <http://cie.co.at/e-ilv>

## ISO/CIE DIS 11664-5:2023(E)

## 3.2 Symbols and abbreviated terms

$X, Y, Z$	tristimulus values of a test stimulus calculated using the colour-matching functions of the CIE 1931 standard colorimetric system (also known as the CIE 2° standard colorimetric system)
$Y_n$	tristimulus value, $Y$ , of a specified white colour stimulus calculated using the colour-matching functions of the CIE 1931 standard colorimetric system
$x, y$	chromaticity coordinates of a test stimulus calculated using the colour-matching functions of the CIE 1931 standard colorimetric system
$L^*$	CIELUV lightness
$u^*, v^*$	CIELUV $u^*, v^*$ coordinates
$u', v'$	CIE 1976 chromaticity coordinates
$u'_n, v'_n$	CIE 1976 chromaticity coordinates of a specified white stimulus
$s_{uv}$	CIELUV saturation
$C_{uv}^*$	CIELUV chroma
$h_{uv}$	CIELUV hue angle
$\Delta(u', v')$	CIELUV chromaticity difference
$\Delta L^*$	CIELUV lightness difference
$\Delta u^*, \Delta v^*$	CIELUV $u^*, v^*$ differences
$\Delta C_{uv}^*$	CIELUV chroma difference
$\Delta h_{uv}$	CIELUV hue angle difference
$\Delta H_{uv}^*$	CIELUV hue difference
$\Delta E_{uv}^*$	CIELUV colour difference

If the character " $\Delta$ " is not available, it may be replaced by the character "D".

The terms "CIE 1976  $L^*u^*v^*$ " and "CIELUV" may be used interchangeably.

Where tristimulus values are calculated using the colour-matching functions of the CIE 1964 standard colorimetric system (also known as the CIE 10° standard colorimetric system), a subscript 10 shall be added to all the above symbols.

## 4 Calculation method

## 4.1 Uniform chromaticity scale diagram (UCS diagram)

The CIE 1976 uniform chromaticity scale diagram is a projective transformation of the CIE  $x, y$  chromaticity diagram yielding perceptually more uniform colour spacing. It is produced by plotting, as abscissa and ordinate, respectively, quantities defined by the following formulae:

$$u' = 4X / (X + 15Y + 3Z) \quad (1)$$