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Eye and face protection for occupational use - Part 1: General requirements (ISO/DIS 16321-1:2018)

Augen- und Gesichtsschutz für betriebliche Anwendungen - Teil 1: Allgemeine Anforderungen (ISO/DIS 16321-1:2018)

Protection des yeux et du visage à usage professionnel - Partie 1: Exigences générales (ISO/DIS 16321-1:2018)

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Eye and face protection for occupational use —

Part 1:
General requirements

Protection des yeux et du visage pour les loisirs —

Partie 1: Exigences générales

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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This document cancels and replaces the ISO 4849:1979, ISO 4851:1979, ISO 4852:1979 and ISO 4853:1979, which has been technically revised.

A list of all parts in the ISO 16321 series can be found on the ISO website.

Introduction

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

Eye and face protection for occupational use —

Part 1: General requirements

1 Scope

This document specifies general requirements for eye and face protectors. These protectors are intended to provide protection for the eyes and faces of persons against common occupational hazards such as impacts from flying particles and fragments, optical radiation, dusts, splashing materials, molten metals, heat, flame, hot solids, harmful gases, vapours and aerosols.

Additional requirements for eye and face protectors used during welding and related techniques and for mesh protectors are given in ISO 16321-2 and ISO 16321-3.

This document applies to all afocal (plano) and prescription lens protectors and components.

This document also applies to those products of eye and face protection used for occupational-type tasks but not performed as part of an occupation, e.g. "do-it-yourself".

This document does not apply to:

— Protectors specifically intended for protection against sunlight for which ISO 12312 series applies;

— protectors for medically prescribed applications (not occupational); e.g. eye protection for severe dry eye, tints prescribed for medical conditions;

— protectors intended to control exposure of the eyes of patients during diagnosis or treatment (e.g. ISO/DTR 22463);

— protectors for use during medical or e.g. aesthetic applications, e.g. intense light sources (ILS) for which ISO 12609 series applies;

— protectors specifically intended for sports for which ISO 18527 series applies;

— laser protectors for which ISO 19818 applies;

— face protectors intended for live-working to protect against short-circuit electric arcs for which IEC 62819 applies;

— protectors intended to protect against ionizing radiation, e.g. X-rays, for which IEC 61331-3 applies.

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

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

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

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

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

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

ISO 11664-1:2007, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO 11664-2:2007, *Colorimetry — Part 2: CIE standard illuminants*

ISO 16034, *Ophthalmic optics — Specifications for single-vision ready-to-wear near- vision spectacles*

ISO 80079-36:2016, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

3 Terms and definitions

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

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

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

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

For the purposes of this document, "protector" is used as a synonym for spectacles, goggles, face shields and eye guards used for eye and/or face protection.

4 General requirements for protectors

4.1 Ambient temperatures

The protectors described in this document are intended for use at normal ambient temperatures (23 ± 5) °C. Where critical aspects of protection are likely to be affected by temperatures towards the extremes of the normal range of occupational environments (from -5 °C to +55 °C), physical and mechanical requirements are included (sometimes optionally) to ensure protection is not compromised. Physical and mechanical requirements are provided for validation of claims for protection at extremes of temperature.

4.2 Physiological compatibility

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 from the protector that can come into prolonged contact with the wearer, shall be reduced

1) Under preparation (Stage at the time of publication ISO/DIS 18526-1)

2) Under preparation (Stage at the time of publication ISO/DIS 18526-2)

3) Under preparation (Stage at the time of publication ISO/DIS 18526-3)

4) Under preparation (Stage at the time of publication ISO/DIS 18526-4)

by the manufacturer to within the limits of any existing regulatory requirement. Special attention shall be given to substances which are allergenic, carcinogenic, mutagenic or toxic to reproduction.

NOTE 1 Excessive pressure due to a poor fit on the face, chemical irritation or allergy is 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 provide appropriate information on potential harmful characteristics of materials contained in the protector.

The following are examples of documents that can be provided:

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 restriction of certain chemical substances should be observed, for example release of nickel in Europe.

4.3 Construction and adjustment

Protectors shall be free from projections, sharp edges or other features likely to cause discomfort or injury during use.

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

Any adjustment system incorporated in the protector shall be designed and manufactured to 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.

