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Varovanje oči in obraza - Preskusne metode - 2. del: Fizikalne optične lastnosti (ISO/DIS 18526-2:2018)

Eye and face protection - Test methods - Part 2 : Physical optical properties (ISO/DIS 18526-2:2018)

Augen- und Gesichtsschutz - Prüfverfahren - Teil 2: Physikalisch optische Eigenschaften (ISO/DIS 18526-2:2018)

Protection des yeux et du visage - Méthodes d'essai - Partie 2: Propriétés optiques physiques (ISO/DIS 18526-2:2018)

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Eye and face protection — Test methods —

Part 2:
Physical optical properties

Protection des yeux et du visage — Méthodes d'essai —

Partie 2: Propriétés optiques physiques

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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 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 6, *Eye and face protection*.

A list of all parts in the ISO 18526 series can be found on the ISO website.

Introduction

This family of documents was developed in response to the worldwide stakeholders' demand for minimum requirements and test methods for eye and face protectors traded internationally. ISO 4007 gives the terms and definitions for all the various product types. The test methods are in the ISO 18526 series, while the requirements for occupational eye protectors are in the ISO 16321 series. Eye protection for specific sports is mostly dealt with by the ISO 18527 series. A guidance document for the selection, use and maintenance of eye and face protectors is in preparation.

Eye and face protection — Test methods — Part 2: Physical optical properties

1 Scope

This document specifies the reference test methods for determining the physical optical properties of personal eye and face protectors.

This document does not apply to any eye and face protection requirements standards for which other test methods are specified.

Other test methods may be used provided they have been shown to be equivalent.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4007:_, [1]*Personal protective equipment – Eye and face protection – Vocabulary*

ISO 11664-1 (CIE S 014-1/E), *Colorimetry- Part 1: CIE standard colorimetric observers*

ISO 11664-2 (CIE S 014-2/E), *Colorimetry- Part 2: CIE standard illuminants*

ISO 16321-2, [2]*Eye and face protection for occupational use – Part 2: Additional requirements for protectors during welding and related techniques*

ISO 16508 CIE S 006/E: *Road traffic lights - Photometric properties of 200 mm roundel signals.*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM: 2008)*

CIE 15, *Colorimetry. Commission Internationale de l'Éclairage. 2004*

CIE S 017, *International lighting vocabulary. 2011*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in in ISO 4007 and CIE S 017 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

For the purpose of this document, "test sample" is taken to be the object under test, e.g. "ocular", "lens", "filter", or "complete protector" as specified in the requirements standard.

[1] Under preparation (Stage at the time of publication ISO/FDIS 4007)

[2] Under preparation (Stage at the time of publication ISO/DIS 16321-1)

4 Preparatory information

Before testing, refer to the requirement standard appropriate to the product for the information needed to apply the tests in this document, for example:

— the number of test samples;

— preparation of test samples;

— the selection of test samples (if included in this part);

— any prior conditioning or testing;

— test method (if more than one is included in this part);

— any deviations from the method(s);

— characteristics to be assessed subjectively (if appropriate);

— pass/ fail criteria.

5 General test requirements

Unless otherwise specified, the values stated in this document are expressed as nominal values. Except for temperature limits, values that are not stated as maxima or minima should be subject to a tolerance of ±5%.

Unless otherwise specified, the ambient temperature for testing should be between 16 °C and 32 °C and any temperature limits specified should be subject to an accuracy of ±1 °C. Relative humidity should be maintained at (50 ± 20) %.

Unless otherwise specified, the test samples shall be tested at the reference points (for testing) as defined in ISO 4007.

The tests shall be done by trained observers.

6 Test methods for measuring transmittance - General

6.1 Uncertainty of measurement

Unless otherwise indicated, the measures calculated from spectral transmittance and the broadband measures of transmittance shall have relative uncertainties less than or equal to those given in Table 1.

Table 1 — Relative uncertainty of measured spectral transmittance

Spectral transmittance value		Relative uncertainty
Less than %	to %	%
100	17,8	±5
17,8	0,44	±10
0,44	0,023	±15
0,023	0,0012	±20
0,0012	0,000023	±30

The application of uncertainty to compliance is set out in Annex A.

The general methods of evaluating the components of uncertainty are set out in ISO/IEC Guide 98/3; Annex B in this document is a guide to the sources of uncertainty in spectrophotometry, their evaluation and minimization.

6.2 Reporting compliance

Any compliance statement based on values reported from these test methods shall take into account the uncertainty of measurement as set out in Annex A.

6.3 Applicability

This spectrophotometric method applies to measurement of transmittance regardless of the test sample tested, e.g. filters and frames. Assessment of the uncertainty of measurement shall, if necessary, include the consequences of non-parallel surfaced test samples.

