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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

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

Reference number
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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).

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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.

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

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

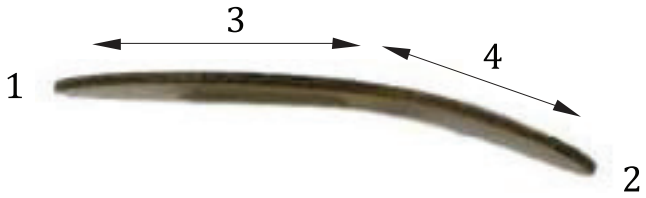
3.4
water seal
water gasket
water cushion
sealing material typically made of a soft or semi-rigid material attached or adhered to the *eyecup* (3.3) to assist sealing between the face and the eyewear

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

Eyewear[1)] 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:

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; and

d) 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 $(3,0^{0}_{-0,5})$ 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. Outside this zone, including on any temporal flange, small isolated material and/or surface defects are acceptable.

4.5 Headform(s)

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 ±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 ±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 tested according to ISO 18526-2:2020, Clause 8, the solar UV-A, τ_{SUVA}, solar UV-B, τ_{SUVB}, and mean spectral 380 nm 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 point of the lens(s).

Table 1 — Transmittance requirements for swimming eyewear

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	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
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 $\left(30{,}0^{+0{,}5}_{0}\right)$ 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.

5.5.2 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 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) %.

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

e) Solar UV-B absorption – In the case where it is claimed that a lens has x % solar UV-B absorption, the solar UV-B transmittance of the lens τ_{SUVB} calculated according to ISO 18526-2:2020, 8.5 shall not exceed (100,5 – x) %.

f) Solar UV-B transmittance – In the case where it is claimed that a lens has less than x % solar UV-B transmittance, the solar UV-B transmittance of the lens τ_{SUVB} calculated according to ISO 18526-2:2020, 8.5 shall not exceed (x + 0,5) %.

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

5.5.4 Anti-reflective coated lenses (optional)

In the case where lenses are claimed to be anti-reflective coated, the luminous reflectance ρ_v of the lens, measured from the eye-side according to ISO 18526-2:2020, Clause 13 with the specular-included geometry specified in ISO 18526-2:2020, 12.2.2 and using CIE Standard Illuminant D65 according to ISO 11664-2, shall be less than 2,5 %.

NOTE This optional claim is applicable to lenses having an anti-reflective coating on the back surface.

5.5.5 Reduced reflection coated lenses (optional)

In the case where lenses are claimed to have reduced reflections, the luminous reflectance ρ_v of the lens, measured from the eye-side according to ISO 18526-2:2020, 12.2.2 with the specular-included geometry specified in ISO 18526-2:2020, Clause 13 and using CIE Standard Illuminant D65 according to ISO 11664-2, shall be less than 8,0 %.

NOTE This optional claim is applicable to tint category SW1 lenses having a mirror coating on the front surface and an anti-reflective coating on the back surface to reduce the increased inter-reflections due to the mirror coated front surface.

6 Scattered light

When tested in accordance with ISO 18526-2:2020, 14.1, the percentage of wide angle scattered light shall not exceed the value of 3 %, when measured according to ISO 18526-2:2020, 14.1.

7 Refractive power and prismatic power

7.1 Non-prescription nominally plano or afocal lenses

The complete eyewear shall be tested in the as-worn position in accordance with ISO 18526-1:2020, 6.1.

The interpupillary distance(s) shall be appropriate to headform(s) that is/are used for testing, according to ISO 18526-4:2020, Tables 2 and 3.

7.1.1 Refractive power

The spherical power and cylindrical power at the left and right reference points shall not exceed the tolerances given in Table 2.

