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Wildland firefighting personal protective equipment — Requirements and test methods —

Part 7: Face and eye protection

Équipement de protection individuelle pour la lutte contre les feux d'espaces naturels — Exigences et méthodes d'essai —

Partie 7: Protection du visage et des yeux

Reference number
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Foreword

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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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 14, *Firefighters' personal equipment.*

This first edition of ISO 16073-7, together with ISO 16073-8 and ISO 16073-1 to ISO 16073-6 cancels and replaces ISO 16073:2011.

The main changes are as follows:

— the content has been reviewed and separated into several parts;

— the respiratory protection has been deleted from the document.

A list of all parts in the ISO 16073 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Wildland firefighting involves work carried out mostly in summer temperatures and for many hours, during which the firefighter can develop high levels of metabolic heat. As a consequence, the personal protective equipment (PPE) is required to be light, flexible and commensurate with the risks to which the firefighter can be exposed in order to be effective without introducing excessive heat stress to the wearer.

It is important to train firefighters in the selection, use, care and maintenance of the PPE covered by this document, including an understanding of its limitations.

It is intended that a risk assessment be undertaken to determine if the PPE covered by this document is suitable for its intended use and the expected exposure.

This document provides minimum performance requirements for wildland firefighters' personal protective equipment (PPE) face and eye protection, designed for use for extended periods during wildland firefighting.

Wildland firefighting personal protective equipment — Requirements and test methods —

Part 7: Face and eye protection

1 Scope

This document specifies the minimum performance requirements and methods of test for personal protective equipment (PPE) face and eye protection, for wildland firefighting.

This document covers the general design of the PPE, the minimum levels of performance for the materials employed and the methods of test used. This PPE is not intended to provide protection during fire entrapment.

This document does not cover PPE for structural firefighting (see ISO 11999 series), for use against chemical, biological, radiological and nuclear hazards, or for use where a reflective outer surface is required (see ISO 15538).

Activities in support of wildland firefighting, such as the cutting of trees and the use of a chainsaw can require additional protection to that provided in this document. Users are directed to those relevant standards for the requirements associated with such protection.

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 18526-2:—[1)], *Eye and face protection — Test methods — Part 2: Physical optical properties*

ISO 18526-3[2)], *Eye and face protection — Test methods — Part 3: Physical and mechanical properties*

ISO 17493, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*

ISO/TR 19591, *Personal protective equipment for firefighters — Standard terms and definitions*

EN 167:2001, *Personal eye-protection — Optical test methods*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/TR 19591 apply.

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

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

1) Under preparation. Stage at the moment of publication ISO/FDIS 18526-2:2019.

2) Under preparation. Stage at the moment of publication ISO/FDIS 18526-3:2019.

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

4 Eye protectors

4.1 General

Wildland firefighters' eyes are exposed to irritants, such as smoke particles and off-gassing chemicals, which cause severe irritation and discomfort to the eyes. Eye protectors should protect the eyes from the ingress of smoke particles and other irritants. The complete eye protector should also resist fogging. Activities associated with wildland firefighting, such as chainsaw use, may require alternative forms of eye protection, such as mesh visors.

Eye protectors may need to interface with other items of PPE used for wildland firefighting, e.g. Helmet.

NOTE For more information, see ISO/TS 11999-2.

4.2 Design and manufacturing requirements

4.2.1 General construction

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

4.2.2 Materials

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

4.2.3 Headbands

Headbands, if 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.

4.3 Basic, particular and optional requirements for non-mesh eye protectors

4.3.1 Basic requirements

4.3.1.1 General

All non-mesh eye protectors shall meet the basic requirements given in this subclause.

Furthermore, according to their intended use, non-mesh eye protectors shall, if appropriate, meet one or more of the particular requirements given in 4.3.2.

Optional requirements related to additional properties of non-mesh eye protectors are given in 4.3.3.

