



SWEDISH
STANDARDS
INSTITUTE

SVENSK STANDARD
SS-EN 168

Fastställd 2001-11-30

Utgåva 2

Ögonskydd – Icke-optiska provningsmetoder

Personal eye-protection – Non-optical test methods

ICS 13.340.20

Språk: engelska

Tryckt i januari 2002

Europastandarden EN 168:2001 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 168:2001.

The European Standard EN 168:2001 has the status of a Swedish Standard. This document contains the official English version of EN 168:2001.

Dokumentet består av 34 sidor.

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 168

November 2001

ICS 13.340.20

Supersedes EN 168:1995

English version

Personal eye-protection - Non-optical test methods

Protection individuelle de l'oeil - Méthodes d'essais autres
qu'optiques

Persönlicher Augenschutz - Nichtoptische Prüfverfahren

This European Standard was approved by CEN on 2 September 2001.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EN 168:2001 (E)

Foreword

This European Standard has been prepared by Technical Committee CEN /TC 85, "Eye-protective equipment", the secretariat of which 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of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

This document replaces EN 168:1995.

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 EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

The annexes A and ZA are informative.

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

1 Scope

This European Standard specifies non-optical test methods for eye-protectors, the requirements for which are contained in other European Standards.

Alternative test methods may be used if shown to be equivalent.

The optical test methods are given in EN 167.

A definition of terms is given in EN 165.

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 165, *Personal eye-protection — Vocabulary*.

EN 166, *Personal eye-protection — Specifications*.

EN 167, *Personal eye-protection — Optical test methods*.

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*.

3 Test for increased robustness

New specimens shall be used for this test.

3.1 Unmounted oculars

3.1.1 Apparatus

The support for the ocular (see Figure 1) shall be a steel or rigid plastic cylinder with an internal diameter of $(35,0 \pm 0,1)$ mm and an outside diameter of $(41,0 \pm 0,1)$ mm. The cylinder shall be inserted into, or be an integral part of a steel base. The ocular shall be cushioned by a silicone seating ring firmly attached to the top of the tube.

This seating ring shall be made of silicone rubber of (40 ± 5) I.R.H.D and shall have an inside diameter of $(35,0 \pm 0,4)$ mm and cross sections of 3 mm x 3 mm nominal dimensions.

The combined mass of the support shall be at least 12 kg.

A load ring of mass (250 ± 5) g is placed on the ocular. The ring has an inside diameter the same as that of the support tube, and any convenient outside diameter. A silicone seating ring having the same dimensions and hardness as the one attached to the top of the support tube is placed between the load ring and the ocular. A piece of carbon paper on a piece of white paper is placed at the base of the 1,5 mm deep cavity in the ocular support (see Figure 1).

For curved oculars with a cylindrical component, the test support tube and load ring shall be curved to conform to the concave and convex surfaces of the ocular respectively, and the dimensions of 3 mm and 4,5 mm shall apply to the deepest point of the circular support. (See Figure 1).

If the ocular is of insufficient dimensions to enable its entire periphery to be adequately supported, suitable adaptor sleeves shall be used.

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3.1.2 Procedure

Centre the intended points of impact of the ocular on the support tube. Adjust the apparatus so that a 22 mm nominal diameter steel ball of 43 g minimum mass falling from $(1,3^{+0}_{-0,03})$ m strikes the ocular within a 5 mm radius from the centre of the support tube. This height will provide an impact speed of approximately 5,1 m/s.

Impacts shall be directed at the visual centre(s) of the oculars. For unmounted oculars covering one eye and for which the visual centre cannot be established, then the geometric centre shall be used.

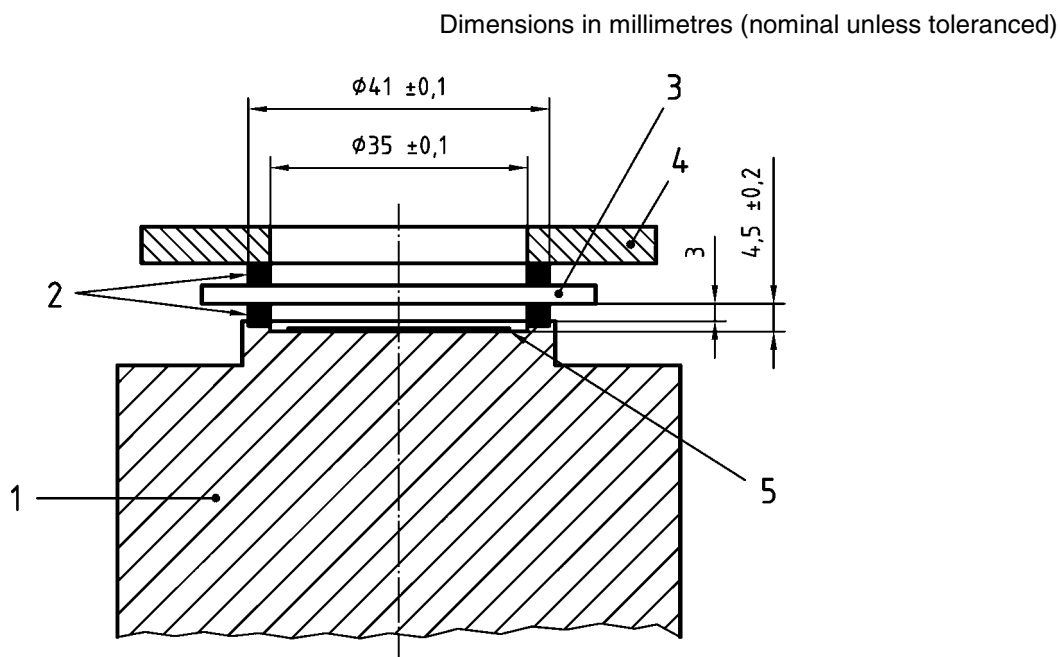
NOTE Visual centre is as defined in EN 166.