Table 2 — Spherical and cylindrical power for afocal lenses

Spherical power dioptres (D) Mean value of the optical power values (F_1, F_2) in the two principal meridians. $(F_1 + F_2)/2$	**Cylindrical power** dioptres (D) Absolute difference between the optical power values (F_1, F_2) in the two principal meridians. $\|F_1 - F_2\|$	**Difference in power** dioptres (D) The maximum difference between the measured spherical powers of the right and left lenses (F_R, F_L). $\|F_R - F_L\|$
±0,18	≤0,18	≤0,25

7.1.2 Spatial deviation

If during the measurements using the telescope, a doubling or other aberration of the image is observed, then the lenses shall be tested at the reference points according to the test method in ISO 18526-1:2020, 6.3, over the minimum optical diameter specified in 9.1. The lens shall be free of rapid or irregular distortions likely to impair vision.

7.1.3 Prism imbalance

The complete eyewear shall be tested in the as-worn position according to the test method in ISO 18526-1:2020, 6.2.

The prism imbalance shall not exceed the values in Table 3.

Table 3 — Prism imbalance

Horizontal		**Vertical**
Base out prism dioptres (Δ)	Base in prism dioptres (Δ)	prism dioptres (Δ)
1,00	0,25	0,25

7.2 Non-prescription mass-produced powered lenses

When tested in accordance with ISO 21987:2017, the back vertex spherical power and cylindrical power shall not exceed the tolerances given in Table 4 in relation to the power(s) claimed by the manufacturer, where F_1 and F_2 are the powers in the two principal meridians of the lens.

NOTE The manufacturer can specify different powers in the two lenses.

Table 4 — Spherical and cylindrical power for mass-produced corrective eyewear

Nominal powers dioptres, D	**Spherical power** Mean value of the optical power values (F_1, F_2) in the two principal meridians. $(F_1 + F_2)/2$ dioptres (D)	**Cylindrical power** Absolute difference between the optical power values (F_1, F_2) in the two principal meridians. $\|F_1 - F_2\|$ dioptres (D)
≤|6,00|	±0,25	≤0,25
>|6,00|	±0,37	≤0,37

7.3 Prescription lenses

7.3.1 Spherical and cylindrical power

Mounted prescription lenses shall satisfy the requirements of ISO 21987:2017, 5.3.1 to 5.3.4, when tested according to the appropriate sub-clauses in ISO 21987:2017, Clause 6.

7.3.2 Prismatic power of unmounted lenses

The prescription lenses shall be tested at the reference point according to ISO 8980-1:2017, 6.4, and ISO 8980-2:2017, 6.4.

7.3.3 Prism imbalance for mounted prescription lenses

The prism imbalance (relative prism error) shall satisfy the requirements of ISO 21987:2017, 5.3.5 or 5.3.6, as appropriate.

8 Mechanical strength

8.1 General

The eyewear shall be meet the requirements of the Strength Level 2 (22 mm nominal diameter steel ball of 43 g minimum mass falling from $\left(1{,}27^{+0{,}03}_{0{,}00}\right)$ m according to ISO 18526-3:2020, 7.1. The impacts shall be directed to within 10 mm of the two reference points on the lenses. The test shall be carried out at (23 ± 5) °C.

8.2 Failure criteria after impact

When tested according to ISO 18526-3:2020, 7.3, the following defects of the lenses (plano and prescription), eyewear or frame shall not be allowed when inspected according to ISO 18526-3:2020, 6.1:

a) cracking through the entire thickness into two or more pieces;

b) the eyewear separates into two or more pieces;

c) the lens has become dislodged from its normal position;

d) material becomes detached from the surface opposite to that impacted;

e) the ball passes through the eyewear; or

f) an indication that there has been contact of the ball or the eyewear with the eye.

This requirement also applies to the eyecup portions of complete eyewear where the eyecup and lenses are integral parts of each other.

Replacement lenses shall be tested after being mounted in the frame type for which they are intended in accordance with ISO 18526-3:2020, 7.3.1.

9 Other requirements for lenses

9.1 Minimum optical aperture

9.1.1 Recreational and competitive use

When measured on the outside surface with a precision millimetric rule or equivalent device, the minimum optical aperture on the horizontal centreline shall be as follows:

a) eyewear for headforms 1-S, 1-M, 1-L, 2-S, 2-M and 2-L: 23 mm;

b) eyewear for headforms 1-C6, 1-C12, 2-C6 and 2-C12: 20 mm.

NOTE The optical aperture does not include the temporal flange (if any) - see 3.6.