6.4 Position and direction of measurement

The location and direction of measurement of transmittance shall be as specified in the relevant requirement standard. If the measurements are not made normal to the surface of the test sample, then particular attention should be paid to the effects of beam displacement, see Annex B. If the direction of measurement is not specified, then it shall be measured normal to the surface of the test sample at the geometrical centre.

Unless otherwise stated, transmittance is measured as direct transmittance (diffuse component excluded).

The test beam shall be incident normally on the surface and any divergence or convergence of the beam shall not result in an uncertainty of measurement exceeding those in Table 1.

6.5 Wavelength intervals

Spectral measurements and calculations shall be carried out at not more than 5 nm intervals ($\Delta\lambda$ = 5 nm) in the ultraviolet-visible region (180-780 nm) and not more than 10 nm in the infrared region (780-3000 nm). The necessary data for calculations at these intervals are provided in Annex D. If smaller intervals are used then linesar interpolation of the Annex D data is appropriate.

6.6 Test reports for spectral values

The spectral transmittances and the associated uncertainties of measurement shall be reported as required in the document(s) referencing these methods.

7 Luminous transmittance

7.1 Calculations of luminous transmittance from spectral values

Luminous transmittance is calculated as a percentage from the spectral transmittances determined hereafter and with reference to a standard observer and a source or illuminant. For the purposes of this document, all calculations use the CIE 2° standard observer (ISO 11664-1) and CIE standard illuminant A and/or CIE standard illuminant D65 (ISO 11664-2) and/or a Planckian Radiator of distribution temperature 1900K. See ISO 4007:–, 3.9.1.32 and Annex C in this document.

7.2 Test reports for luminous transmittance values

The luminous transmittance(s), the applicable illuminant(s) and/or source(s) and the associated uncertainty of measurement shall be reported as required in the document(s) referencing these methods.

7.3 Broadband method of measurement of luminous transmittance to CIE Source A

7.3.1 Apparatus

The luminous transmittance is measured by using a test apparatus consisting of a light source and a detector. The light source shall be a broadband collimated light source with approximately the spectral distribution of the CIE standard source A (ISO 11664-2). The detector shall have a spectral response corresponding to CIE 2° standard observer (ISO 11664-1). The detector shall be mounted normal to the beam of illumination.

7.3.2 Calibration

The broadband method shall be calibrated by comparison with filters for which the luminous transmittances are known with uncertainties of measurement sufficiently small as to enable the applicable requirement of Table 1 to be met by the test method. The maximum difference in shade number between the test sample and the nearest reference filter shall ensure compliance with Table 1.

7.3.3 Procedure

The luminous transmittance is measured as the ratio of the light transmitted by the test sample to the incident light measured with no test sample in the light beam.

If the direction of measurement is not specified, measurement shall be with incident radiation normal to the surface of the test sample. If the position of measurement is not specified, the geometric centre of the test sample shall be used.

7.3.4 Test reports for luminous transmittance values

The luminous transmittance(s), the applicable source (CIE source A) and the associated uncertainty of measurement shall be reported as required in the document(s) referencing these methods.

7.4 Measurement of uniformity of luminous transmittance

7.4.1 Unmounted filter covering one eye

7.4.1.1 Test method

Locate the reference point defined in ISO 4007. Determine a circular area around the reference point with diameter d, calculated as follows, (see Figure 1):

— for test samples equal to or greater than 50 mm in the vertical dimension at the reference point, $d = (40{,}0 \pm 0{,}5)$ mm;

— for test samples less than 50 mm in the vertical dimension at the reference point, $d = ((h\text{-}10) \pm 0{,}5)$mm, where h is the vertical depth of test sample.

If a 5 mm wide portion around the edge of the test sample intrudes into this circular area, then this intrusion shall be excluded from testing.

Scan this circular area with beam of light of 5 mm nominal diameter, incident normally on the surface of the test sample. Use either white light and a detector whose spectral responsivity approximates that of the CIE 2° standard observer (ISO 11664-1) or use or a narrow spectral band of light with a maximum spectral energy at (555 ± 25) nm (the spectral sensitivity of the detector does not influence the measurement). The effects of displacement of the light beam by any prismatic effect of the test sample (see B.3.4.1) shall be compensated for. If necessary to demonstrate compliance, the effects of variation of thickness of the test sample shall be compensated for as in 7.4.1.4.

For test samples with bands or gradients of different luminous transmittance, the requirement for variations in luminous transmittance applies in this circular area but perpendicular to the gradient (see Figure 1). Two example scans perpendicular to the gradient are shown in Figure 1.

Position the test sample and the light beam so that the incident light falls normally on the surface of the test sample at the reference point and parallel to that direction when testing at other locations on the test sample.

Measure and record the maximum value of luminous transmittance $\tau_{v\,max}$ and the minimum value of luminous transmittance $\tau_{v\,min}$.