4.3.1.2 Field of vision

The size of the field of vision shall be defined in conjunction with the appropriate headform described in EN 168:2001, Clause 17.

Eye protectors shall exhibit a minimum field of vision defined by the two ellipses in Figure 1, when placed and centred at a distance of 25 mm from the surface of the eyes of the appropriate headform. 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 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 headform and 54 mm for the small headform, if not specified differently by the manufacturer.

The test shall be carried out in accordance with EN 168:2001, Clause 18.

Dimensions in millimetres

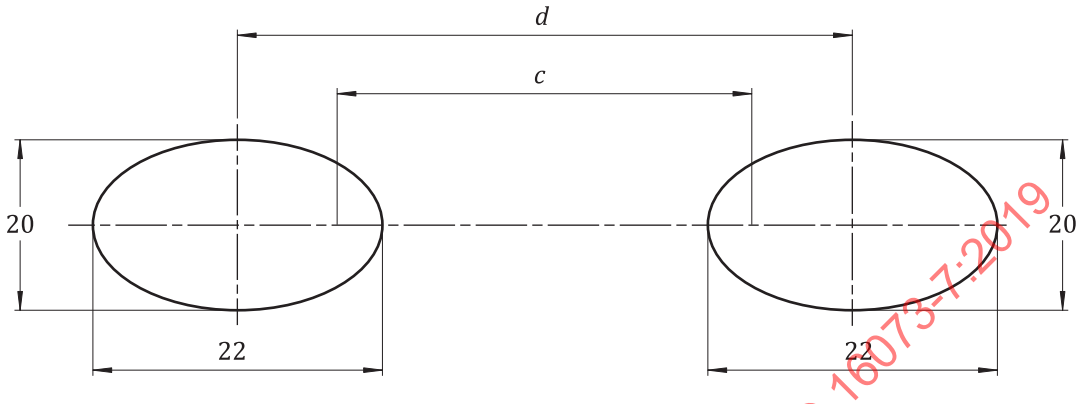


Figure 1 — Definition of the field of vision

4.3.1.3 Optical requirements

4.3.1.3.1 Spherical, astigmatic and prismatic refractive powers

The refractive powers of oculars shall be measured by the reference methods specified in EN 167:2001,Clause 3. This Clause 3 also refers to an optional method for use in specific circumstances; the details of this method are given in EN 167:2001, Annex A.

4.3.1.3.2 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 EN 167:2001, 3.2, at the visual centre of the ocular.

The permissible tolerances for oculars without corrective effect are given in Table 1.

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 1 — 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 $\frac{(D_1 + D_2)}{2}$	Astigmatic refractive power $\lvert D_1 - D_2 \rvert$	Difference in prismatic refractive power cm/m		
			Horizontal		Vertical
	m^{-1}	m^{-1}	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
NOTE D_1 and D_2 are the refractive powers in the two principal meridians.					

4.3.1.3.3 Transmittance

4.3.1.3.3.1 Oculars without filtering action

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 EN 167:2001, Clause 6 [based on CIE source A (2 856 K)].

4.3.1.3.3.2 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, i.e. EN 170 or EN 172.

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 EN 167:2001, Clause 6.

4.3.1.3.3.3 Variations in transmittance — Oculars without corrective effect

NOTE Oculars without filtering action are exempt from this requirement.

Variations in luminous transmittance shall be measured in accordance with EN 167:2001, Clause 7.

The relative variations of the luminous transmittance around the visual centre(s) P1 and P2 shall not exceed the values of Table 2. The relative difference in luminous transmittance P3 between left and right eye shall not exceed the values of Table 2 or 20 %, whichever is the greater.

Table 2 — Variations in luminous transmittance

Luminous transmittance		Permissible relative variation
less than %	up to %	%
100	17,8	±5
17,8	0,44	±10
0,44	0,023	±15
0,023	0,001 2	±20
0,001 2	0,000 023	±30

4.3.1.3.4 Scattering of light

The percentage value of wide angle scatter (haze) shall not exceed 3,0 %, when measured according to ISO 18526-2:—, 14.1.

