



SLOVENSKI STANDARD

SIST ISO 9416:2011

01-maj-2011

Papir - Določanje koeficienta sipanja in koeficienta absorpcije svetlobe (uporaba teorije po Kubelka-Munku)

Paper -- Determination of light scattering and absorption coefficients (using Kubelka-Munk theory)

iTeh STANDARD PREVIEW

Papier -- Détermination des coefficients de diffusion et d'absorption de la lumière (utilisation de la théorie de Kubelka-Munk)

[SIST ISO 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-670dd8d71c87/sist-iso-9416-2011)

Ta slovenski standard je istoveten z: **ISO 9416:2009**

ICS:

85.060

Papir, karton in lepenka

Paper and board

SIST ISO 9416:2011

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 9416:2011](#)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

INTERNATIONAL STANDARD

ISO
9416

Second edition
2009-05-01

Paper — Determination of light scattering and absorption coefficients (using Kubelka-Munk theory)

*Papier — Détermination des coefficients de diffusion et d'absorption de
la lumière (utilisation de la théorie de Kubelka-Munk)*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>



Reference number
ISO 9416:2009(E)

© ISO 2009

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 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2009

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.org
Web www.iso.org

Published in Switzerland

Contents

Page

| | |
|---|----|
| Foreword..... | iv |
| Introduction | v |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions..... | 2 |
| 4 Principle | 3 |
| 5 Apparatus | 3 |
| 6 Sampling and conditioning..... | 4 |
| 7 Preparation of test pieces..... | 4 |
| 8 Procedure | 4 |
| 9 Calculation of results | 5 |
| 10 Precision..... | 5 |
| 11 Test report | 6 |
| Annex A (informative) Spectral characteristics of reflectometers for measuring luminance factor | 7 |
| Bibliography | 9 |

[SIST ISO 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

ISO 9416:2009(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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9416 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This second edition cancels and replaces the first edition (ISO 9416:1998), of which it constitutes a technical revision.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

Introduction

The opacity of a paper is dependent on its grammage, but it is also intrinsically dependent on the light-absorption and light-scattering coefficients of the material. These coefficients are calculated from the values of the reflectance factor over a black backing, the intrinsic reflectance factor and the grammage of the sheet.

The calculation of these coefficients requires luminance factor data obtained by measurement under specified conditions. Apart from the optical properties of the sample, 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 International Standard should therefore be read in conjunction with ISO 2469 and ISO 2471.

NOTE This method is based on a theory developed by Kubelka and Munk. This theory describes scattering and absorption processes with certain approximations and simplifications and can therefore yield questionable results in extreme cases. However, the Kubelka-Munk theory offers a simple method for determining these coefficients with the instrument used for the determination of optical properties of paper and pulps. Moreover, the method based on this theory has been successfully used in practical applications.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST ISO 9416:2011](https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 9416:2011](#)

<https://standards.iteh.ai/catalog/standards/sist/e6dea4a5-132d-43fa-8d69-676dd8d71c87/sist-iso-9416-2011>

Paper — Determination of light scattering and absorption coefficients (using Kubelka-Munk theory)

1 Scope

This International Standard specifies a method for the calculation of light-scattering and light-absorption coefficients based upon diffuse reflectance measurements made under the conditions specified in ISO 2469 using the colour matching function $y(\lambda)$ and CIE illuminant C.

It is emphasized that the strict evaluation of the light-scattering and light-absorption coefficients requires conditions which cannot be achieved with the instrumentation specified here. The values obtained by application of this International Standard are dependent on the application of the Kubelka-Munk equations, not to full reflectance data but to reflectance factor data obtained using the specified $d/0^\circ$ geometry and a gloss trap.

The use of the method is restricted to white and near-white uncoated papers with an opacity less than about 95 %. Paper that has been treated with a fluorescent dyestuff or that exhibits significant fluorescence can only be dealt with if a filter with a cut-off wavelength of 420 nm is used to eliminate all the fluorescence effect in the UVex(420) mode.

NOTE 1 The residual UV-level in the instrument may depend on whether the instrument is adjusted to UV(C) or UV(D65) conditions prior to switching to the UVex(420) mode, but it is considered that this uncertainty in the residual level can be ignored in the application of this International Standard.

NOTE 2 Although this method is restricted to paper, it can be applied to pulp sheets, although this is not in accordance with this International Standard. In general, when pulps are tested, the light-absorption coefficient at 457 nm corresponding to the ISO brightness value or the spectral absorption coefficients are of greater interest than the weighted value standardized in this International Standard.

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 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 536, *Paper and board — Determination of grammage*

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

ISO 2471, *Paper and board — Determination of opacity (paper backing) — Diffuse reflectance method*