



SLOVENSKI STANDARD

oSIST prEN 166:2007

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Personal eye-protection - Specifications

Persönlicher Augenschutz - Anforderungen

Protection individuelle de l'oeil - Spécifications

Protection individuelle de l'oeil - Spécifications

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Ta slovenski standard je istoveten z: **prEN 166**
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English Version

Personal eye-protection - Specifications

Persönlicher Augenschutz - Anforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 85.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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Foreword

This document (prEN 166:2007) has been prepared by Technical Committee CEN/TC 85 “Eye protective equipment”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 166:2001.

This document 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).

For relationship with EC Directive(s), see informative Annex ZA which is an integral part of this document.

Annex A provides details of significant technical changes between this European Standard and the previous edition:

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1 Scope

This European Standard specifies functional requirements for various types of personal eye-protectors and incorporates general considerations 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.

The transmittance requirements for various types of filter oculars are given in separate standards (see clause 2).

This European 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 and laser beams.

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.

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The requirements of this standard apply to oculars for welding and allied processes but do not apply to equipment for eye and face protection for welding and allied processes, requirements for which are contained in EN 175.

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 EN ISO 8980-1 and EN ISO 8980-2.

2 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 apply 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 (including amendments).

EN 136, *Respiratory protective devices – Full face masks – Requirements, testing, marking.*

EN 165, *Personal eye-protection — Vocabulary.*

prEN 167:2007, *Personal eye-protection — Optical test methods.*

prEN 168:2007, *Personal eye-protection — Non-optical test methods.*

EN 169, *Personal eye-protection — Filters for welding and related techniques — Transmittance requirements and recommended utilisation.*

EN 170:2002, *Personal eye-protection — Ultraviolet filters — Transmittance requirements and recommended use.*

EN 171, *Personal eye-protection — Infrared filters — Transmittance requirements and recommended use.*

EN 172, *Personal eye-protection — Sunglare filters for industrial use.*

EN 175, *Personal protection — Equipment for eye and face protection during welding and allied processes.*

EN 379, *Specification for welding filters with switchable luminous transmittance and welding filters with dual luminous transmittance.*

EN ISO 6942, *Protective clothing. Protection against heat and fire. Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat.*

EN ISO 8980-1, *Ophthalmic optics — Uncut finished spectacle lenses - Part 1: Specifications for single-vision and multifocal lenses (ISO 8980-1:1996).*

EN ISO 8980-2, *Ophthalmic optics — Uncut finished spectacle lenses - Part 2: Specifications for progressive power lenses (ISO 8980-2:1996).*

EN ISO 8980-3, *Ophthalmic optics – Uncut finished spectacle lenses – Part 3 : Transmittance specifications and test methods (ISO 8980-3 :1999).*

3 Terms and definitions

For the purpose of this European Standard, the terms and definitions given in EN 165 and the following apply.

3.1 visual centre

the point on the ocular corresponding to the intersection of the horizontal and vertical planes through the pupil of the appropriate head-form specified in clause 17 of prEN 168:2007 when the eye-protector is fitted to it in accordance with the manufacturers instructions

3.2 radiant heat

longer wavelength infrared radiation (IR-B and IR-C) from low temperature sources, which is typically not associated with emission of significant quantities of visible radiation.

NOTE The emission spectrum of a radiating heat source is a function of the source temperature. Hotter sources emit predominantly at shorter wavelengths (<2000nm) covered by EN 171.

4 Classification

4.1 Function of eye-protectors

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

- impacts of different severities;
- optical radiations;
- 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

NOTE Refer to definitions given in EN 165.

4.2.1 Spectacles with or without lateral protection

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.

4.3 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 (for example 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	Infrared filters	Filters for sunglare	
No number code	Code number 2	Code number 4	Code number 5	Code number 6
Scale number				
1,2	2 – 1,2	4 – 1,2	5 – 1,1	6 – 1,1
1,4	2 – 1,4	4 – 1,4	5 – 1,4	6 – 1,4
1,7	2 – 1,7	4 – 1,7	5 – 1,7	6 – 1,7
2	2 – 2	4 – 2	5 – 2	6 – 2
2,5	2 – 2,5	4 – 2,5	5 – 2,5	6 – 2,5
3	2 – 3	4 – 3	5 – 3,1	6 – 3,1
4	2 – 4	4 – 4	5 – 4,1	6 – 4,1
5	2 - 5	4 - 5		
6		4 - 6		
7		4 - 7		
8		4 - 8		
9		4 - 9		
10		4 - 10		
11		4 - 11		
12		4 - 12		
13		4 - 13		
14		4 - 14		
15		4 - 15		
16		4 - 16		
<p>Code number key :</p> <p>2 Ultraviolet filter</p> <p>4 Infrared filter ;</p> <p>5 Sunglare filter without infrared specification ;</p> <p>6 Sunglare filter with infrared specification.</p> <p>Additional classifications :</p> <p>C = Ultraviolet filter with enhanced colour recognition in accordance with clause 5.3 of EN 170:2002</p> <p>R = Infrared filter with enhanced reflectance in accordance with clause 7.3.3 of this standard</p>				

6 Design and manufacturing requirements

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 over any portion which may come into contact with the wearer's head. Headbands shall be adjustable or self-adjusting.

