
**Tissue paper and tissue products —
Part 15:
Determination of optical properties —
Measurement of brightness and colour
with C/2° (indoor daylight) illuminant**

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Papier tissue et produits tissue —

Partie 15: Détermination des propriétés optiques — Mesurage du degré de blancheur et de la couleur avec l'illuminant C/2° (lumière du jour à l'intérieur)

ISO 12625-15:2015

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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).

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](#)

ISO 12625-15 was prepared by European Committee for Standardization (CEN) Technical Committee CEN/TC 172 *Pulp, paper and board*, in collaboration with Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods for quality specifications for paper and board*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 12625 consists of the following parts, under the general title *Tissue paper and tissue products*:

- *Part 1: General guidance on terms*
- *Part 3: Determination of thickness, bulking thickness, apparent bulk density and bulk*
- *Part 4: Determination of tensile strength, stretch at break and tensile energy absorption*
- *Part 5: Determination of wet tensile strength*
- *Part 6: Determination of grammage*
- *Part 7: Determination of optical properties — Measurement of brightness and colour with D65/10° (outdoor daylight)*
- *Part 8: Water-absorption time and water-absorption capacity, basket-immersion test method*
- *Part 9: Determination of ball burst strength*
- *Part 11: Determination of wet ball burst strength*
- *Part 12: Determination of tensile strength of perforated lines — Calculation of perforation efficiency*
- *Part 15: Determination of optical properties — Measurement of brightness and colour with C/2° (indoor daylight)*
- *Part 16: Determination of optical properties — Opacity (paper backing) — Diffuse reflectance method*

Introduction

Brightness and colour measurement may be performed under various illumination and observation conditions. This part of ISO 12625 deals with C/2° conditions, which refer to an indoor daylight.

D65/10° conditions (outdoor daylight) are considered in ISO 12625-7. Although both standards deal with brightness and colour, results obtained are usually different and do not correlate.

Optical measurements are affected by the geometry of the instruments used and by the texture of the material. The design of the instrument to be used according to this part of ISO 12625, and the routine to be adopted for its calibration are specified in ISO 2469 and ISO 2470-1.

The optical properties are related to the visual appearance of the material in a specified illumination condition. Although optical properties are intrinsic properties of tissue paper, they are not functional properties.

Brightness is not to be confused with the optical property called CIE-whiteness, which is based on reflectance data obtained over the full visible spectral range (VIS). In contrast, brightness is limited to the blue region of VIS (visible spectrum).

As preferences for the properties to be specified can vary by country/market, three different test methods for the determination of optical properties were developed:

- *Part 7: Determination of optical properties — Measurement of brightness and colour with D65/10° (outdoor daylight);*
- *Part 15: Determination of optical properties — Measurement of brightness and colour with C/2° (indoor daylight);*
- *Part 16: Determination of optical properties — Measurement of opacity (paper backing) — Diffuse reflectance method.*

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Tissue paper and tissue products —

Part 15:

Determination of optical properties — Measurement of brightness and colour with C/2° (indoor daylight) illuminant

1 Scope

This part of ISO 12625 specifies testing procedures for the instrumental determination of brightness and colour of tissue paper and tissue products viewed in indoor daylight conditions. It also gives specific instructions for the preparation of test pieces (single-ply, multi-ply products) and for the optical measurements of products, where special precautions may be necessary.

NOTE The properties called D65 brightness and colour are measured with an instrument adjusted to a much higher UV content than that specified in this part of ISO 12625. The measurements of D65 brightness and colour are described in ISO 12625-7.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*
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ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 2469, *Paper, board and pulps — Measurement of diffuse radiance factor*

ISO 2470-1:2009, *Paper, board and pulps — Measurement of diffuse blue reflectance factor — Part 1: Indoor daylight conditions (ISO brightness)*

ISO 5631-1:2009, *Paper and board — Determination of colour by diffuse reflectance — Part 1: Indoor daylight conditions (C/2°)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 reflectance factor

R

ratio of the radiation reflected by a body to that reflected by the perfect diffuser under the same conditions of illumination and detection

Note 1 to entry: The reflectance factor is expressed as a percentage.

