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ISO 5631-3

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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.

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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 www.iso.org/directives).

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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 www.iso.org/patents).

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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 the following URL: [Foreword - Supplementary information www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html), 5631-3

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The committee responsible for this document ISO/TC 6, Paper, board and pulps.

This fourth edition cancels and replaces the second third edition (ISO 5631-3:2015), A, of which it constitutes a minor revision has been carried out to update the CIE, ISO and joint ISO/CIE references to their current versions. The changes are as follows:

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ISO 5631 consists of the following parts, under the general title *Paper and board — Determination of colour by diffuse reflectance*:

— Part 1: Indoor daylight conditions (C/2°)

— Part 2: Outdoor daylight conditions (D65/10°)

— Part 3: Indoor illumination conditions (D50/2°)

— update of the CIE and joint ISO/CIE Normative and Bibliographic references to current versions.

Any feedback or questions on this document should be directed to 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 colour of an object can be uniquely characterized by means of a triplet of colour coordinates such as the CIE X, Y, Z tristimulus values or the CIELAB 1976 L^*, a^*, b^* coordinates for a specified CIE illuminant and CIE standard observer.

Apart from the optical properties of the sample, the values of such coordinates depend upon the conditions of measurement, particularly the spectral and geometric characteristics of the instrument used. This [part of ISO 5631 document](#) should therefore be read in conjunction with ISO 2469.

This [part of ISO 5631 document](#) describes the measurement and description of colour in terms of the CIE illuminant D50 and the CIE 1931 (2°) standard observer. The method is especially applicable to the comparison of papers in graphic arts situations since these particular illuminant/observer conditions are required by ISO 13655 for the graphic arts industry. It is, however, emphasized that this is only a partial approach to the graphic arts conditions, since ISO 13655 also specifies measurement with a 45:0 or 0:45 geometry of a single sheet over a specified black backing and also requires that the illumination in the light booth be adjusted to CIE illuminant D50 conditions.

The other parts of this International Standard describe measurements and calculations carried out in an analogous manner using either the CIE illuminant C and the CIE 1931 (2°) standard observer (ISO 5631-1) or the CIE standard illuminant D65 and the CIE 1964 (10°) standard observer (ISO 5631-2). The choice of illuminant conditions is important when determining the colour coordinates of white papers containing a fluorescent whitening agent. In ISO 5631-2, the UV content of the illumination is much higher, approximating UV levels encountered in outdoor viewing conditions

[ISO 5631-3](#)

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Paper and board — Determination of colour by diffuse reflectance — Part 3: Indoor illumination conditions (D50/2°)

1 Scope

This ~~part of ISO 5631 document~~ specifies a method for measuring the colour of paper and board by the diffuse reflectance method with the elimination of specular gloss.

This ~~part of ISO 5631 document~~ is primarily intended for measuring the colour of paper and board to be used in the graphic arts industry, where that industry specifies the measurement of colour under D50/2° conditions in accordance with ISO 13655. This method differs from ISO 13655, in that the UV content of the illumination is adjusted to a different level.

The method can be used to determine the colour of papers or boards that contain fluorescent whitening agents, provided the UV content of the illumination on the test piece has been adjusted to conform to that in the CIE illuminant C, using a fluorescent reference standard that fulfils the requirements for international fluorescent reference standards of level 3 (IR3) as prescribed by ISO 2469 with an assigned ISO brightness value (C/2°) provided by an authorized laboratory, as described in ISO 2470-1.

This ~~part of ISO 5631 document~~ is not applicable to coloured papers or boards that incorporate fluorescent dyes or pigments.

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 186, *Paper and board*. — *Sampling to determine average quality*

ISO 2469, *Paper, board and pulps*. — *Measurement of diffuse radiance factor (diffuse reflectance factor)*

ISO 2470-1, *Paper, board and pulps*. — *Measurement of diffuse blue reflectance factor*. — *Part 1: Indoor daylight conditions (ISO brightness)*

ASTM E308, *Standard Practice for Computing the Colors of Objects by Using the CIE System*

CIE Publication 015:2018, *Colorimetry*, 4th ed

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3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

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3.1 radiance factor

β
ratio of the radiance of a surface element of a body in the direction delimited by a given cone, with its apex at the surface element, to that of the perfect reflecting diffuser under the same conditions of illumination

Note 1 to entry: For fluorescent (luminescent) materials, the total radiance factor, β , is the sum of two portions, the reflected radiance factor, β_R , and the luminescent radiance factor, β_L , so that $\beta = \beta_R + \beta_L$.

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For non-fluorescent materials, the reflected radiance factor, β_R , is numerically equal to the reflectance factor, R .

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3.2 intrinsic radiance factor

β_∞
radiance factor (3.1) of a layer or pad of material thick enough to be opaque, such that increasing the thickness of the pad by doubling the number of sheets results in no change in the measured radiance factor

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Note 1 to entry: The intrinsic radiance factor is often expressed as a percentage.

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3.3 reflectance factor

R
ratio of the radiation reflected by a surface element of a body in the direction delimited by a given cone, with its apex at the surface element to that of the perfect reflecting diffuser under the same conditions of illumination

Note 1 to entry: The ratio is often expressed as a percentage.

Note 2 to entry: The reflectance factor is influenced by the backing if the body is translucent.

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3.4 intrinsic reflectance factor

R_∞
reflectance factor (3.3) of a layer or pad of material thick enough to be opaque, such that increasing the thickness of the pad by doubling the number of sheets results in no change in the measured reflectance factor

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Note 1 to entry: The reflectance factor of a non-opaque sheet is dependent on the background and is not a material property.

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3.5 tristimulus values

X, Y, Z
amount of the three reference colour stimuli, in a given chromatic system, required to match the stimulus considered

Note 1 to entry: In this part of ISO 5631 document, the CIE illuminant D50 and the CIE 1931 (2°) standard observer are used to define the trichromatic system.

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Note 2 to entry: No subscript is applied to conform to the CIE convention that tristimulus values have no subscript when the CIE 1931 (2°) standard observer is used [the subscript 10 is applied for tristimulus values that are obtained using the CIE 1964 (10°) standard observer].

3.6