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Tissue paper and tissue products —

Part 16: Determination of optical properties — Opacity (paper backing) — Diffuse reflectance method

Papier tissue et produits tissue —

Partie 16: Détermination des propriétés optiques — Opacité sur fond papier — Méthode par réflexion en lumière diffuse

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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).

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

ISO 12625-16 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 and 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

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.

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

The opacity value depends on the principle used for its evaluation, and a method is to be chosen which most closely relates to the interpretation to be placed upon the results. The method described in this part of ISO 12625 is applicable when it is desired to measure that property of a tissue paper or tissue product which governs the extent to which one sheet visually obscures print on underlying sheets. It is not be confused with methods based on the reduction in a standard contrast by interposition of the paper opacity (white backing), formerly known as contrast ratio, nor with the assessment of the amount and condition of light penetrating a sheet (transparency or translucency).

The calculation of opacity requires luminance-factor data obtained by measurement under specified conditions. The luminance factor depends on the conditions of measurement, and particularly on the spectral and geometric characteristics of the instrument used for its determination. This part of ISO 12625 is to be read in conjunction with ISO 2469.

Tissue paper and tissue products —

Part 16: Determination of optical properties — Opacity (paper backing) — Diffuse reflectance method

1 Scope

This part of ISO 12625 specifies the testing procedures for the instrumental determination of the opacity of tissue paper or tissue products by diffuse reflectance using a paper backing.

This part of ISO 12625 contains specific instructions for the preparation of test pieces of single-ply and multi-ply products, where special preparation/procedures might be necessary.

It can be used to determine the opacity of tissue paper and tissue products containing fluorescent whitening agents, provided the UV content of the radiation incident on the test piece has been adjusted to conform to that in the CIE illuminant C using a fluorescent reference standard provided by an authorized laboratory as described in ISO 2470-1.

This part of ISO 12625 is not applicable to coloured tissue paper and tissue products which incorporate fluorescent dyes or pigments.

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*

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

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

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.

[SOURCE: ISO 2471:2008]

3.2
luminance factor (C)
luminous reflectance factor
***Y*(C/2°)-value**
R_y
reflectance factor or radiance factor defined with reference to the CIE illuminant C and the visual efficiency function $V(\lambda)$

Note 1 to entry: The visual efficiency function describes the sensitivity of the eye to light, so that the luminance factor (C) corresponds to the attribute of visual perception of the reflecting surface.

Note 2 to entry: For computational purposes, the function is identical with the CIE 1931 colour-matching function $\bar{y}\,\lambda$.

Note 3 to entry: The luminance factor (C) is also known as the Y(C/2°)-value. In previous editions of this International Standard, it was referred to as the luminous reflectance factor.

[SOURCE: ISO 2471:2008]

3.3
single-sheet luminance factor (C)
R_0
luminance factor (C) of a single sheet of paper with a black cavity as backing

[SOURCE: ISO 2471:2008]

3.4
intrinsic luminance factor (C)
R_∞
luminance factor (C) 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 2471:2008]

3.5
opacity (paper backing)
ratio of the single-sheet luminance factor (C), R_0, to the intrinsic luminance factor (C), R_∞, of the same sample

Note 1 to entry: Opacity is expressed as a percentage.

[SOURCE: ISO 2471:2008]

4 Principle

The luminance factor of a single sheet of the tissue paper or tissue product over a black cavity and the intrinsic luminance factor of the tissue paper or tissue product are determined. The opacity is calculated as the ratio of these two luminance factor values.

5 Apparatus

5.1 Reflectometer

5.1.1 Reflectometer, having the geometric, spectral and photometric characteristics described in ISO 2469, calibrated in accordance with the provisions of ISO 2469 and equipped for the measurement of luminance factor (C).

The materials to be measured can contain fluorescent whitening agents. The reflectometer shall therefore be equipped with a radiation source adjusted to correspond to the CIE illuminant C. This should be achieved through the use of a fluorescent reference standard (5.2.2) as described in ISO 2470-1.

5.1.2 In the case of a **filter reflectometer**, a **filter** that, in conjunction with the optical characteristics of the basic instrument, gives an overall response equivalent to the CIE tristimulus value *Y* of the CIE 1931 standard colourimetric system of the test piece evaluated for the CIE illuminant C.

5.1.3 In the case of an **abridged spectrophotometer**, a **function** that permits calculation of the CIE tristimulus value *Y* of the CIE 1931 standard colourimetric system of the test piece, evaluated for the CIE illumunant C using the weighting functions given in Annex A.

5.2 Reference standards

The reference standards for calibrating the instrument and the working standards should be used with sufficient regularity to ensure satisfactory performance.

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 in order to adjust the UV setting of the instrument to conform to UV(C) conditions, as described in ISO 2470-1.

5.3 Working standards

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

NOTE In some instruments, the function of the primary working standard can be fulfilled by a built-in internal standard.

5.4 Black cavity

The black cavity should have a reflectance factor which does not differ from its nominal value 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 1 The condition of the black cavity can be checked by reference to the instrument manufacturer.

NOTE 2 The nominal value is given by the manufacturer.

6 Sampling

If the tests are being made to evaluate a lot, the sample should be selected in accordance with ISO 186. If the tests are made on another type of sample, make sure that the test pieces taken are representative of the sample received.

When sampling finished roll products, eliminate at least the first six layers and the last six layers because of the possible presence of adhesive or mechanical damage.

On finished products, one single sheet can be made of several plies. Do not try to separate the constituting plies.

7 Conditioning

Mark the samples for identification and make sure that the two sides of the paper or of the product can be distinguished.