

Paper and board — Determination of CIE whiteness, D65/10° (outdoor daylight)

ICS 85.060

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Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, page ii, pages 1 to 12, an inside back cover and a back cover.

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Paper and board — Determination of CIE whiteness, D65/10° (outdoor daylight)

Papier et carton — Détermination du degré de blanc CIE, D65/10° (lumière du jour extérieure)



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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11475 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*. It is based on the CIE whiteness formula, published in CIE Publication 15.2-1986, *Colorimetry*.

Annexes A and B form an integral part of this International Standard.

Paper and board – Determination of CIE whiteness, D65/10° (outdoor daylight)

1 Scope

This International Standard specifies the procedure to be used for determining the whiteness of papers and boards. The values obtained correspond to the visual appearance of white papers and boards with or without fluorescent whitening agents when they are viewed under the CIE D65 daylight illuminant. It is based on reflectance data obtained over the full visible spectral range (VIS) in contrast to the measurement of ISO brightness which is limited to the blue region of VIS.

In addition, it specifies a method for adjustment of the UV-content to correspond to the D65 daylight illuminant [8] [9], insofar as results obtained when fluorescent whitening agents are present are dependent upon the UV-content of the radiation falling upon the sample. It is specific for the measurement of fluorescence in the blue region of the spectrum.

This method is not applicable to coloured papers containing fluorescent dyes.

This International Standard should be read in conjunction with ISO 2469.

NOTE A related standard, ISO 11476 [4], specifying the procedure for obtaining values corresponding to the appearance of these products under indoor illumination is being prepared.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2469:1994, *Paper, board and pulps — Measurements of diffuse reflectance factor*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 reflectance factor

R

ratio, expressed as a percentage, of the radiation reflected by a body to that reflected by the perfect reflecting diffuser under the same conditions

3.2 intrinsic reflectance factor reflectivity

R_{∞}

reflectance factor of a layer or pad of the material thick enough to be opaque, i.e. such that increasing the thickness of the pad by doubling the number of sheets results in no change in the measured reflectance factor

3.3 radiance factor β

ratio of the radiance of a body to that of the perfect reflecting diffuser under the same conditions of illumination and viewing

NOTE For fluorescent (luminescent) materials, the total radiance factor, β , is the sum of two portions, the reflected radiance factor, β_S , and the luminescent radiance factor, β_L , so that

$$\beta = \beta_S + \beta_L$$

For non-fluorescent materials, the reflected radiance factor, β_S , is simply the reflectance factor, R .

3.4 CIE whiteness

W_{10}

measure of whiteness derived from the CIE tristimulus values determined under the conditions specified in this International Standard and expressed as whiteness units

3.5 green/red tint

$T_{W,10}$

measure of the deviation from whiteness of the test material towards the green or red region, and expressed as tint units

NOTE A positive value of $T_{W,10}$ indicates a greenish tint and a negative value indicates a reddish tint.

3.6 fluorescence component

F_{10}

measure of the extent to which the whiteness of the material is affected by excitation of the added fluorescent whitening agent (FWA) under the conditions specified in this International Standard

NOTE The suffix 10 is used to indicate that the value refers to the CIE 1964 (10°) observer.

4 Principle

The diffuse reflectivity of the material is determined under standardized conditions after adjustment of the instrument so that the relative UV-content of the illumination corresponds to that of the CIE standard D65 illuminant, and the CIE whiteness and tint are calculated. The fluorescence component of the whiteness is calculated from the difference between this reflectivity value and the value obtained when the fluorescence emission from the material is eliminated, for instance by the introduction into the light beams of a sharp cut-off UV-absorbing filter.

5 Apparatus and equipment

5.1 Reflectometer or spectrophotometer, having the geometric, spectral and photometric characteristics described in ISO 2469:1994, annex A, calibrated in accordance with the provisions of ISO 2469:1994, annex B, and equipped with a radiation source having an adequate UV-content and a means of adjusting the relative UV-content so that the measured CIE whiteness value agrees with that corresponding to the D65 illuminant [6].

For the measurement of reflectance factors with the fluorescence effect eliminated, the instrument shall be equipped with a sharp cut-off, UV-absorbing filter having a transmittance not exceeding 5,0 % at and below a wavelength of 410 nm and not exceeding 50 % at a wavelength of 420 nm. The cut-off filter shall have characteristics such that a reliable reflectance value is obtained at 420 nm. The reflectance value obtained at 420 nm shall then be considered for computational purposes to be the value which applies at all lower wavelengths, at which it is not possible to make any measurement.