The impacts are carried out in the following conditions:

- a) with the ocular heated to (55 ± 2) °C and maintained at this temperature for at least 1 h;
- b) with the ocular cooled to a temperature of (-5 ± 2) °C and maintained at this temperature for at least 1 h.

New oculars shall be used for each individual impact and for each temperature condition. The impact shall be applied within 30 s of temperature conditioning.

The test shall be carried out at (23 ± 5) °C.



- Key**
- 1 Supporting plate (12 kg minimum)
 - 2 Silicone seating rings
 - 3 Ocular
 - 4 Load ring (250 ± 5) g
 - 5 Carbon paper on white paper

Figure 1 — Holding device for oculars for the increased robustness test

3.2 Complete eye-protectors and frames

3.2.1 Apparatus

3.2.1.1 Appropriate head-form, as defined in clause 17.

3.2.1.2 A device enabling a 22 mm nominal diameter steel ball of 43 g minimum mass to be projected at a specified point on the eye-protector at a speed of approximately 5,1 m/s.

3.2.2 Procedure

The eye-protector to be tested shall be placed on the appropriate head-form in the position corresponding to normal use.

If the frame only is to be assessed then oculars meeting the requirements of 3.1 (increased robustness) shall be fitted to the frame.

A sheet of carbon paper on top of a sheet of white paper is attached to the head-form behind the eye-protector. The head-form and eye-protector assembly is positioned in the test apparatus.

The ball is projected at the points of impact defined in 3.2.3.

For spectacles with no lateral protection the ball shall strike the sidearm within the prescribed lateral protection area on a vertical plane through the impact centre. (See 3.2.3).

The impacts are carried out in the following conditions:

- a) with the eye-protector heated to (55 ± 2) °C and maintained at this temperature for at least 1 h;
- b) with the eye-protector cooled to a temperature of (-5 ± 2) °C and maintained at this temperature for at least 1 h.

New eye-protectors shall be used for each individual point of impact and for each temperature condition. The impact shall be applied within 30 s of temperature conditioning.

The tests shall be conducted at an ambient temperature of (23 ± 5) °C.

3.2.3 Points of impact

There are four impact points, and these are defined with respect to the head-form rather than the eye-protector. The ball is aimed at these impact points with the eye-protector mounted in the normal use position.

The impact points shall be considered as any single point within a 10 mm radius of one of four impact centres. These impact centres are denoted by an asterisk (*) in Figure 11.

With respect to the test schedule contained in EN 166, the four impact points are defined as follows:

1. the left eye frontal;
2. the right eye frontal;
3. the left eye side;
4. the right eye side.

For frontal impacts at the two eye centres the ball is projected normal to the vertical axis of the head-form and parallel to its optical axis along each line of sight.

For lateral impacts the head-form is rotated about its vertical axis by 90° (left and right) from the frontal impact position.

The head-form may be moved horizontally and vertically to select any single impact point lying within 10 mm of the specified impact centres.

As stated in 3.2.2, new eye-protectors shall be used for each individual impact.

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4 Test for minimum robustness of oculars with filtering effect and cover plates

New specimens are used for this test.

4.1 Apparatus

See Figure 2.

4.1.1 Loading device

A steel ball of 22 mm nominal diameter is fastened to the lower end of a tube, whose length is 70 mm nominal.

The total loading mass is such that the force acting on the ocular is (100 ± 2) N.

4.1.2 Specimen support

The support for the ocular (see Figure 2) shall be a steel cylinder with an internal diameter of $(35,0 \pm 0,1)$ mm and an outside diameter of $(41,0 \pm 0,1)$ mm. The cylinder shall be inserted into, or be part of, a steel base.

The specimen is placed between two seating rings made of silicone rubber of (40 ± 5) I.R.H.D. having an inside diameter of $(35,0 \pm 0,4)$ mm and cross sections of 3 mm x 3 mm nominal dimensions. The silicone seating rings are fixed to the steel supporting plate and the load ring respectively.