9.1.2 Specialist competitive use (optional)

Some eyewear that is intended for specialist competitive use may not meet the requirements of 9.1.1. This eyewear shall be accompanied with the warning in 12.3. o).

9.2 Field of view

When tested in accordance with ISO 18526-3:2020, 6.2 the field of view shall be the minima set out in Table 5. A transparent frame and the temporal flange can be included in the field of view.

Table 5 — Minimum field of view

Field of view	Minimum	
	Eyewear with non-prescription and mass-produced corrective lenses	Prescription eyewear
Temporal	60°	50°
Nasal	30°	30°
Superior	30°	25°
Inferior	30°	25°

9.3 Temporal flange lenses

Across the length of the optical aperture as defined in 9.1, temporal flange lenses shall be flat or have a shallow uniform curve.

Across the junction with the temporal flange, the thickness of the lens shall remain substantially uniform across the entire surface to avoid changes in focal power occurring. The curvature angle or arc of the curved section of the lens shall remain uniform without angular irregularities.

The angle of the temporal flange to the optical aperture shall not exceed an angle of 60 °.

9.4 Resistance to fogging (optional)

9.4.1 Pre-conditioning

Follow one cycle of any manufacturer's instructions for cleaning and disinfection, if provided with the eyewear. If instructions are not provided, the eyewear shall be preconditioned as follows:

— immerse in de-ionized water for (10 ± 5) s maintained at (25 ± 2) °C;

— shake dry; and

— wait $\left(60^{+10}_{0}\right)$ s.

9.4.2 Testing

When claimed to be anti-fog and when tested according to ISO 18526-3:2020, 6.11, with the modified pre-conditioning defined in 9.4.1, the lens shall remain fog-free for a period of at least 30 s. An initial fogging for ≤0,5 s shall not constitute a failure.

NOTE This is a test of the lens alone. There is no accepted test for the resistance to fogging of assembled eyewear under all conditions of use.

10 Other requirements

10.1 Leakage

The purpose of this requirement is to assess leakage between the components of the eyewear and not the seal between the eyewear and the face of the wearer.

When tested in accordance with 11.1, the pressure shall not rise by more than 0,3 kPa after 10 s and 3,0 kPa after 20 s.

NOTE These pressures correspond to approximately 0,2 cm Hg and 2,0 cm Hg respectively.

10.2 Compressive strength of eyewear

When tested in accordance with 11.2, eyewear shall not fracture or splinter.

10.3 Adhesion of water seal to eyecup

When tested in accordance with 11.3, no part of the water seal shall become detached from the eyecup.

10.4 Headband

10.4.1 Adjustment

The eyewear should be adjustable by the user to be held in place sufficiently for use and to assist in providing a seal around the eyes.

NOTE This can be by providing an adjustment facility or elasticity in the headband.

10.4.2 Resistance to slipping

When tested in accordance with 11.4, the total amount of slippage of the headband through the fastening device(s) shall not exceed 6 mm.

10.4.3 Resistance to breaking

When tested in accordance with 11.5, the headband shall not tear or break.

10.5 Nosebridge strap

If the nosebridge strap is supplied as a separate item, it shall be adjustable by way of length or by supplying separate interchangeable nosebridge straps with the eyewear.

NOTE This is to allow correct fitting around the nose.

When tested in accordance with 11.6, the nosebridge strap shall neither break nor slip through its retainer.

11 Test methods

11.1 Leakage

11.1.1 Apparatus

11.1.1.1 Soft cylindrical surface, with a radius of curvature of (135 ± 5) mm and a nominal width of 210 mm and height of 100 mm and with connections to the vacuum chambers (11.1.1.2). See Figure 2. If the whole block is not made of the soft material, then the surface of soft material shall be at least 5 mm thick.

NOTE Solid (not foam) silicone- or thermoplastic-rubber compounds and other soft polymers have been found to be appropriate.

11.1.1.2 Vacuum connections, at each eye location, independently controlled and with a nominal internal diameter of 5 mm and nominal total length of 200 mm between the gauges, mounting surface and non-return valves.