4.3.1.4 Quality of material and surface

Except for a marginal area 5 mm wide, oculars shall be free from any significant defects likely to impair vision in use, such as bubbles, scratches, inclusions, dull spots, pitting, mould marks, scouring, grains, pocking, scaling and undulation.

The assessment shall be carried out in accordance with the method specified in EN 167:2001, Clause 5.

4.3.1.5 Resistance to ageing

4.3.1.5.1 Stability at an elevated temperature

Assembled eye protectors shall show no apparent deformation when tested by the method specified in A.4 (test 1).

4.3.1.5.2 Resistance to ultraviolet radiation — Oculars only

Oculars shall be subjected to the test for resistance to ultraviolet radiation in accordance with the method specified in EN 168:2001, Clause 6. At the end of the test, oculars shall meet the following requirements.

a) The relative change of luminous transmittance shall not be greater than the values specified in Table 3.

b) The value of the reduced luminance factor shall not exceed the permissible limits given in 4.3.1.3.4.

Table 3 — Permissible relative change in luminous transmittance following the ultraviolet radiation test

Luminous transmittance		Permissible relative change
less than %	up to %	%
100	17,8	±5
17,8	0,44	±10
0,44	0,023	±15
0,023	0,001 2	±20
0,001 2	0,000 023	±30

4.3.1.6 Resistance to corrosion

After having undergone the test for resistance to corrosion specified in EN 168:2001, Clause 8, all metal parts of the eye protector shall display smooth surfaces, free from corrosion, when examined by a trained observer.

4.3.1.7 Resistance to ignition

Eye protectors shall be tested in accordance with the method specified in EN 168:2001, Clause 7 and shall be considered to be satisfactory if no part of the eye protector ignites or continues to glow after removal of the steel rod.

4.3.2 Particular requirements

4.3.2.1 Protection against high-speed particles

Eye protectors intended to provide protection against high-speed particles shall withstand the impact of a 6 mm nominal diameter steel ball of 0,86 g minimum mass, striking the oculars and the lateral protection at one of the speeds given in Table 4.

Table 4 — Requirements relating to protection against high-speed particles

Type of eye protector	Impact speed of ball		
	Low-energy impact	Medium-energy impact	High-energy impact
	F	B	A
	$45^{+1,5}_{0}$ m/s	120^{+3}_{0} m/s	190^{+5}_{0} m/s
Goggles	+	+	Not applicable
Face shields	+	+	+

The test shall be in accordance with the method specified in EN 168:2001, Clause 9.

It shall not be possible for the ball to strike the lateral impact point without first striking the lateral protection.

On so testing, the following defects shall not occur.

a) Ocular fracture: an ocular shall be considered to have fractured if it cracks through its entire thickness into two or more pieces, or if more than 5 mg of the ocular material becomes detached from the surface away from the one struck by the ball, or if the ball passes through the ocular.

b) Ocular deformation: an ocular shall be considered to have been deformed if a mark appears on the white paper on the opposite side to that struck by the ball.

c) Ocular housing or frame failure: an ocular housing or frame shall be considered to have failed if it separates into two or more pieces, or if it is no longer capable of holding an ocular in position, or if an unbroken ocular detaches from the frame, or if the ball passes through the housing or frame.

d) Lateral protection failure: the lateral protection shall be considered to have failed if it fractures through its entire thickness into two or more separate pieces, or if one or more particles becomes detached from the surface remote from the impact point, or if it allows the ball to penetrate completely, or if it partially or totally detaches from the eye protector, or if its component parts become separated.

Eye protectors offering protection against high-speed particles shall provide lateral protection.