7 Basic, particular and optional 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

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7.1.1 Field of vision

The size of the field of vision is defined in conjunction with the appropriate head-form described in clause 17 of prEN 168:2007.

Eye-protectors shall exhibit a minimum field of vision defined by the two ellipses in Figure 1 when placed and centered at a distance of 25 mm from the surface of the eyes of the appropriate head-form. The horizontal axis shall be parallel to and 0,7 mm below the height of the line connecting the centres of the two eyes.

The horizontal length of the ellipses shall be of 22,0 mm, the vertical width of the ellipses shall be 20,0 mm. The centre distance of the two ellipses shall be $d = c + 6$ mm, where c is the pupillary distance. The pupillary distance is 64 mm for the medium head-form and 54 mm for the small head-form, if not specified differently by the manufacture.

The test shall be carried out in accordance with clause 18 of prEN 168:2007.

Dimensions in millimetres

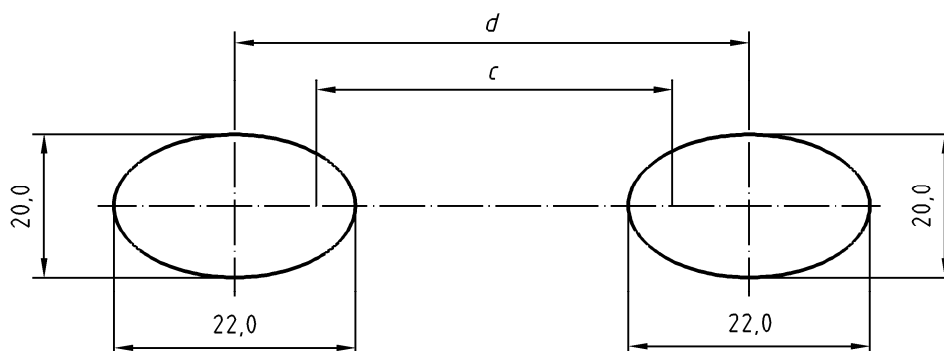


Figure 1 — Definition of the field of vision

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 prEN 167:2007. This clause refers also to an optional method for use in specific circumstances; the details of this method are given in annex A of prEN 167:2007.

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 prEN 167:2007 (non-corrective oculars), and by the methods specified in EN ISO 8980-1 (corrective oculars).

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 EN ISO 8980-1 and EN ISO 8980-2. Oculars that comply with EN ISO 8980-1 and EN ISO 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 $(D_1 + D_2)/2$ m ⁻¹	Astigmatic refractive power $ D_1 - D_2 $ m ⁻¹	Prismatic refractive power 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 mounted oculars or unmounted oculars covering both eyes shall be measured by the method specified in 3.2 of prEN 167:2007 at two positions on the ocular corresponding to the maximum and minimum PD over which the optical class of the device is met, as claimed by the manufacturer.

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.

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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 $(D_1 + D_2)/2$ m^{-1}	Astigmatic refractive power $ D_1 - D_2 $ m^{-1}	Difference in prismatic refractive power		
			cm/m		Vertical
			Horizontal		
			Base out	Base in	
1	$\pm 0,06$	0,06	0,75	0,25	0,25
2	$\pm 0,12$	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. For optical class 3 the axes of the principal meridians shall be parallel within $\pm 10^\circ$.

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

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7.1.2.2.1 Oculars without filtering action [oSIST prEN 166:2007](https://standards.iteh.ai/catalog/standards/sist/c00022e1-c9ed-4655-bc7a-)<https://standards.iteh.ai/catalog/standards/sist/c00022e1-c9ed-4655-bc7a->

Oculars intended to protect the eyes against mechanical or chemical hazards only, and cover plates, shall have a luminous transmittance greater than 74,4 % when measured as given in clause 6 of prEN 167:2007 (based on CIE source A (2856 K)).

7.1.2.2.2 Oculars with filtering action (filters) and housings for oculars with filtering action.

The transmittance of oculars with filtering action shall meet the requirements given in the specific standards relating to the various types of ocular (see 7.2.1).

Frames and housings of goggles and face-shields which claim to provide protection against optical radiation shall provide at least the same level of protection against optical radiation as given by a filter of any scale number declared usable with the eye-protector by the manufacturer or supplier. Testing shall be in accordance with clause 6 of EN 167:2004.

Frames and housings shall be designed so that no radiation can penetrate from the side unintentionally. This requirement is met if for the horizontal angle range α from -50° (nasal side) to $+90^\circ$ (temporal side) the vertical angle β range is protected within the following limit angles in degree ($^\circ$).

The upward limit β_u of the protected range shall be:

$$\beta_u = 55 - 0,0013 \cdot (\alpha - 12)^2 - 1,3 \cdot 10^{-6} \cdot (\alpha - 12)^4$$

The downward limit β_l of the protected range shall be:

$$\beta_l = -70 + 10^{-5} \cdot (\alpha - 22)^2 + 2,3 \cdot 10^{-6} \cdot (\alpha - 22)^4$$