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Eye and face protection for sports use —

Part 1: Requirements for downhill skiing and snowboarding goggles

Protection des yeux et du visage à usage sportif —

Partie 1: Exigences relatives aux lunettes de ski alpin et de surf des neiges

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Foreword

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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).

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

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 6, *Eye and face protection*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 85, *Eye protective equipment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 18527 series can be found on the ISO website.

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.

Introduction

This family of documents comprised of the ISO 16321 series, the ISO 18526 series and the ISO 18527 series 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 given in the ISO 18526 series, while the requirements for occupational eye and face protectors are given in the ISO 16321 series. Eye protectors for specific sports are mostly dealt with by the ISO 18527 series. A guidance document, ISO 19734, for the selection, use and maintenance of eye and face protectors is under preparation.

Eye and face protection for sports use —

Part 1:
Requirements for downhill skiing and snowboarding goggles

1 Scope

This document applies to all goggles with plano lenses, intended for eye protection against hazards including ultraviolet and visible solar radiation, rain, snow and wind, during downhill skiing, snowboarding and other similar activities.

This document applies to downhill skiing and snowboarding goggles fitted with an insert to carry prescription lenses.

It specifies requirements and testing for materials, performance, marking of goggles and information to be supplied by the manufacturer.

Information on the selection and use of downhill skiing and snowboarding goggles is given in Annex A.

This document does not apply to

a) eye protectors for protection when operating or travelling on a motorized vehicle,

b) eye protectors for protection against optical radiation from artificial sources, such as those used in solaria,

c) eye protectors for direct observation of the sun, and

d) eye protectors intended for sports with unrelated hazards and risks.

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, *Personal protective equipment — Eye and face protection — Vocabulary*

ISO 8980-5, *Ophthalmic optics — Uncut finished spectacle lenses — Part 5: Minimum requirements for spectacle lens surfaces claimed to be abrasion-resistant*

ISO 11664-2, *Colorimetry — Part 2: CIE standard illuminants*

ISO 18526-1:2020, *Eye and face protection — Test methods — Part 1: Geometrical optical properties*

ISO 18526-2:2020, *Eye and face protection — Test methods — Part 2: Physical optical properties*

ISO 18526-3:2020, *Eye and face protection — Test methods — Part 3: Physical and mechanical properties*

ISO 18526-4, *Eye and face protection — Test methods — Part 4: Headforms*

ISO 21987, *Ophthalmic optics — Mounted spectacle lenses*

3 Terms and definitions

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

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

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

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

4 General requirements for goggles

4.1 Physiological compatibility

Goggles shall be designed and manufactured in such a way that, when used under the conditions and for the purposes intended, they will not compromise the health or safety of the wearer. The risks posed by substances leaking or evaporating from the goggles that can come into prolonged contact with the wearer shall be reduced by the manufacturer to within the limits of any applicable regulatory requirement.

Special attention shall be given to substances that are allergenic, carcinogenic, mutagenic or toxic to reproduction.

NOTE 1 Excessive pressure due to a poor fit on the head, chemical irritation or allergy are known to produce reactions. Rare or idiosyncratic reactions to any material are known to occur and the individual wearer is well advised to avoid those types of frame materials.

Substances recommended for cleaning, maintenance or disinfection shall be known to be unlikely to have any adverse effect upon the wearer, when applied in accordance with the instructions given in the information to be supplied by the manufacturer.

Manufacturers/suppliers shall perform an appropriate risk analysis on potentially harmful substances contained in the goggles such that, when the goggles are used under the conditions and for the purposes intended, the health (and safety) of the wearer shall not be compromised.

The following are examples of documents that represent the appropriate information:

a) specification of the material(s);

b) safety data sheets relating to the materials;

c) information relating to the suitability of the materials for use with food, in medical devices, or other relevant applications;

d) information relating to toxicological, allergenic, carcinogenic, toxic to reproduction, or mutagenic investigations on the materials.

NOTE 2 Specific national regulations with regard to the restriction of certain chemical substances need to be observed, for example release of nickel.