NOTE 1 Independent control can be by means of separate systems or the use of non-return valves.

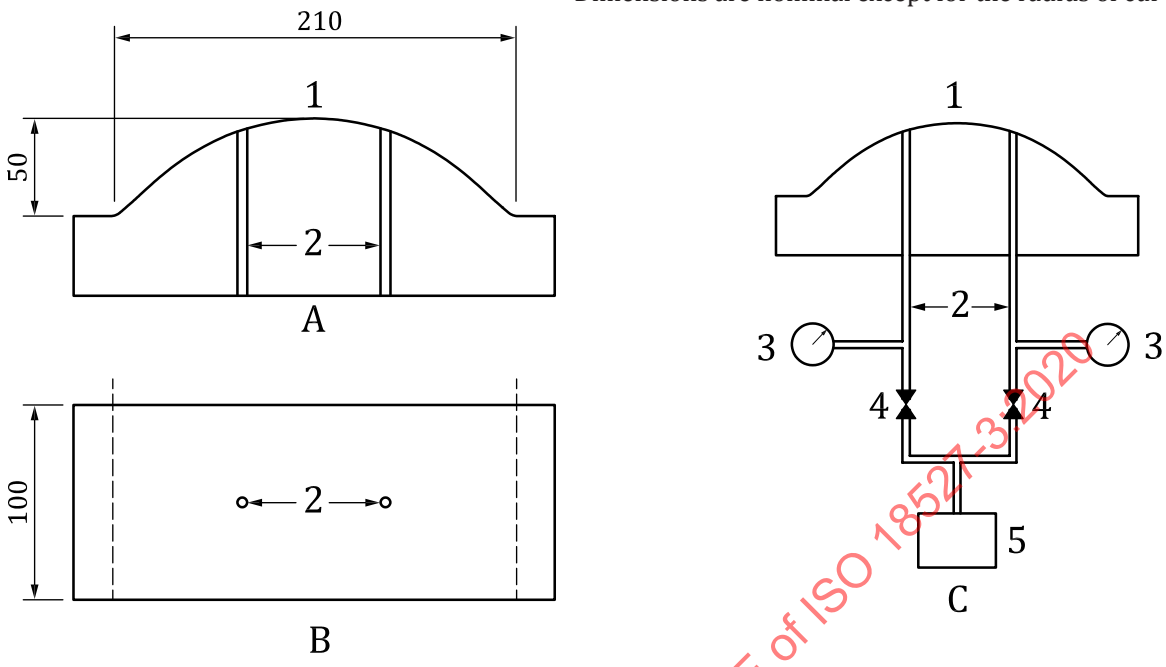
NOTE 2 The nominal dimensions of the vacuum connections ensure that the volume in the connections is of the same order as the volume contained between the eyewear and the cylindrical surface on which the eyewear is mounted (which varies with the eyewear).

11.1.1.3 Vacuum pump(s), capable of reducing the pressure behind each eyecup independently to less than 40,0 kPa.

11.1.1.4 Vacuum gauges, for each chamber, capable of measurement of pressure with an uncertainty of measurement ≤0,1 kPa.

See Figure 3 for an example of the equipment layout.

Dimensions are nominal except for the radius of curvature



Key

1	cylindrical surface radius of curvature = (135 ± 5) mm	A	elevation view
2	connection to vacuum pump nominal 5 mm internal diameter	B	plan view
3	vacuum gauges	C	schematic
4	non-return valves		
5	vacuum pump		

Figure 2 — Example of equipment for measuring leakage

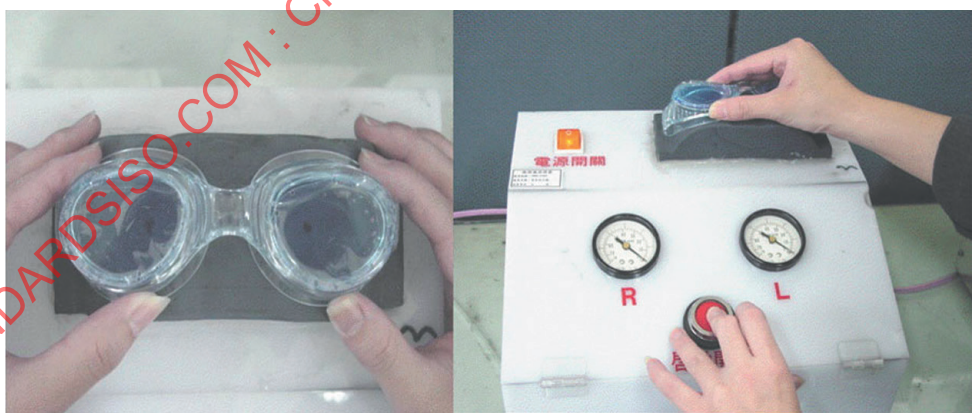


Figure 3 — Example of the equipment layout for measuring leakage

11.1.2 Procedure

— Place the eyewear on the soft-surfaced test jig (11.1.1.1) with air-holes connected to the vacuum chambers (11.1.1.2) and vacuum pump(s) (11.1.1.3).

— Retain the eyewear on the curved jig, then turn on the vacuum pump (11.1.1.3) until it reaches a stable pressure that is less than 40,0 kPa.

— Record the vacuum gauge (11.1.1.4) reading.

— Turn off the pump (11.1.1.3), and record the vacuum gauges readings (11.1.1.4) after 10 s and then 20 s.

11.1.3 Report

Record and report the pressure drop at 10 s and 20 s after the pump is turned off.

11.2 Compressive strength of eyewear

11.2.1 Apparatus

11.2.1.1 Steel support, with a flat face and capable of supporting the eyewear as follows:

a) flat with the outer face of the eyecups facing upwards;

b) on edge.

11.2.1.2 Circular steel plate, with diameter (50 ± 2) mm, thickness (15 ± 1) mm, covered by a (2,0 ± 0,1) mm thick coating of IRHD hardness, according to ISO 48-2, of (80 ± 5). This is held horizontally above the steel support (11.2.1.1) by means of a jig, e.g. a woodworking vice orientated with jaws horizontal.

11.2.1.3 Weights, or other means of applying a force of (600 ± 5) N to the eyecup using the circular steel plate (11.2.1.2).

11.2.2 Procedure

11.2.2.1 Samples

Use a new sample for testing to 11.2.2.2 and 11.2.2.3.

11.2.2.2 Eyewear flat with lenses and eyecups facing upwards

— Place the eyewear in the steel support flat [11.2.1.1 a)] with the outer face of the eyecups facing upwards.

— Apply a compression force of (600 ± 5) N (11.2.1.3) through the circular steel plate (11.2.1.2) to one of the eyecups for (60 ± 5) s.

— Repeat the procedure for the second eyecup.

11.2.2.3 Eyewear on edge

— Place the eyewear in the steel support [11.2.1.1 b)] on edge.

— Apply a compression force of (600 ± 5) N (11.2.1.3) through the circular steel plate (11.2.1.2) to the edge of the eyecup for (60 ± 5).

— Repeat the procedure for the second eyecup.

11.2.3 Test report

Examine the eyewear according to ISO 18526-3:2020, 6.1 and report any fracturing or splintering.

11.3 Adhesion of a foam-style water seal to the eyecup

11.3.1 Apparatus

11.3.1.1 Container of still, potable water, maintained at (30 ± 2) °C of sufficient dimension to contain the test sample.

11.3.1.2 Weights, to hold the test sample submerged.

11.3.2 Procedure

— Weight the eyecup and water seal assembly and submerge it in the container of water (11.3.1.1).

— Leave the assembly submerged for (24 ± 4) h.

— Remove the assembly from the water and, within 5 min, apply a tensile force of (2 ± 0,5) N to the water seal, in a direction perpendicular to the eyecup.

— Repeat at three other positions distributed around the edge of the cup.

11.3.3 Test report

Examine the eyewear according to ISO 18526-3:2020, 6.1, and report any detachment of the water seal from the eyecup.

11.4 Slip resistance of the headband

11.4.1 Apparatus

11.4.1.1 Container of still, potable water, maintained at (30 ± 2) °C of sufficient dimension to contain the test sample.