4.3.2.2 Protection against droplets and splashes of liquids

Eye protectors for use against droplets (goggles) and splashes of liquids (face shields) shall be tested in accordance with the methods specified in EN 168:2001, Clause 12. The results shall be considered to be satisfactory if:

a) no pink or crimson colouration appears in the ocular regions defined by the two circles when assessing goggles for protection against droplets; no account shall be taken of any such coloration up to a distance of 6 mm inside the edges of the eye protector;

b) face shields cover the eye-region rectangle of the appropriate headform, as described in EN 168:2001, 10.2.2.2 and as assessed in accordance with EN 168:2001, 10.2.

Additionally, face shields for protection against splashes of liquids shall have a viewing area with a minimum vertical centreline depth of 150 mm when mounted in the appropriate housing.

4.3.2.3 Protection against large dust particles

Eye protectors for use against large dust particles shall be tested in accordance with the method specified in EN 168:2001, Clause 13. The result shall be considered to be satisfactory if the reflectance after the test is not less than 80 % of its value before the test.

4.3.2.4 Protection against gases and fine dust particles

Eye protectors for use against gases and fine dust particles shall be tested in accordance with the method specified in EN 168:2001, Clause 14. They shall be regarded as satisfactory if no pink or crimson coloration appears in the area covered by the eye protector. No account shall be taken of any such coloration up to a distance of 6 mm inside the edges of the eye protector.

4.3.2.5 Lateral protection

Eye protectors claiming to provide lateral protection shall pass the lateral region coverage assessment detailed in EN 168:2001, Clause 19.

4.3.3 Optional requirements

4.3.3.1 General

Optional requirements are specified for additional characteristics of eye protectors which can be found to be beneficial to the user for operational reasons.

4.3.3.2 Resistance to surface damage by fine particles

If the surface of the lens or filter is claimed to be resistant to surface damage by flying fine particles, the resulting values for wide angle scatter (haze) shall not exceed 8 % when tested in accordance with ISO 18526-3:—, 7.4, and ISO 18526-2:—, 14.1.

NOTE This procedure does not assess resistance to abrasion.

4.3.3.3 Resistance to fogging of oculars

If oculars are described as resistant to fogging, they shall remain free from fogging for a minimum of 8 s when tested in accordance with EN 168:2001, Clause 16.

NOTE This test applies to the surface properties of the ocular material only and cannot provide a reliable measure of eye protector performance in real use. Methods that assess the performance of complete devices are under development and can be incorporated in a future revision of this document.

4.3.3.4 Oculars with enhanced reflectance in the infrared

Oculars that are claimed to have enhanced reflectance in the infrared shall have a mean spectral reflectance greater than 60 % within the wavelength range 780 nm to 2 000 nm when measured in accordance with EN 167:2001, Clause 8.

4.3.3.5 Protection against high-speed particles at extremes of temperature

Eye protectors intended to provide protection against high-speed particles at extremes of temperature shall withstand the impact of a 6 mm nominal diameter steel ball of 0,86 g minimum mass, striking the oculars and the lateral protection at one of the speeds given in Table 4. The impacts are carried out within one minute after the eye protectors have been conditioned at extremes of temperature (55 ± 2) °C and (−5 ± 2) °C using the method specified in EN 168:2001, Clause 9.

It shall not be possible for the ball to strike the lateral impact point without first striking the lateral protection.

On so testing, the following defects shall not occur.

a) Ocular fracture: an ocular shall be considered to have fractured if it cracks through its entire thickness into two or more pieces, or if more than 5 mg of the ocular material becomes detached from the surface away from the one struck by the ball, or if the ball passes through the ocular.

b) Ocular deformation: an ocular shall be considered to have been deformed if a mark appears on the white paper on the opposite side to that struck by the ball.

c) Ocular housing or frame failure: an ocular housing or frame shall be considered to have failed if it separates into two or more pieces, or if it is no longer capable of holding an ocular in position, or if an unbroken ocular detaches from the frame, or if the ball passes through the housing or frame.

d) Lateral protection failure: the lateral protection shall be considered to have failed if it fractures through its entire thickness into two or more separate pieces, or if one or more particles becomes detached from the surface remote from the impact point, or if it allows the ball to penetrate completely, or if it partially or totally detaches from the eye protector, or if its component parts become separated.