4.2 Construction and adjustment

Areas of the goggles that may, during intended use, come into contact with the wearer shall be free from projections, sharp edges or other features likely to cause discomfort or injury to the wearer.

Any part of the goggles that can be adjusted or removed by the wearer for the purpose of replacement (in accordance with the instructions given in the information to be supplied by the manufacturer) shall facilitate adjustment, removal and attachment without the use of tools.

Any adjustment system incorporated in the goggles shall maintain the intended fit for the foreseeable conditions of use.

The test shall be carried out by physical inspection according to ISO 18526-3:2020, 6.1.

4.3 Cleaning and/or disinfection

The goggles shall be cleaned only once according to the cleaning and/or disinfection procedures in the information to be supplied by the manufacturer before being subjected to testing.

4.4 Lens material and surface quality

In a circular area $30^{+0,5}_{-0}$ mm diameter centred on the reference point(s) but excluding a marginal area $5^{+0}_{-0,5}$ mm wide around the edge of the lens if this overlaps with the circular area, lenses shall be free from defects likely to impair vision in use (such as bubbles, scratches, inclusions, dull spots, pitting, mould marks, scouring, grains, pocking, scaling and undulation) when examined according to ISO 18526-3:2020, 6.6.

4.5 Headform(s)

Unless the manufacturer specifies the headform(s) according to ISO 18526-4 that is/are compatible with the goggles, the test methods where (a) headform(s) is/are required shall use the headform 1-M according to ISO 18526-4 as the default.

4.6 Retention by headband and harnesses (sit and fit)

Goggles shall sit in the intended position during normal use and shall adapt to the contours of the face. The headband shall be designed to be flexible or adjustable and sit securely on the back of the head or a helmet. The headband assembly shall not cause any discomfort nor exhibit any insecurity when tested in accordance with ISO 18526-3:2020, 6.5.

4.7 Mandatory and optional requirements

In this document both optional and mandatory requirements are described. Depending on the intended use and/or the manufacturer's claimed specification, some requirements marked as optional become mandatory.

5 Transmittance of the lenses

5.1 General

Transmittance values shall be determined in accordance with ISO 18526-2:2020, Clauses 6 to 11, as appropriate. Luminous transmittance shall be calculated using CIE standard illuminant D65 in accordance with ISO 11664-2 (see also ISO 4007:2018, 3.10.1.32).

5.2 Transmittance categories

Depending upon the mean luminous transmittance, $\tau_{v,D65}$, at their reference points, lenses for downhill skiing and snowboarding use shall be attributed to one of the five tint categories in Table 1.

The ranges of the luminous transmittance, $\tau_{v,D65}$, of these five categories are given by the values in Table 1. There are only three descriptive groups for use by consumers as shown in Table 7. An overlap of the transmittance values shall be not more than ±2 % (absolute) between the categories 0, 1, 2 and 3. There is no overlap in transmittance values between categories 3 and 4.

If the manufacturer and/or supplier declares a luminous transmittance value, the maximum deviation for this value shall be ±3 % absolute for transmittance values falling in categories 0 to 3 and ±30 % relative to the stated value for transmittance values falling in tint category 4.

When describing the transmittance properties of a lens with changeable tint, e.g. photochromic, two categories for the luminous transmittance values are generally used. These two values correspond to the highest and lowest transmittance states of the lens. Lenses or filters with temperature sensitive transmittance shall also be tested at (+5 ± 2) °C. If the performance at (+5 ± 2) °C results in a category change, then this category shall also be attributed.

In the case of a gradient-tinted lens, the mean luminous transmittance $\tau_{v,D65}$ at the reference points shall be used to characterize the luminous transmittance and the tint category.

For a gradient-tinted lens, the overlap in luminous transmittance allowed between categories shall be double that for uniformly tinted lenses.

5.3 Solar ultraviolet transmittance

When tested within a 10 mm radius circle centred on the reference point according to ISO 18526-2:2020, Clause 8, the solar UV-A, τ_{SUVA}, solar UV-B, τ_{SUVB}, and mean spectral (380 to 400) nm, $\tau_{m380-400}$, transmittances shall conform with the requirements in Table 1, based on the mean luminous transmittance, $\tau_{v,D65}$, at the reference points of the lens(es).

Table 1 — Transmittance requirements for downhill skiing and snowboarding lenses

Tint category	Wavelength range from 280 nm to 400 nm			Visible spectral range	Optional infrared spectral range
	Maximum solar UV-B transmittance τ_{SUVB} 280 nm ≤ λ ≤ 315 nm (%)	Maximum solar UV-A transmittance $\tau_{SUVA,380}$ 315 nm ≤ λ ≤ 380 nm (%)	Maximum mean 380 nm to 400 nm spectral transmittance $\tau_{m380-400}$ 380 nm ≤ λ ≤ 400 nm (%)	Luminous transmittance $\tau_{v,D65}$ 380 nm ≤ λ ≤ 780 nm (%)	Maximum solar IR transmittance τ_{SIR} 780 nm ≤ λ ≤ 2 000 nm (%)
S0	0,03 $\tau_{v,D65}$	0,30 $\tau_{v,D65}$	0,75 $\tau_{v,D65}$	$\tau_{v,D65} > 80$	$\tau_{v,D65}$
S1				$43 < \tau_{v,D65} \leq 80$	$\tau_{v,D65}$
S2			0,5 $\tau_{v,D65}$	$18 < \tau_{v,D65} \leq 43$	$\tau_{v,D65}$
S3		0,15 $\tau_{v,D65}$		$8 < \tau_{v,D65} \leq 18$	$\tau_{v,D65}$
S4			0,5 % absolute or 0,15 $\tau_{v,D65}$ whichever is greater	$3 < \tau_{v,D65} \leq 8$	$\tau_{v,D65}$
NOTE Some national requirements can stipulate a different requirement for the long wavelength limit of UV-A.					

5.4 General transmittance requirements

5.4.1 Uniformity of luminous transmittance and transmittance matching

5.4.1.1 Uniformly tinted lenses

Lenses that are intended to be uniformly tinted shall appear to be visually uniform within circles $30^{+0,5}_{-0}$ mm diameter centred on the reference points or to the edge of the lens less the marginal zone $5^{+0}_{-0,5}$ mm wide (whichever is greater), and appear to have the same transmittance at the two reference points when inspected against a white background in accordance with ISO 18526-3:2020, 6.6. Where there is visible non-uniformity, then, when tested according to ISO 18526-2:2020, 7.4, the relative difference in the luminous transmittance values between any two points of the lens within these areas shall not be greater than 15 % (relative to the higher value), except for tint category S4 where it shall not be greater than 20 %.

Where there are visibly mismatched transmittances at the reference points, when measured in accordance with ISO 18526-2:2020, 7.5, the difference in luminous transmittance values at the reference points for the right and left eyes shall not exceed 15 % (relative to the higher transmittance).

5.4.1.2 Linear gradient-tinted lenses

In the case of mounted linear gradient-tinted lenses, when inspected against a white background in accordance with ISO 18526-3:2020, 6.6, the luminous transmittances shall appear constant in the horizontal direction and having equal transmittance at the reference points. Where there is visible rotation of the gradient or visibly mismatched transmittances at the reference points, when measured in accordance with ISO 18526-2:2020, 7.5, the difference in the luminous transmittances at the reference points and between pairs of points on the lens at $15^{+0,5}_{-0}$ mm to the left, to the right, above and below the reference points shall not exceed 15 % (relative to the higher value in each direction).

5.4.1.3 Radial gradient-tinted lenses

When measured in accordance with ISO 18526-2:2020, 7.5, the difference in the luminous transmittances at the reference points and between pairs of points on the lens $15^{+0,5}_{-0}$ mm to the left, to the right, above and below the reference points shall not exceed 15 % (relative to the higher value).

5.4.1.4 Variations due to thickness variations

Changes of luminous transmittance that are caused by thickness variations due to the design of the lens are permitted. For verification, the test method in ISO 18526-2:2020, 7.4.1.4 shall be used.