11.4.1.2 Weights, to hold the test sample submerged.

11.4.1.3 Pen, with waterproof ink.

11.4.1.4 Two half-cylindrical surfaces, of diameter (135 ± 30) mm of nominal length 200 mm. See Figure 4.

11.4.1.5 Device, to apply a load, of (10,0 ± 0,5) N for 60 cycles within a period of (300 ± 10) s.

11.4.1.6 Means of measuring, the slippage with an uncertainty of measurement not greater than 0,5 mm.

11.4.2 Procedure

— Using waterproof ink, (11.4.1.3) make two marks on the headband at the points where it enters the fastening devices.

— Immerse the eyewear in still, potable water (11.4.1.1) at (30 ± 2) °C with the weights (11.4.1.2) for 10 min, and ensure that all parts are fully wet.

— Remove the eyewear from the water and fit onto the two half-cylindrical surfaces (11.4.1.4).

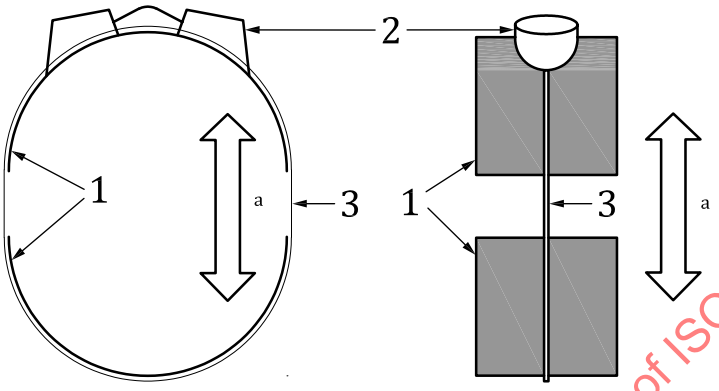
— Stretch the headband over the cylinder to simulate putting on the eyewear in normal use.

— Expand the headband by gradually applying a load of (10,0 ± 0,1) N (11.4.1.5) to the lower half-cylinder for 60 cycles within a period of (600 ± 10) s.

— Observe for the presence of any abnormality of the headband.

— Within 30 s of completing the loading, remove the eyewear from the cylinder by sliding it up and off.

— Record any displacement, in millimetres, of the marks from where the headband enters the fastening devices.



Key

1 half-cylindrical surfaces radius of curvature = (135 ± 30 mm)
2 eyewear
3 strap
a Applied load (downwards on the lower portion or upwards on the upper portion or a combination of both).

Figure 4 — Illustration of loading system for the test of slip resistance of the headband

11.4.3 Test report

Report the mean displacement, in millimetres, of the marks on the right and left sides to where the headband now enters the fastening devices.

11.5 Method for determining the strength of the headband

11.5.1 Apparatus

11.5.1.1 Elongation tensile testing device, capable of applying a force to provide the necessary extension.

NOTE 40 N has been found to be sufficient capability.

11.5.2 Procedure

— Slowly and smoothly, apply a force to extend the headband, increasing the force until the headband length is extended by (190 ± 10) mm.

— Record any breakage, splitting or tearing.

11.5.3 Test report

Report any breakage, splitting or tearing.

11.6 Method for determination of the tensile strength and slip resistance of the nosebridge strap

11.6.1 Apparatus

11.6.1.1 Container of still, potable water, at (30 ± 2) °C.

11.6.1.2 Device, capable of applying a tensile load of (40,0 ± 0,5) N.

11.6.2 Procedure

— Adjust the nosebridge strap to its greatest length, if it is adjustable.

— Dip the nosebridge strap and retainers of the eyewear into still, potable water (11.6.1.1) for at least 10 s.

— Within 30 s after removal from the water and with the eyewear maintained in the normal wearing position, apply a tensile load of (40,0 ± 0,5) N (11.6.1.2) to the eyecups in a direction along the main axis of the nosebridge strap.

11.6.3 Test report

Record any separation of the nosebridge strap and a retainer and/or any failure of the retainers to retain an adjustable nosebridge strap.