Eye protectors offering protection against high-speed particles at extremes of temperature shall provide lateral protection.

4.4 Mesh eye and face protectors

4.4.1 Basic requirements

4.4.1.1 Materials

4.4.1.1.1 Resistance to corrosion

No metal parts of a mesh-type eye protector, including the mesh if made from metal, shall show a significant sign of corrosion when examined by a trained observer after having undergone the test for resistance to corrosion specified in EN 168:2001, Clause 8.

4.4.1.1.2 Resistance to ignition

When tested in accordance with EN 168:2001, Clause 7, no part of a mesh-type eye protector shall ignite or continue to glow after removal of the heated rod.

4.4.1.1.3 Cleaning and disinfection

All parts of a mesh-type eye protector shall withstand cleaning and disinfection in accordance with the agents and procedures recommended by the manufacturer.

4.4.1.1.4 Skin irritation

Materials that come into contact with the wearer's skin shall not be known to be likely to cause irritation or any other adverse effect to health.

4.4.1.2 Number of apertures in a mesh

The minimum number of apertures in the mesh shall be 15/cm^2.

4.4.2 Design and manufacture

4.4.2.1 Construction

4.4.2.1.1 General

Mesh eye protectors shall be free from projections, sharp edges or other defects which are likely to cause discomfort or injury to the wearer during use.

4.4.2.1.2 Headbands and harnesses

Headbands or head harnesses where provided and used as the principal means of support shall be at least 10 mm wide where in direct contact with the head.

4.4.2.1.3 Adjustability and/or replacement of components

Adjustable parts or components incorporated in mesh eye protectors shall be easily adjustable and, where intended to, shall be easily replaceable without the use of special tools.

4.4.2.1.4 Basic dimensions of a mesh face screen

A mesh face screen with or without ocular(s) shall be such that a rectangle with minimum dimensions of 160 mm (horizontal length) × 130 mm (vertical length) can be described in full on the surface of the face screen.

4.4.2.2 Minimum dimension of ocular area(s)

The ocular area of a mesh face screen, a mesh goggle, mesh spectacle or a mesh face screen with ocular(s) shall be such that a rectangle with minimum dimensions of 32 mm (horizontal length) × 25 mm (vertical depth) can be described in full for each eye (pupillary distance: nominally 64 mm).

4.4.3 Performance

4.4.3.1 Luminous transmittance of the mesh ocular area

The luminous transmission of the mesh ocular area shall be greater than 20,0 % when measured in accordance with EN 167:2001, Clause 6.

4.4.3.2 Variations in luminous transmittance

Variations in luminous transmittance shall be in accordance with 4.3.1.3.3.3.

4.4.3.3 Additional or alternative oculars

Additional or alternative oculars fitted to a mesh-type eye protector shall comply with 4.3.1.

4.4.3.4 Robustness of construction — Increased robustness

The complete mesh-type eye protector shall be submitted to the impact of a steel ball striking the ocular area and the lateral protection at a specified speed. Test in accordance with EN 168:2001, 3.2.

The following defects shall not occur during testing.

a) Mesh fracture in the ocular area: the mesh shall be considered to have fractured if the steel ball passes through the mesh or if, at any point in the ocular area, a gap or tear is produced which allows a (300 ± 3) mm long and (3,0 ± 0,1) mm diameter steel rod, with end faces that are flat and perpendicular to its longitudinal axis, to pass through under its own weight in any orientation.

b) Ocular area deformation: the mesh ocular area shall be considered to have been deformed if a mark appears on the white paper on the opposite side to that struck by the steel ball.

c) