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Colorimetry —

Part 6: CIEDE2000 colour-difference formula

Colorimétrie —

Partie 6: Formule de la différence de couleur CIEDE2000

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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).

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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 Technical Committee ISO/TC 274, *Light and lighting*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO/CIE 11664-6:2014), of which it constitutes a minor revision. The changes are as follows:

— normative references updated;

— previous Clause 3 split into Clauses 3 and 4;

— Clause 6: previous NOTE 1 changed to body text;

— minor editorial changes.

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

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

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Introduction

The three-dimensional colour space produced by plotting CIE tristimulus values (X, Y, Z) in rectangular coordinates is not visually uniform. Neither is the (x, y, Y) space nor the two-dimensional CIE (x, y) chromaticity diagram. Equal distances in these spaces and the respective diagram do not represent equally perceptible differences between colour stimuli. For this reason, the CIE has standardized two more-nearly uniform colour spaces (known as CIELAB and CIELUV), whose coordinates are non-linear functions of X, Y and Z. Numerical values representing approximately the relative magnitude of colour differences can be described by simple Euclidean distances in these spaces or by more sophisticated colour-difference formulae that improve the correlation with the relative perceived size of differences. The purpose of this document is to define one such formula, the CIEDE2000 formula. This document is based on CIE 142-2001.

The formula is an extension of the CIE 1976 $L^*a^*b^*$ colour-difference formula (ISO/CIE 11664-4) with corrections for variation in colour-difference perception dependent on lightness, chroma, hue and chroma-hue interaction. Reference conditions define material and viewing environment characteristics to which the formula applies.

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Colorimetry —

Part 6:
CIEDE2000 colour-difference formula

1 Scope

This document specifies the method of calculating colour differences according to the CIEDE2000 formula.

This document is applicable to input values of CIELAB L^*, a^*, b^* coordinates calculated according to ISO/CIE 11664-4. It can be used for the specification of the colour difference between two colour stimuli perceived as belonging to reflecting or transmitting objects. This includes displays if they are being used to simulate reflecting or transmitting objects and if the tristimulus values representing the stimuli are appropriately normalized.

This document does not apply to colour stimuli perceived as belonging to areas that appear to be emitting light as primary light sources or that appear to be specularly reflecting such light.

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.

ISO/CIE 11664-4, *Colorimetry — Part 4: CIE 1976 L*a*b* colour space*

CIE S 017, *ILV: International Lighting Vocabulary*

3 Terms and definitions

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

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 terminology database for use in standardization at the following address:

— CIE e-ILV: available at https://cie.co.at/e-ilv

4 Symbols

L^*	CIELAB lightness
a^*, b^*	CIELAB a^*, b^* coordinates
C^*_{ab}	CIELAB chroma
h_{ab}	CIELAB hue angle

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