5.4.2 Ultraviolet transmittance of the frame or housing

When tested in accordance with ISO 18526-2:2020, Clause 6, non-lens areas of goggles shall provide at least the same level of protection against ultraviolet radiation, for the area to be protected according Clause 12, as given by a lens of any tint category declared usable with the goggles by the manufacturer or supplier.

5.5 Special transmittance requirements

5.5.1 Photochromic lenses

The tint categories of photochromic lenses shall be determined by the luminous transmittance in the faded state, $\tau_{v,0}$, and the luminous transmittance in the darkened state, $\tau_{v,1}$, measured according to ISO 18526-2:2020, Clause 16, at a temperature of (5 ± 2) °C. In both states, the requirements specified in 5.2 and 5.3 shall be met. The photochromic response $PR = \tau_{v,0}/\tau_{v,1}$ shall be ≥1,25.

5.5.2 Polarizing lenses

5.5.2.1 Plane of transmission

If the lenses in the goggles are claimed to be polarizing, the lenses shall be fitted in the frame so that their planes of transmission, when tested according to ISO 18526-2:2020, 15.1, shall not deviate from the vertical by more than ±5°. When the goggles are fitted with two separate lenses, any misalignment between the planes of transmission of the left and right lenses shall not be greater than 6°.

5.5.2.2 Polarizing efficiency

When tested according to ISO 18526-2:2020, 15.2, the polarizing efficiency, *P*, shall be ≥78 % for tint categories 2, 3, 4 and ≥60 % for tint category 1.

NOTE 1 These values are equivalent to ratios of the luminous transmittance values parallel and perpendicular to the plane of transmission of approximately 8:1 and 4:1 respectively.

NOTE 2 Lenses of tint category 0 do not have any useful polarizing effect.

5.5.3 Gradient-tinted lenses

5.5.3.1 General

Uniformity of transmission is subject to the requirements of 5.4.1.2 and 5.4.1.3.

5.5.3.2 Determination of the tint category

The tint category of gradient-tinted lenses shall be determined by the luminous transmittance at the reference point.

5.6 Claimed transmittance and reflectance properties (optional requirements)

5.6.1 General

In the case where specific transmittance values are claimed, these claims shall be according to 5.6.2 and 5.6.3. These requirements shall apply within a 10 mm radius circle centred on the reference point.

5.6.2 Solar blue-light absorption/transmittance

a) **Solar blue-light absorption** – In the case where it is claimed that a lens has *x* % solar blue-light absorption, the solar blue-light transmittance, τ_{SB}, of the lens, measured according to ISO 18526-2:2020, 9.1, shall not exceed (100,5 – *x*) %.

b) **Solar blue-light transmittance** – In the case where it is claimed that a lens has less than *x* % solar blue-light transmittance, the solar blue-light transmittance, τ_{SB}, of the lens, measured according to ISO 18526-2:2020, 9.1, shall not exceed (*x* + 0,5) %.

For the calculation of the blue-light transmittance, the values of ISO 18526-2:2020, Table D.1 shall be used.

5.6.3 Solar UV absorption/transmittance

Requirements for the maximum transmittance of lenses in the UV-A and the UV-B shall be as given in Table 1 as appropriate. In cases where it is claimed that a lens provides a certain percentage UV absorption or UV transmittance that is better than the requirement in Table 1, corresponding requirements shall apply.

For the calculation of the values of UV absorption/transmittance the values of ISO 18526-2:2020, Table D.1 shall be used.

a) **Solar UV absorption** – In the case where it is claimed that a lens has *x* % UV absorption, the solar UV transmittance of the lens, $\tau_{SUV,380}$, measured according to ISO 18526-2:2020, 8.3, shall not exceed (100,5 – *x*) %.

b) **Solar UV transmittance** – In the case where it is claimed that a lens has less than *x* % UV transmittance, the solar UV transmittance of the lens, $\tau_{SUV,380}$, measured according to ISO 18526-2:2020, 8.3, shall not exceed (*x* + 0,5) %.