
**Eye and face protection for sports
use —**

**Part 3:
Requirements and test methods for
eyewear intended to be used for
surface swimming**

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Protection des yeux et du visage à usage sportif —

*Partie 3: Exigences et méthodes d'essai pour les articles de lunetterie
destinés à la natation de surface*

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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.

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 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 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.

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Eye and face protection for sports use —

Part 3:

Requirements and test methods for eyewear intended to be used for surface swimming

1 Scope

This document specifies requirements and test methods for eyewear intended for surface swimming only. It contains requirements for eyewear for both recreational and specialist competitive swimming. It deals with materials, construction, optical properties and test methods.

Requirements for the labelling and marking of swimming eyewear and for information to be supplied by the manufacturer are also specified.

Eyewear intended for surface swimming conforming to the requirements of this standard are suitable for surface use and shallow diving only, e.g. from the edge of a pool, and are not suitable for wear when diving from a high board.

This document applies to eyewear that include

- a) non-prescription nominally plano or afocal lenses,
- b) non-prescription mass-produced corrective lenses, and
- c) prescription lenses.

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 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 4007, *Personal protective equipment — Eye and face protection — Vocabulary*

ISO 8980-1:2017, *Ophthalmic optics — Uncut finished spectacle lenses — Part 1: Specifications for single-vision and multifocal lenses*

ISO 8980-2:2017, *Ophthalmic optics — Uncut finished spectacle lenses — Part 2: Specifications for power-variation lenses*

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

ISO 12312-1:2013, *Eye and face protection — Sunglasses and related eyewear — Part 1: Sunglasses for general use*

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 18526-4:2020, *Eye and face protection — Test methods — Part 4: Headforms*

ISO 21987:2017, *Ophthalmic optics — Mounted spectacle lenses*

3 Terms and definitions

For the purposes of this document, the terms and the definitions given in ISO 4007 and the following 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/>

3.1

swimming goggles

eyewear having individual cup-type flat or curved sheet plano lenses or corrective lenses for each eye and designed for surface swimming only

3.2

swimming mask

eyewear (with one-piece or separate lenses) intended for surface swimming with a single *water seal* or *water gasket* (3.4) on the perimeter of the frame that does not cover the nostrils

3.3

eyecup

part of the eyewear surrounding the lens or lenses, generally with the *water seal* or water gasket (3.4) incorporated

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Note 1 to entry: Some eyewear designed for competitive use may not have a *water seal* (3.4).

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3.4

water seal

water gasket

water cushion

sealing material typically made of a soft or semi-rigid material attached or adhered to the *eyecup* (3.3) to assist sealing between the face and the eyewear

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3.5

nosebridge strap

section of the complete goggle that connects the *eyecups* (3.3) together either by way of a separate adjustable strap or fixed strap that is integral to the frame

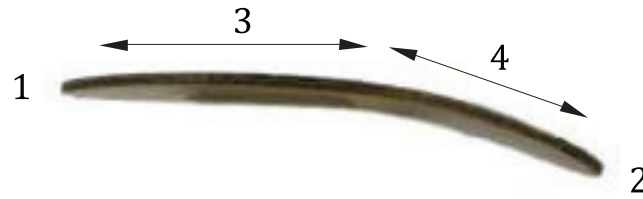
Note 1 to entry: Some products have a nosebridge strap that is one-piece with the frame and, as a consequence, is not adjustable. Some products have a separate nosebridge strap and eyecups and this may be adjustable.

3.6

temporal flange lens

lens that is flat or has a shallow curve across the optical aperture but with a temporal zone angled towards the wearer's face

Note 1 to entry: See [Figure 1](#).

**Key**

1	nasal	3	optical aperture
2	temporal	4	temporal flange

Figure 1 — View from above of an example of a right lens with a temporal flange

4 General requirements for eyewear

4.1 Physiological compatibility

Eyewear¹⁾ 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 eyewear 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 eyewear that, when the eyewear 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:

- specification of the material(s);
- safety data sheets relating to the materials;
- information relating to the suitability of the materials for use with food, in medical devices, or other relevant applications; and
- information relating to toxicological, allergenic, carcinogenic, toxic to reproduction, or mutagenic investigations on the materials.

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

1) For the purposes of this document, “eyewear” is used as a general term for swimming masks and swimming goggles used for surface swimming. Examples of types of swimming eyewear are given in [Annex B](#).

4.2 Construction and adjustment

Areas of the eyewear 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 eyewear 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 be designed and manufactured to facilitate adjustment, removal and attachment without the use of tools.

Any adjustment system incorporated in the eyewear 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 eyewear 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 ($30,0^{+0,5}_0$) mm diameter centred on the reference point(s) but excluding a marginal area ($3,0^{+0}_0$) 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. Outside this zone, including on any temporal flange, small isolated material and/or surface defects are acceptable.

