SLOVENSKI STANDARD
SIST EN 166:1996

01-december-1996

Osebno varovanje oči - Specifikacije

Personal eye-protection - Specifications

Persönlicher Augenschutz - Anforderungen

Protection individuelle de l'oeil - Spécifications

Ta slovenski standard je istoveten z: **EN 166:1995**

ICS:

13.340.20 Varovalna oprema za glavo Head protective equipment

SIST EN 166:1996 **en**

EUROPEAN STANDARD **EN 166**

NORME EUROPÉENNE

EUROPÄISCHE NORM July 1995

ICS 13.340.10

Descriptors: Safety, accident prevention, eyes, eye-glasses, oculars, optical filters, specifications, operating requirements, characteristics, optical properties, designation, classifications, marking

English version

Personal eye-protection - Specifications

Protection individuelle de l'oeil - Spécifications

Persönlicher Augenschutz - Anforderungen

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Contents

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 85 "Eye-protective equipment" of which the secretariat is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 1996, and conflicting national standards shall be withdrawn at the latest by January 1996.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

0 Introduction

This standard deals with general considerations relating to eye-protectors, such as :

- designation ;
- classification ;
- basic requirements applicable to all eye-protectors ;
- various particular and optional requirements ;
- allocation of requirements, testing and application ;
- marking ;
- information for users.

1 Object

This standard specifies functional requirements for various types of personal eye-protectors.

The transmittance requirements for various types of filter oculars are given in separate standards (see clause 3).

2 Scope

This standard applies to all types of personal eye-protectors used against various hazards, as encountered in industry, laboratories, educational establishments, DIY activities, etc which are likely to damage the eye or impair vision, with the exception of nuclear radiation, X-rays, laser beams and low temperature infra-red (IR) radiation emitted by low temperature sources.

The requirements of this standard do not apply to eye-protectors for which separate and complete standards exist, such as laser eye-protectors, sunglasses for general use, etc unless such standards make specific reference to this standard.

Eye-protectors fitted with prescription lenses are not excluded from the field of application. The refractive power tolerances and other special characteristics dependent upon the prescription requirement are specified in ISO/DIS 8980-1 and ISO/DIS 8980-2.

3 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 165	Personal eye-protection - Vocabulary
EN 167:1995	Personal eye-protection - Optical test methods
EN 168:1995	Personal eye-protection - Non-optical test methods
EN 169	Personal eye-protection - Filters for welding and related techniques - Transmittance requirements and recommended utilisation
EN 170	Personal eye-protection - Ultraviolet filters - Transmittance requirements and recommended use
EN 171	Personal eye-protection - Infra-red filters - Transmittance requirements and recommended use
EN 172	Personal eye-protection - Sunglare filters for industrial use
EN 379	Specification for welding filters with switchable luminous transmittance and welding filters with dual luminous transmittance
ISO/DIS 8980-1	Ophthalmic optics - Uncut finished spectacle lenses - Part 1: Specifications for single vision and multifocal lenses
ISO/DIS 8980-2	Ophthalmic optics - Uncut finished spectacle lenses - Part 2: Specifications for progressive power spectacle lenses

4 Classification

4.1 Function of eye-protectors

The function of eye-protectors is to provide protection against :

- impacts of different severities ;
- optical radiations (wavelengths 0,1μm to 1000 μm) ;
- molten metals and hot solids ;
- droplets and splashes ;
- dust ;
- gases ;

- short circuit electric arc

or any combination of these.

4.2 Types of eye-protectors

(Refer to definitions given in EN 165).

4.2.1 Spectacles with or without side-shields

4.2.2 Goggles

4.2.3 Face-shields

NOTE : Face-shields normally incorporate a suitable headband, browguard, helmet, protective hood or other appropriate mounting device.

4.2.4 Welding hand-shield (hand-held device which protects the eyes, face and neck).

4.2.5 Welding helmet (device worn on the head, protecting the eyes, face, neck and all or part of the top of the head).

4.3 Types of ocular

4.3.1 Mineral oculars (glass).

4.3.1.1 Untoughened mineral oculars

4.3.1.2 Toughened mineral oculars - toughened chemically, thermally or by other processes to give superior resistance to impact in comparison with untoughened mineral oculars.

4.3.2 Organic oculars (plastic).

4.3.3 Laminated oculars : Oculars made in multiple layers joined together by a binder.

NOTE : All types of oculars may be further classified into filtering types (e.g. according to EN 169, EN 170, EN 171, EN 172 and EN 379). They may also be classified as oculars with corrective effect and oculars without corrective effect. They may also have coatings on their surface(s) to give additional characteristics.

5 Designation of filters

The transmittance characteristics of a filter are represented by a scale number.

The scale number is a combination of the code number and the shade number of the filter, joined together by a dash.

The scale number for welding filters does not include a code number, it comprises the shade number only.

Table 1 gives the designation of the various types of filters specified in this European Standard.

