



**ISO 2469**

**Paper, board and pulps —  
Measurement of diffuse radiance  
factor (diffuse reflectance factor)**

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

**Sixth edition  
2024-03**



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

This is a preview of ISO 2469:2024. [Click here to purchase the full version from the ANSI store.](#)

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>3</b>
<b>5 Apparatus</b> .....	<b>3</b>
5.1 Reflectometer.....	3
5.2 Reference standards.....	4
5.3 Working standards.....	4
5.4 Black cavity.....	4
<b>6 Calibration of the instrument and its working standards</b> .....	<b>4</b>
6.1 General.....	4
6.2 Photometric calibration of the instrument and UV setting.....	4
6.2.1 Step 1.....	4
6.2.2 Step 2.....	5
6.2.3 Step 3.....	5
6.2.4 Step 4.....	5
6.2.5 Step 5.....	5
6.3 Value assignment to the working standards for their intended use.....	5
6.4 Use of the working standards.....	6
6.5 Cleaning the working standards.....	6
<b>7 Sampling</b> .....	<b>6</b>
<b>8 Preparation of the test pieces</b> .....	<b>6</b>
<b>9 Procedure</b> .....	<b>7</b>
9.1 General.....	7
9.2 Verification of calibration.....	7
9.3 Measurement.....	7
<b>10 Calculation and expression of results</b> .....	<b>7</b>
<b>11 Precision</b> .....	<b>7</b>
<b>12 Test report</b> .....	<b>7</b>
<b>Annex A (normative) Instruments for the measurement of radiance factor</b> .....	<b>9</b>
<b>Annex B (normative) Calibration service — Photometric calibration</b> .....	<b>21</b>
<b>Annex C (normative) Calibration service — UV-adjustment</b> .....	<b>23</b>
<b>Annex D (informative) Measurement uncertainty</b> .....	<b>25</b>
<b>Bibliography</b> .....	<b>28</b>

This is a preview of ISO 2469:2024. [Click here to purchase the full version from the ANSI store.](#)

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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

This sixth edition cancels and replaces the fifth edition (ISO 2469:2014), which has been technically revised.

The main changes are as follows:

- introduction of the method for calibrating to the CIE illuminant C and to the CIE standard illuminant D65, in addition to the procedure for calibration of the non-fluorescent part of the spectrum;
- addition of limit values for brightness and whiteness to check the performance of the calibration (as it is reported for non-fluorescence calibration);
- addition of effective residual ink concentration (ERIC number) to the list of optical properties based on reflectance and radiance measurements in the introduction;
- update of [Annex C](#) in order to reflect the revised version of ISO 4094;
- update of bibliography;
- editorial revision.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

This is a preview of ISO 2469:2024. [Click here to purchase the full version from the ANSI store.](#)

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 document is determined using instruments having the characteristics given in [Annex A](#) and calibrated with standards delivered in the framework of the organisation described in [Annex B](#).

The diffuse radiance factor is the sum of the reflected radiance factor and the luminescent radiance factor, and the luminescent radiance factor of a luminescent (fluorescent) object is dependent on the spectral power distribution of the illumination. If adequately accurate measurements are carried out on fluorescent objects, the UV-content of the instrument illumination is adjusted to produce the same amount of fluorescence for a fluorescent reference standard as the selected CIE illuminant. 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 diffuse radiance factor or the weighted diffuse radiance factor applicable to one or several specified wavelength bands is often used to characterize the properties of pulp, paper and board. Examples of diffuse radiance factors associated with specified wavelength bands are the ISO brightness (diffuse blue radiance factor) and the luminance factor.

The diffuse radiance factor or diffuse reflectance factor is also used as the basis for calculating optical properties, such as opacity, colour, whiteness, effective residual ink concentration (ERIC number) and the Kubelka-Munk scattering and absorption coefficients. These various properties are described in detail in specific International Standards.