12 Labelling and information to be supplied by the manufacturer

12.1 Complete eyewear

When assessed by visual inspection according to ISO 18526-3:2020, Clause 8, all markings shall be clear and sufficiently durable to remain legible throughout the intended lifetime of the product.

The marking shall be fully visible when the complete eyewear is assembled. The marking shall not encroach into the minimum field of view. If the lens and eyecup form a single unit, the complete marking shall be applied to the eyecup or one of the lenses.

12.2 Mandatory markings on swimming eyewear

The following information shall be legibly and permanently marked on the eyewear:

a) manufacturer's identifying mark or manufacturer's trademark;

b) the number of this document, i.e. ISO 18527-3:2020.

12.3 Information to be supplied by the manufacturer with each eyewear

The manufacturer shall provide information for the user with each eyewear. This information shall be in the form of markings on the frame or separate information on labels, packaging, etc. that accompanies the eyewear. Where pictograms are used, an explanation of the significance of these pictograms shall also be supplied with each pair of eyewear.

This information shall include:

a) name and address of the manufacturer or supplier;

b) identification of model;

c) the applicable headform(s) and size(s);

d) type of lens if photochromic and/or polarizing;

e) the tint category (in both the faded and darkened states for photochromic lenses), preferably on the frame, or on the lens;

f) a description of the tint category in form of the designation as given in Table 6;

g) the markings and information as required in ISO 12312-1:2013, 12.1 g) to j);

h) the number of this document (ISO 18527-3);

i) instructions for care and cleaning; warning(s) about cleaning or other products that might damage the eyewear; list of damaging products not suitable for cleaning;

j) instructions on how to assemble the eyewear, if applicable, e.g. if the water seal and eyecups or nosebridge strap are provided separately, the method of attachment;

k) adjustment of headband and nosebridge strap;

l) instructions on how to put on, fit and remove the swimming eyewear. See Annex A for an example;

m) an eye safety warning; “WARNING: Do not pull eyecups away from face as they may spring back and cause eye damage.”;

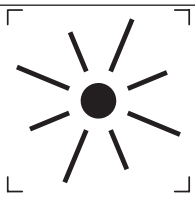
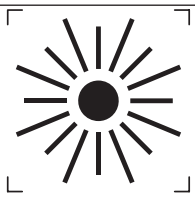
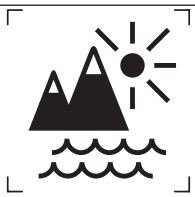
n) a statement that the swimming eyewear are 'FOR SURFACE SWIMMING ONLY';

o) if the eyewear does not conform with 9.1.1, the statement “FOR SPECIALIST COMPETITIVE USE ONLY”; and

p) if the luminous transmittance is less than 8 %, a statement that the swimming eyewear is suitable for outdoor use in bright environments only.

NOTE An example of instructions for fitting, adjustment and removal is given in Annex A.

Table 6 — Description of tint categories and assigned symbols

Tint category	Description	Usage	Symbol
SW0	Light tint eyewear	Very limited reduction of sunglare Some UV protection Intended for indoor use	 IEC 60417-5955
SW1		Limited reduction of sunglare Some UV protection Intended for indoor use	 ISO 7000-2948
SW2	General purpose eyewear	Good protection against sunglare Good UV protection Intended for outdoor use	 ISO 7000-2949
SW3		High protection against sunglare Good UV protection Intended for outdoor use	 ISO 7000-2950
SW4	Very dark special purpose eyewear	High protection against extreme sunglare Good UV protection For outdoor use in extremely bright conditions	 ISO 7000-2951

The wording related to ultraviolet may be replaced with a numerical claim according to 5.5.3.

NOTE 1 Either the wording and/or the pictograms can be used.

NOTE 2 Specific national or regional regulations with regard to information to be provided might have additional mandatory requirements.

12.4 Additional information to be available from the manufacturer

The following information shall be available from the manufacturer or supplier on request:

a) explanation of the marking and of the trademarks that are not universally recognized or foreseen by the users of this document;

b) the position of the reference point when this is different from the one defined in this document;