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

3.2
diffuse reflectance radiance factor

R

ratio of the reflection from a body to that from the perfect reflecting diffuser under the same conditions of diffuse illumination and normal detection

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

[SOURCE: ISO 2469:2007]

3.3
intrinsic reflectance factor

R_{∞}

diffuse reflectance factor of a layer or pad of 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

[SOURCE: ISO 2469:2007]

3.4
C/2° brightness

intrinsic reflectance factor measured with a reflectometer having the characteristics described in ISO 2469, equipped with a filter or corresponding function having an effective wavelength of 457 nm (and a half bandwidth of 44 nm, and adjusted so that the UV content of the irradiation incident upon the test piece corresponds to that of the CIE illuminant C

Note 1 to entry: The filter function is described more fully by the weighing function factors given in ISO 2470-1.

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

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Note 1 to entry: In this part of 12625 as in ISO 5631-1, the CIE standard illuminant C and the CIE 1931 (2°) standard observer are used to define the trichromatic system.

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].

[SOURCE: ISO 5631-1:2009]

3.6
C/2° colour

CIELAB colour space, L^* , a^* , and b^* coordinates of the sample according to the CIELAB 1976 system, corresponding to the CIE standard illuminant C, described in ISO 11664-2 and the CIE 1964 supplementary standard colorimetric 2° observer, described in ISO 11664-1, determined by the measurements obtained under the conditions specified in ISO 5631-1

Note 1 to entry: The quantity L^* is a measure of the lightness of the test piece, where $L^* = 0$ corresponds to black and $L^* = 100$ is defined by the perfect reflecting diffuser. Visually, the quantities a^* and b^* represent respectively the red-green and yellow-blue axes in colour space, such that

- $+a^*$ is a measure of the degree of redness of the test piece,
- $-a^*$ is a measure of the degree of greenness of the test piece,
- $+b^*$ is a measure of the degree of yellowness of the test piece, and
- $-b^*$ is a measure of the degree of blueness of the test piece.

If both a^* and b^* are equal to zero, the test piece is grey.

4 Principle

A test piece is illuminated diffusely in a standard instrument and the light reflected normal to the surface is either allowed to pass through a defined optical filter, and then measured by a photodetector or measured by an array of photosensitive diodes, where each diode responds to a different effective wavelength. The brightness is then determined directly from the output from the photodetector or by calculation from the photosensitive diode outputs using the appropriate weighting function and colour coordinates are calculated for C/2° conditions.

5 Apparatus

5.1 Reflectometer or spectrophotometer

The apparatus have the geometric, spectral, and photometric characteristics described in ISO 2469 and calibrated in accordance with the provisions of ISO 2469 and ISO 2470-1, and equipped for the measurement of blue reflectance factor.

5.1.1 In the case of a filter reflectometer, the radiation falling upon the test piece shall have a UV content corresponding to that of the CIE standard illuminant C, adjusted or verified by using the fluorescent reference standard (5.2.2).

5.1.2 In the case of an abridged spectrophotometer, the instrument shall have an adjustable filter with a cut-off wavelength of 395 nm or some other system for adjustment and control, and this filter shall be adjusted or the system shall be calibrated with the help of the fluorescence reference standard (5.2.2), so that the UV content of the illumination falling upon the sample corresponds to that of the CIE standard illuminant C.

5.2 Reference standard for calibration of the instrument

5.2.1 Non-fluorescent reference standard, for photometric calibration, issued by an authorized laboratory in accordance with the provisions of ISO 2469.

5.2.2 Fluorescent reference standard, for use in adjusting the UV content of the radiation incident upon the sample, having a C/2° brightness value assigned by an authorized laboratory as prescribed in ISO 2470-1:2009, Annex B.

5.3 Working standards

5.3.1 Two plates, of flat opal glass, ceramic, or other suitable non-fluorescent material, cleaned and calibrated as described in ISO 2469.

NOTE In some instruments, the function of the primary working standard may be taken over by a built-in internal standard.

5.3.2 Stable plastic or other standard, incorporating a fluorescent whitening agent.

5.3.3 Black cavity, having a reflectance factor which does not differ from its nominal values by more than 0,2 %, at all wavelengths. The black cavity should be stored upside down in a dust-free environment or with a protective cover.

NOTE The condition of the black cavity can be checked by reference to the instrument maker.