4.4 Cleaning and disinfection

The procedure for cleaning and disinfection, as described in the information to be supplied by the manufacturer, shall not impair the performance of the protectors. All the tests shall be carried out after subjecting the protector to the cleaning and/or disinfection procedures according to the information to be supplied by the manufacturer.

4.5 Headforms

Unless the manufacturer specifies the headforms according to ISO 18526-4 that are compatible with the protector, the test methods where headforms are required shall use the headform 1-M according to ISO 18526-4 as the default.

5 Geometrical optical requirements for protectors

5.1 Field of view

Protectors, in the as-worn position, shall have a minimum unobstructed field of view in front of each eye of 30° temporally and nasally in the horizontal meridian, and 30° superiorly and inferiorly in the vertical meridian, when measured at the centre at the corneal apex of the headform according to ISO 18526-3:—, 6.2.

Protectors used for driving shall have a minimum unobstructed field of view in front of each eye of 60° temporally and 30° nasally in the horizontal meridian and 30° superiorly and inferiorly in the vertical meridian, when measured at the centre at the corneal apex of the headform according to ISO 18526-3:—, 6.2.

5.2 Refractive power and prismatic deviation for plano lenses

5.2.1 Spherical and cylindrical power

The lenses shall be tested at the reference points in the as-worn position according to ISO 18526-1:—, 6.1.

The spherical power and cylindrical power shall not exceed the tolerances given in Table 1.

Table 1 — Spherical, cylindrical power and prismatic deviation

Products	**Spherical power** **Mean of the focal power F in the two principal meridians.** $(F_1+F_2)/2$ dioptres	**Cylindrical power** **Absolute difference between the focal power F in the two principal meridians.** $\lvert F_1 - F_2 \rvert$ dioptres	**Additional requirements for mounted lenses, one-piece and visor types**	**Prismatic deviation of unmounted lenses (in any direction)** prism dioptres
plane automatic welding filters, plane passive welding filters, cover, or backing plates for welding helmets	± 0,06	0,06	The maximum difference between the measured spherical powers of the right and left lens shall not exceed 0,09 dioptres	0,12
eye shields, face shields, spectacles, goggles	± 0,12	0,12	The maximum difference between the measured spherical power of the right and left lens shall not exceed 0,18 dioptres	0,25

5.2.2 Spatial deviation

If during the measurements using the telescope method a doubling or other aberration of the image is observed, then the lenses shall be further assessed by the test method according to ISO 18526-1: —, 6.3. The lens shall be free of rapid or irregular distortions likely to impair vision.

5.2.3 Prismatic deviation for unmounted lenses covering one eye

The lenses shall be tested at the reference point in the as-worn position according to ISO 18526-1:—, 6.1.

The prismatic deviation shall not exceed the values given in Table 1.

5.2.4 Prism imbalance of complete eye protectors or lenses covering both eyes

The lenses shall be tested in the as-worn position according to ISO 18526-1:—, 6.2. Depending on the specified headforms, as defined in ISO 18526-4, the respective diaphragm LB_2 shall be used.

The prism imbalance shall not exceed the values in Table 2.

Table 2 — Prism imbalance

Products	Horizontal		Vertical
	Base out prism dioptres	Base in prism dioptres	prism dioptres
plane automatic welding filters, plane passive welding filters cover, or back plates for welding helmets	0,75	0,25	0,25
eye shields, face shields, spectacles, goggles	1,00	0,25	0,25

5.3 Mounted prescription lenses

5.3.1 Optical

The back vertex power, direction of cylinder axis, addition power or variation power, and prism imbalance shall satisfy the requirements of ISO 21987:2017, 5.3.

5.3.2 Positioning

The positioning for multifocal lenses, for position-specific single-vision lenses and power-variation lenses shall satisfy the requirements of ISO 21987:2017, 5.5.

5.4 Single-vision ready-to-wear near-vision lenses (with corrective lenses)

The optical power range, the optical power, the design reference points and prismatic power shall satisfy the requirements of ISO 16034:2002, 4.2, 4.3, and 4.4.

5.5 Enhanced optical performances (Optional requirement)

Enhanced optical performances for eye shields, face shields, spectacles and goggles may be claimed by the manufacturer if they fulfil the requirements given in Table 3 and 4.