If the specimen ocular is of insufficient dimensions to enable its entire periphery to be adequately supported, suitable adaptor sleeves shall be used.

The load ring shall have a mass of (250 ± 5) g. By its weight, it presses the upper silicone seating ring against the upper surface of the specimen.

A sheet of carbon paper on top of a sheet of white paper is placed on the supporting steel plate at the base of the 1,5 mm deep cavity.

4.2 Procedure

4.2.1 The test is carried out at (23 ± 5) °C.

4.2.2 Align the central vertical axis of the loading tube with that of the specimen support.

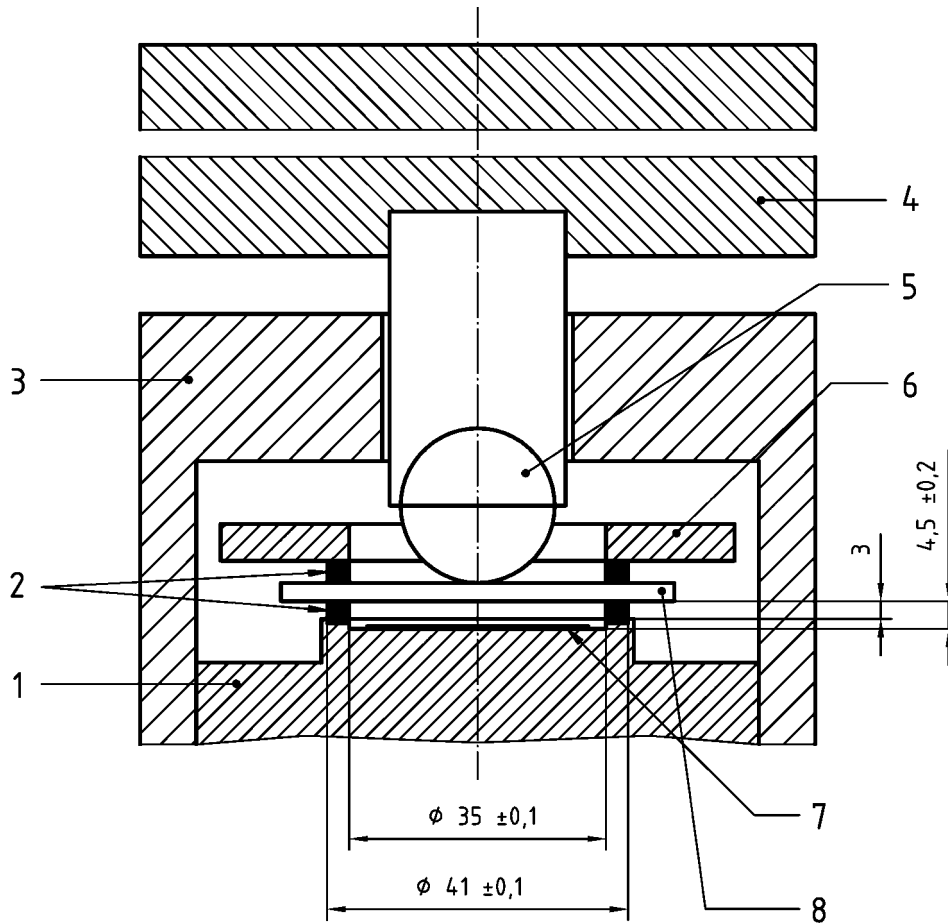
4.2.3 Position the specimen on the support with the "eye side" downwards and place the load ring on the specimen. For curved oculars with a cylindrical component the supporting plate and the load ring are curved to conform to the surface of the ocular, and the dimensions of 3 mm and 4,5 mm shall apply to the deepest point of the circular support.

4.2.4 Adjust the position of the specimen such that the load ring axis (4.2.2) passes through the visual centre of the specimen. If the visual centre cannot be established the geometric centre shall be used.

NOTE Visual centre is as defined in EN 166.

4.2.5 The loading mass is lowered on to the ocular at a speed not exceeding 400 mm/min. The force of (100 ± 2) N is maintained for (10 ± 2) s. The loading mass is then removed.

Dimensions in millimetres (nominal unless toleranced)



Key

- 1 Supporting plate
- 2 Silicone seating rings
- 3 Guiding block
- 4 Loading mass (100 ± 2) N
- 5 Steel ball
- 6 Load ring (250 ± 5) g
- 7 Carbon paper on white paper
- 8 Ocular

Figure 2 — Apparatus for minimum robustness (static deformation) test

5 Test for stability at elevated temperature

New specimens are used for this test.

5.1 Apparatus

Oven, capable of maintaining a temperature of (55 ± 2) °C.

5.2 Procedure

Place the specimen in a position corresponding to normal use, in the oven for (60 ± 5) min at a temperature of (55 ± 5) °C. Then remove it and allow to stabilise at (23 ± 5) °C for a minimum of 60 min prior to visual examination.