

Paper, board and pulps — Measurement of diffuse radiance factor

ICS 85.040; 85.060

National foreword

This British Standard is the UK implementation of ISO 2469:2007. It supersedes BS 4432-1:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PAI/11, Methods of test for paper, board and pulps.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2007

© BSI 2007

ISBN 978 0 580 54136 0

Amendments issued since publication

Amd. No.	Date	Comments

INTERNATIONAL STANDARD

ISO
2469

Fourth edition
2007-06-15

Paper, board and pulps — Measurement of diffuse radiance factor

*Papier, carton et pâtes — Mesurage du facteur de luminance
énergétique diffuse*



Reference number
ISO 2469:2007(E)

AVA **Documents**
Document Sharing Hub

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	3
5 Apparatus	3
6 Photometric calibration of the instrument and its working standards	4
7 Sampling	5
8 Preparation of the test pieces	5
9 Procedure	5
10 Calculation and expression of results	6
11 Precision	6
12 Test report	6
Annex A (normative) Instruments for the measurement of radiance factor	8
Annex B (normative) Calibration service — Photometric calibration	11
Annex C (normative) Calibration service — UV-adjustment	13
Annex D (informative) Measurement uncertainty	15
Annex E (informative) Radiance and reflectance	18
Bibliography	19

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 2469 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This fourth edition of ISO 2469 cancels and replaces the third edition (ISO 2469:1994) and ISO 2469:1994/Cor.1:1998, which have been technically revised. Primarily, certain instrumental features and computational routines are more rigorously defined in order to meet the requirements of technological advances and in order to ensure a high precision and reproducibility in the measurement results.

In addition, the property mentioned in the title has been changed from “diffuse reflectance factor” to “diffuse radiance factor” as an acknowledgement of the fact that many grades of paper now contain added fluorescent whitening agents. For any given material, the total radiance factor is the sum of the reflected radiance factor and the luminescent radiance factor, and it is this total property which is the subject of this International Standard. For pulps and papers not containing any fluorescent component, the radiance factor and the reflectance factor are synonymous, see Annex E.

Introduction

The radiance factor depends on the conditions of measurement, particularly the spectral and geometric characteristics of the instrument used. The diffuse radiance factor as defined by this International Standard is determined using instruments having the characteristics given in Annex A and calibrated according to the procedure specified in Annex B.

The radiance factor is the sum of the reflected radiance factor and the luminescent radiance factors, and the radiance factor of a luminescent (fluorescent) object is dependent on the spectral power distribution of the illumination. The content of UV radiation in the illumination must therefore be set to a specified level if adequately accurate measurements are to be carried out on fluorescent objects. The preparation of fluorescent reference standards to enable this adjustment to be made is described in Annex C. The use of these fluorescent reference standards is described in detail in the International Standards describing the measurement of the properties of the materials containing fluorescent whitening agents.

The spectral radiance factor or the weighted radiance factor applicable to one or several specified wavelength bands is often used to characterize the properties of pulp, paper and board. Examples of radiance factors associated with specified wavelength bands are the ISO brightness (diffuse blue radiance factor) and the luminance factor.

The radiance factor or reflectance factor is also used as the basis for calculating optical properties, such as opacity, colour, whiteness and the Kubelka-Munk scattering and absorption coefficients. These various properties are specified in specific International Standards, for all of which this International Standard is the primary normative reference.

Paper, board and pulps — Measurement of diffuse radiance factor

1 Scope

This International Standard describes the general procedure for measuring the diffuse radiance factor of all types of pulp, paper and board. More particularly, it specifies in detail in Annex A the characteristics of the equipment to be used for such measurements, and in Annex B the procedures to be used for calibrating that equipment.

This International Standard may be used to measure the radiance factors and related properties of materials containing fluorescent whitening agents, provided that the UV radiation content in the illumination has been adjusted to the level specified in the specific International Standard describing the measurement of the property in question.

This International Standard describes in Annex C the preparation of fluorescent reference standards, although the procedures for using these standards are not included, since their use is described in detail in the specific International Standards describing the measurement of the properties of materials containing fluorescent whitening agents.

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 4094, *Paper, board and pulps — International calibration of testing apparatus — Nomination and acceptance of standardizing and authorized laboratories*

ASTM E308-06, *Standard Practice for Computing the Colors of Objects by Using the CIE System*

3 Terms and definitions

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

3.1 radiance factor

β

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

NOTE For luminescent (fluorescent) 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 numerically equal to the reflectance factor, R .