

Personal eye-protection — Specifications

The European Standard EN 166:1995 has the status of a
British Standard

ICS 13.340.10

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- Department of Trade and Industry (National Physical Laboratory)
- Electricity Association
- Engineering Equipment and Materials Users' Association
- Federation of Manufacturing Opticians
- Flat Glass Manufacturers' Association
- Health and Safety Executive
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- Institution of Occupational Safety and Health
- Light Metal Founders' Association
- Manufacturing Science Finance
- Ministry of Defence
- National Radiological Protection Board
- Safety Equipment Association
- Safety Equipment Distributors' Association
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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 166	3
List of references	Inside back cover

National foreword

This British Standard has been prepared by Technical Committee PH/2 and is the English language version of EN 166:1995 *Personal eye-protection — Specifications* published by the European Committee for Standardization (CEN). EN 166 was produced as a result of international discussions in which the United Kingdom took an active part. It is based on ISO 4849:1981 *Personal eye-protectors — Specifications*.

The scope of this standard includes matters which are given in the specification clauses of BS 2092:1987 together with the schedule of tests given in appendix E of BS 2092:1987. It does not include matters which are given in the remaining appendices of BS 2092:1987. The latter consist of optical and non-optical test methods; these are replaced by test methods given in BS EN 167:1994 and BS EN 168:1994 respectively.

This British Standard, together with BS EN 167:1995 and BS EN 168:1995, replaces BS 2092:1987, which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
EN 165	BS EN 165:1996 <i>Personal eye-protection — Vocabulary</i>
EN 167:1995	BS EN 167:1995 <i>Personal eye-protection — Optical test methods</i>
EN 168:1995	BS EN 168:1995 <i>Personal eye-protection — Non-optical test methods</i>
EN 169:1992	BS EN 169:1992 <i>Specification for filters for personal eye-protection equipment used in welding and similar operations</i>
EN 170:1992	BS EN 170:1992 <i>Specification for ultraviolet filters used in personal eye-protection equipment</i>
EN 171:1992	BS EN 171:1992 <i>Specification for infra-red filters used in personal eye-protection equipment</i>
EN 172:1994	BS EN 172:1995 <i>Specification for sunglare filters used in personal eye-protectors for industrial use</i>
EN 379:1994	BS EN 379:1994 <i>Specification for filters with switchable or dual luminous transmittance for personal eye-protectors used in welding and similar operations</i>

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Summary of pages

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English version

Personal eye-protection — Specifications

Protection individuelle de l'oeil —
Spécifications

Persönlicher Augenschutz —
Anforderungen

This European Standard was approved by CEN on 1995-06-02. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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.

Contents

	Page		Page
Foreword	2	9.1 General	17
0 Introduction	3	9.2 Ocular marking	17
1 Object	3	9.3 Frame marking	20
2 Scope	3	9.4 Marking of eye-protectors where the frame and ocular form a single unit	22
3 Normative references	3	10 Information for users	22
4 Classification	3	Table 1 — Scale numbers for filters	5
4.1 Function of eye-protectors	3	Table 2 — Permissible tolerances for refractive powers of unmounted oculars without corrective effect covering one eye	6
4.2 Types of eye-protectors	3	Table 3 — Permissible tolerances for refractive powers of mounted oculars without corrective effect and unmounted oculars without corrective effect covering both eyes	6
4.3 Types of ocular	4	Table 4 — Variation in luminous transmittance	7
5 Designation of filters	4	Table 5 — Requirements relating to increased robustness of complete eye-protectors	9
6 Design and manufacture	4	Table 6 — Permissible relative change in luminous transmittance following the ultraviolet radiation test	9
6.1 General construction	4	Table 7 — Requirements relating to protection against high speed particles	9
6.2 Materials	4	Table 8 — Allocation of requirements and tests for unmounted and mounted oculars	12
6.3 Headbands	4	Table 9 — Allocation of requirements and tests for frames and complete eye-protectors	13
7 Requirements	4	Table 10 — Type examination test schedule for unmounted and mounted oculars	14
7.1 Basic requirements	4	Table 11 — Type examination test schedule for frames and complete eye protectors	15
7.2 Particular requirements	9	Table 12 — Application of eye-protector types for the various fields of use	16
7.3 Optional requirements	10	Table 13 — Identification symbols for mechanical strength	17
8 Allocation of requirements, test schedules and application	11	Table 14 — Symbols for field of use	20
8.1 Requirements and test methods	11	Table 15 — Symbols for resistance to high speed particles	21
8.2 Test schedules for type examination	11		
8.3 Application of eye-protector types	11		
9 Marking	17		

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 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.

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 0,1 μm to 1 000 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.

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) × 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 pupular 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 $0,06 \text{ m}^{-1}$ higher than for class 1.

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					