Table 1 : Scale numbers for filters

Welding filters	Ultraviolet filters		Infra-red filters	Filters for sunglare	
Shade number	Code number 2	Code number 3	Code number 4	Code number 5	Code number 6
Scale number					
1,2	2 - 1,2	3 - 1,2	4 - 1,2	5 - 1,1	6 - 1,1
1,4	2 - 1,4	3 - 1,4	4 - 1,4	5 - 1,4	6 - 1,4
1,7		3 - 1,7	4 - 1,7	5 - 1,7	6 - 1,7
2		3 - 2	4 - 2	5 - 2	6 - 2
2,5		3 - 2,5	4 - 2,5	5 - 2,5	6 - 2,5
3		3 - 3	4 - 3	5 - 3,1	6 - 3,1
4		3 - 4	4 - 4	5 - 4,1	6 - 4,1
4a					
5		3 - 5	4 - 5		
5a					
6			4 - 6		
6a					
7			4 - 7		
7a					
8			4 - 8		
9			4 - 9		
10			4 - 10		
11					
12					
13					
14					
15					
16					

Code number key :

2: Ultraviolet filter, colour recognition may be affected

3: Ultraviolet filter, good colour recognition

4: Infra-red filter

5: Sunglare filter without infra-red specification

6: Sunglare filter with infra-red specification

6 Design and manufacture

6.1 General construction

Eye-protectors shall be free from projections, sharp edges or other defects which are likely to cause discomfort or injury during use.

6.2 Materials

No parts of the eye-protector which are in contact with the wearer shall be made of materials which are known to cause any skin irritation.

6.3 Headbands

Headbands, when used as the principal means of retention, shall be at least 10 mm wide.

7 Requirements

All eye-protectors shall meet the basic requirements given in 7.1. Furthermore, according to their intended use, eye-protectors shall, if appropriate, meet one or more of the particular requirements given in 7.2. Optional requirements related to additional properties of eye-protectors are given in 7.3.

7.1 Basic requirements

7.1.1 Dimensions

The aperture of mounted oculars shall be such that a rectangle with minimum dimensions of 32 mm (horizontal length) X 25 mm (vertical length) can be described in full for each eye (pupillary distance = 64 mm).

7.1.2 Optical requirements

7.1.2.1 Spherical, astigmatic and prismatic refractive powers

The refractive powers of oculars shall be measured by the reference methods specified in clause 3 of EN 167:1995. This clause refers also to an optional method for use in specific circumstances; the details of this method are given in annex A of EN 167:1995.

7.1.2.1.1 Unmounted oculars covering one eye

The refractive power characteristics of unmounted oculars covering one eye shall be measured by the method specified in 3.1 of EN 167:1995.

The measurements of spherical, astigmatic and prismatic refractive powers shall be taken at the visual centre of the ocular corresponding to a nominal pupilar distance of 64 mm. If the visual centre is not known, the geometrical centre shall be used.

The permissible tolerances for oculars without corrective effect are given in table 2.

The permissible deviations for the vertex powers of oculars with corrective effect are specified in ISO/DIS 8980-1 and ISO/DIS 8980-2. Oculars that comply with ISO/DIS 8980-1 and ISO/DIS 8980-2 shall be categorised as class 1. For class 2, the deviations in vertex refractions may be 0,06 m^{-1} higher than for class 1.

Table 2 : Permissible tolerances for refractive powers of unmounted oculars without corrective effect covering one eye

Optical class	Spherical refractive power $\frac{D_1 + D_2}{2}$ (D, m^{-1})	Astigmatic refractive power $\lvert D_1 - D_2 \rvert$ (D, m^{-1})	Prismatic refractive power (Δ, cm/m)
1	± 0,06	0,06	0,12
2	± 0,12	0,12	0,12
NOTE : D_1 and D_2 are the refractive powers in the two principal meridians.			

7.1.2.1.2 Mounted oculars and unmounted oculars covering both eyes

The refractive power characteristics of unmounted oculars covering both eyes and of oculars mounted in spectacles, goggles or face-shields shall be measured by the method specified in 3.2 of EN 167:1995 at the visual centre of the ocular corresponding to a nominal pupilary distance of 64 mm.

The permissible tolerances for oculars without corrective effect are given in table 3.

The permissible deviations for vertex powers of oculars with corrective effect are as defined in 7.1.2.1.1. Deviations that would correspond to class 3 shall not be permitted.

NOTE : The difference in prismatic refractive power specified for an eye-protector depends not only on the prismatic refractive power of each ocular, but also on the position of the optical axis of the ocular in relation to the axis of vision, and therefore the shape of the frame. It is therefore necessary to use replacement oculars for which the difference in prismatic power remains within the permissible tolerance limits for the frame in question.

Table 3 : Permissible tolerances for refractive powers of mounted oculars without corrective effect and unmounted oculars without corrective effect covering both eyes

Optical class	Spherical refractive power $\frac{D_1 + D_2}{2}$ (D, m^{-1})	Astigmatic refractive power $\lvert D_1 - D_2 \rvert$ (D, m^{-1})	Difference in prismatic refractive power (Δ, cm/m)		
			Horizontal		Vertical
			Base out	Base in	
1	± 0,06	0,06	0,75	0,25	0,25
2	± 0,12	0,12	1,00	0,25	0,25
3	+ 0,12 - 0,25	0,25*)	1,00	0,25	0,25

NOTE : D_1 and D_2 are the refractive powers in the two principal meridians.

*) The axes of the principal meridians of the two oculars shall be parallel within ± 10°.

7.1.2.1.3 Cover Plates

The refractive powers of cover plates shall comply with the tolerances for optical class 1 given in tables 2 and 3.

7.1.2.2 Transmittance

7.1.2.2.1 Oculars without filtering action

If it is intended to use the oculars to protect the eyes against mechanical or chemical hazards only, their luminous transmittance shall be greater than 74,4 % when measured as given in clause 6 of EN 167 (based on CIE source A (2856 K)).

The measurement shall be made at the visual centre of the ocular corresponding to a nominal pupilar distance of 64 mm. If the visual centre is not known, the geometrical centre shall be used.