4.5 Headform(s)

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

4.6 Resistance to corrosion

Testing for resistance to corrosion is only required where the eyewear has metal parts. Following the resistance to corrosion test according to ISO 18526-3:2020, 6.9, the intended use of all exposed metal parts of the eyewear shall not be affected. No metallic part intended to be in direct contact with the user during intended use shall show signs of corrosion. The test shall be verified by physical inspection according to ISO 18526-3:2020, 6.1.

4.7 Retention by headband (Sit and fit)

Eyewear 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 free of sharp edges and, ideally, made of soft flexible material. The headband shall be designed to be flexible or adjustable and sit securely on the back of the head. The headband assembly shall not cause any discomfort nor exhibit any insecurity when tested in accordance with ISO 18526-3:2020, 6.5.

4.8 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 8 as appropriate.

5.2 Transmittance and filter categories

Depending upon the mean luminous transmittance $\tau_{v D65}$ at their reference points, lenses for surface swimming use shall be attributed to one of five filter categories.

The ranges of 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 6](#). An overlap of the transmittance values shall be not more than $\pm 2\%$ (absolute) between the categories 0, 1, 2 and 3. There is no overlap in transmittance values between categories 3 and 4.

If the supplier declares a luminous transmittance value, the maximum deviation for this value shall be $\pm 3\%$ absolute for the transmittance values falling in categories 0 to 3 and $\pm 30\%$ relative to the stated value for the transmittance values falling in category 4.

When tested according to ISO 18526-2:2020, Clause 8, the solar UV-A, $\tau_{SUV A}$, solar UV-B, $\tau_{SUV B}$, and mean spectral 380 nm 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 point of the lens(s).

Table 1 — Transmittance requirements for swimming eyewear
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Tint category	Wavelength range from 280 nm to 400 nm			Visible spectral range
	Maximum solar UV-B transmittance $\tau_{SUV B}$ 280 nm $\leq \lambda \leq$ 315 nm	Maximum solar UV-A transmittance $\tau_{SUV A 380}$ 315 nm $\leq \lambda \leq$ 380 nm	Mean 380 nm to 400 nm spectral transmittance $\tau_{m380-400}$ 380 nm $\leq \lambda \leq$ 400 nm	Luminous transmittance $\tau_{v D65}$ 380 nm $\leq \lambda \leq$ 780 nm
SW0	0,05 $\tau_{v D65}$	0,50 $\tau_{v D65}$	0,75 $\tau_{v D65}$	$\tau_{v D65} > 80\%$
SW1				$43\% < \tau_{v D65} \leq 80\%$
SW2		0,25 $\tau_{v D65}$	0,50 $\tau_{v D65}$	$18\% < \tau_{v D65} \leq 43\%$
SW3				$8\% < \tau_{v D65} \leq 18\%$
SW4				$3\% < \tau_{v D65} \leq 8\%$

NOTE Some national requirements stipulate a different requirement for the long wavelength limit of UV-A.

5.3 General transmittance requirements

5.3.1 Uniformity of luminous transmittance and transmittance matching

Lenses that are intended to be uniformly tinted shall appear to be visually uniform within a circle $(30,0^{+0,5})$ mm in diameter centred on the reference points or to the edge of the lens less the marginal zone 3 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 shall not be greater than 15 % (relative to the higher transmittance), except for tint category SW4 where it shall not be greater than 20 %.

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

5.3.2 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 18526-2:2020, 7.4.1.4 shall be used.

5.4 Special transmittance requirements

5.4.1 Photochromic lenses

Photochromic lenses shall meet the transmittance requirements of ISO 12312-1:2013, 5.3.4.1.

5.4.2 Polarizing lenses

Polarizing lenses shall meet the transmittance requirements of ISO 12312-1:2013, 5.3.4.2.

5.5 Claimed solar absorption/transmittance properties (optional)

5.5.1 General

In the case where specific transmittance values are claimed, these claims shall be according to [5.5.2](#) and [5.5.3](#).

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5.5.2 Solar blue-light absorption/transmittance

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

5.5.3 Solar UV absorption/transmittance

Requirements for the maximum transmittance of lenses in UV-A and UV-B are given in [Table 1](#). In cases where it is claimed that eyewear reaches a certain percentage of UV absorption or UV transmittance better than the requirement in [Table 1](#), the corresponding requirements shall apply.

- a) Solar UV absorption - In the case where it is claimed that a lens has x % solar UV absorption, the solar UV transmittance of the lens τ_{SUV} calculated 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 % solar UV transmittance, the solar UV transmittance of the lens τ_{SUV} calculated according to ISO 18526-2:2020, 8.3 shall not exceed $(x + 0,5)$ %.
- c) Solar UV-A absorption - In the case where it is claimed that a lens has x % solar UV-A absorption, the solar UV-A transmittance of the lens τ_{SUVA} calculated according to ISO 18526-2:2020, 8.4 shall not exceed $(100,5 - x)$ %.