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Eye and face protection for sports use —

Part 2:
Requirements for eye protectors for squash and eye protectors for racquetball and squash 57

Protection des yeux et du visage à usage sportif —

Partie 2: Exigences relatives aux protecteurs oculaires pour le squash et aux protecteurs oculaires pour le racquetball et le squash 57

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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).

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).

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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 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*.

A list of all parts of ISO 18527 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 protection 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 2: Requirements for eye protectors for squash and eye protectors for racquetball and squash 57

1 Scope

This document applies to all eye protectors intended for eye protection against hazards during playing or instructing in the sports of squash, racquetball and squash 57 and sports with similar hazards and no greater risks. It applies to eye protectors that incorporate prescription lenses but has no specific tests for eye protectors designed for use over spectacles.

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

Information on the selection and use of eye protectors for squash, racquetball and squash 57 is given in Annex A.

This document does not apply to

a) sports eye protectors designed for use over prescription spectacles,

b) eye protectors for other occupational applications,

c) eye protectors without lenses, and

d) eye protectors for sports where the hazards are unrelated to the hazards in or involve greater risks than squash, racquetball and squash 57.

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, *Eye and face protection — Test methods — Part 1: Geometrical optical properties*[1)]

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

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

1) Under preparation (Stage at the time of publication ISO/FDIS 18526-1:2019).

2) Under preparation (Stage at the time of publication ISO/FDIS 18526-2:2019).

3) Under preparation (Stage at the time of publication ISO/FDIS 18526-3:2019).

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

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 eye protectors[5)]

4.1 Physiological compatibility

Eye protectors 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 eye protector 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 eye protector such that, when the protector is 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) Under preparation (Stage at the time of publication ISO/FDIS 18526-4:2019).

5) For the purposes of this document, “eye protector” is used to mean eye protectors for squash, racquetball and squash 57.

4.2 Construction and adjustment

Areas of the eye protectors that may, during intended use, come into contact with the wearer or other players on the court shall be smooth, without sharp protuberances that may cause discomfort or injury to the wearer or other players on the court.

Any part of the eye protector 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 eye protectors 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:—, 6.1.

4.3 Cleaning and/or disinfection

The eye protector 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 mm diameter centred on the reference point(s) but excluding a marginal area 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:—, 6.6.

4.5 Headform(s)

Unless the manufacturer specifies the headform(s) according to ISO 18526-4 that is/are compatible with the eye protector, 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)

Eye protectors shall sit in the intended position during normal use and shall adapt to the contours of the face. The surfaces in contact with the face shall be made of soft flexible material. Any headband shall be designed to be flexible or adjustable and sit securely on the back of the head. Any headband assembly shall not cause any discomfort nor exhibit any insecurity when tested in accordance with ISO 18526-3:—, 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:—, 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 and at (23 ± 1) °C in the case of temperature sensitive transmittance, lenses for squash, racquetball and squash 57 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 is given by the values in Table 1. 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 declare a luminous transmittance value, the maximum deviation for this value shall be ±3 % absolute for the transmittance values falling in categories 0 to 3 and ±30 % relative to the stated value for the transmittance values falling in category 4.

When describing the transmittance properties of lenses with changeable tint, e.g. photochromic, two categories for luminous transmittance values are generally used. These two values correspond to the highest and lowest luminous transmittance state of the lens.

5.3 Solar ultraviolet transmittance

When tested within a 10 mm radius circle centred on the reference point according to ISO 18526-2:—, Clause 8, the solar UV-A, τ_{SUVA}, solar UV-B, τ_{SUVB}, and mean spectral (380 to 400) nm, $\tau_{m380\text{-}400}$, 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 the lenses of squash, racquetball and squash 57 eye protectors

Tint category	Wavelength range from 280 nm to 400 nm			Visible 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 $\tau_{m380\text{-}400}$ 380 nm ≤ λ ≤ 400 nm	Luminous transmittance $\tau_{v\,D65}$ 380 nm ≤ λ ≤ 780 nm
S0, R0 or SR0	0,03 $\tau_{v\,D65}$	0,30 $\tau_{v\,D65}$	0,75 $\tau_{v\,D65}$	$\tau_{v\,D65}$ > 80%
S1, R1 or SR1				43 % < $\tau_{v\,D65}$ ≤ 80 %
S2, R2 or SR2			0,50 $\tau_{v\,D65}$	18 % < $\tau_{v\,D65}$ ≤ 43 %
S3, R3 or SR3		0,15 $\tau_{v\,D65}$		8 % < $\tau_{v\,D65}$ ≤ 18 %
S4, R4 or SR4			0,5 % absolute or 0,15 $\tau_{v\,D65}$ whichever is greater	3 % < $\tau_{v\,D65}$ ≤ 8 %
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

Lenses shall appear to be visually uniform within circles 30 mm diameter centred on the reference points or to the edge of the lens less the marginal zone 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:—, 6.6. Where there is visible non-uniformity, then, when tested according to ISO 18526-2:—, 7.4, the relative difference in the luminous transmittance value between

any two points of the lens shall not be greater than 15 % (relative to the higher value), except for tint category S4, R4 or SR4 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:—, 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).

5.4.2 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:—, 7.4.1.4 shall be used.

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, $\tau_{v\,1}$, achieved after 15 min irradiation measured according to ISO 18526-2:—, 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 eye protector 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:—, 15.1, shall not deviate from the vertical by more than ±5°. When the eye protector is 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:—, 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

No provision is made for gradient-tint lenses because they are not appropriate for squash, racquetball and squash 57.

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.