



SLOVENSKI STANDARD
SIST ISO 11476:2004
01-marec-2004

Določitev svetlosti papirja in kartona pri 2-odstotni svetilnosti (pri notranji osvetlitvi)

Paper and board -- Determination of CIE-whiteness, C/2 degree (indoor illumination conditions)

iTeh STANDARD PREVIEW

Papier et carton -- Détermination du degré de blanc CIE G/2 degrés (éclairage intérieur)

Ta slovenski standard je istoveten z: **ISO 11476:2004**

<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>

ICS:

85.060 Papir, karton in lepenka Paper and board

SIST ISO 11476:2004 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 11476:2004

<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>

INTERNATIONAL STANDARD

ISO
11476

First edition
2000-11-15

Paper and board — Determination of CIE whiteness, C/2° (indoor illumination conditions)

*Papier et carton — Détermination du degré de blanc CIE, C/2° (éclairage
intérieur)*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 11476:2004](https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004)

<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>



Reference number
ISO 11476:2000(E)

© ISO 2000

ISO 11476:2000(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST ISO 11476:2004](https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004)

<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>

© ISO 2000

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Principle.....	3
5 Apparatus and equipment	3
6 Calibration	4
7 Sampling.....	5
8 Preparation of test pieces.....	5
9 Procedure	5
10 Calculation and expression of results.....	5
11 Precision.....	6
12 Test report	7
Annex A (normative) Spectral characteristics of reflectometers for determining tristimulus values	8
Annex B (normative) UV-calibration service	11
Bibliography	13

iTeh STANDARD PREVIEW
 (standards.iteh.ai)
 SIST ISO 11476:2004
<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>

ISO 11476:2000(E)**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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11476 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 a normative part of this International Standard.

ITIH STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 11476:2004](https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004)

<https://standards.iteh.ai/catalog/standards/sist/c9440046-d2d3-48e0-ac16-4b987e34b967/sist-iso-11476-2004>

Paper and board — Determination of CIE whiteness, C/2° (indoor illumination conditions)

1 Scope

This International Standard specifies the procedure to be used for determining the whiteness of papers and boards, in order to obtain values which correspond to the visual appearance of white papers and boards, with or without fluorescent whitening agents, when they are viewed indoors. It is based on radiance factor 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 CIE illuminant C [1] [2], since the results obtained when fluorescent whitening agents are present are dependent upon the UV-content of the radiation falling upon the sample. The CIE illumination C is taken to be representative of indoor illumination conditions because it contains a suitable proportion of UV-radiation [3] [4]. This method is not applicable to coloured papers containing fluorescent dyes. It is specific for the situation where the fluorescence occurs in the blue region of the visible spectral range.

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

NOTE 1 It is recognized that the CIE-whiteness equation was developed in the context of the CIE standard illuminant D65 [10], but the similarity between the relative spectral power curves for the C and D65 illuminants within the visible region and the closeness of their correlated colour temperatures (6 770 K and 6 500 K respectively) is taken as a justification for the use of the analogous whiteness equation with the CIE illuminant C.

NOTE 2 A related International Standard, ISO 11475 [13] specifies the procedure for obtaining values corresponding to the appearance of papers viewed under the CIE illuminant D65.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 186:1994, *Paper and board — Sampling to determine average quality*.

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

ISO 2470, *Paper, board and pulps — Measurement of diffuse blue reflectance factor (ISO brightness)*.

ISO 11476:2000(E)

3 Terms and definitions

For the purposes of this International Standard, 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 reflecting diffuser under the same conditions

NOTE The ratio is usually expressed as a percentage.

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 intrinsic radiance factor

β_{∞}

radiance 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 radiance factor

NOTE For fluorescent (luminescent) materials, the intrinsic total radiance factor β_{∞} , is the sum of two portions, the intrinsic reflected radiance factor, $\beta_{\infty,S}$, and the intrinsic luminescent radiance factor, $\beta_{\infty,L}$, so that

$$\beta_{\infty} = \beta_{\infty,S} + \beta_{\infty,L}$$

For non-fluorescent materials, the intrinsic reflected radiance factor, $\beta_{\infty,S}$, is simply the intrinsic reflectance factor R_{∞} .

3.5 CIE whiteness

W

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

3.6 green/red tint

T_w

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 indicates a greenish tint and a negative value indicates a reddish tint.

3.7

fluorescence component

W_F

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

4 Principle

The diffuse radiance factor 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 illuminant C, and the CIE whiteness and tint are calculated. The fluorescence component of the whiteness is calculated from the difference between this diffuse-radiance-factor 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, calibrated in accordance with the provisions of ISO 2469, and equipped with a radiation source having an adequate UV-content and a means of adjusting the relative UV-content so that the measured ISO-brightness value agrees with the ISO-brightness value assigned to a fluorescent reference standard (5.2.2) and corresponding to the CIE illuminant C [2][5][6]. If a filter (the UV-adjustment filter) is used to make this adjustment, it shall have a cut-off value of 395 nm so that it absorbs UV-radiation but does not at the same time alter the visible spectrum within the sphere.

NOTE 1 In the 1994 edition of ISO 2469, the reflectometer characteristics are described in annex A and the calibration service is described in annex B. When ISO 2469 is revised, the numbering may change; users of editions subsequent to 1994 should therefore determine which elements of text specify these characteristics and this service.

NOTE 2 In order to achieve concordance between the conditions for measuring both ISO brightness and CIE whiteness ($C/2^\circ$), an adjustment based on a reference standard having an assigned ISO-brightness value is preferred.

For the measurement of reflectance factors with the fluorescence effect eliminated, the instrument shall be equipped with a sharp-cut-off, UV-absorbing filter (the UV-cut-off 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-factor value is obtained at 420 nm. The reflectance-factor 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.

For the measurement of fluorescent papers, photometric linearity up to a scale reading of at least 200 % is necessary in the wavelength region corresponding to the fluorescent emission.

5.1.1 In the case of a filter reflectometer, pairs of filters giving the photoelectric detectors of the reflectometer responses equivalent to the CIE tristimulus values X , Y , Z of the test piece [7], evaluated for the CIE illuminant C [6] and CIE 1931 (2°) observer [8].

5.1.2 In the case of an abridged spectrophotometer, a means of calculating the weighted means according to the requirements of the CIE illuminant C and CIE 1931 (2°) observer using the weighting functions given in annex A.

5.2 Reference standards for calibration of the instrument and working standards

5.2.1 Non-fluorescent reference standard for calibration, fulfilling the requirements for ISO reference standards of level 3 as prescribed in ISO 2469.

5.2.2 Fluorescent reference standard for use in adjusting the UV-content of the radiation incident upon the sample, having an assigned ISO-brightness value as specified in annex B and fulfilling the requirements for ISO reference standards of level 3.

Use new reference standards sufficiently frequently to ensure satisfactory calibration and UV-adjustment.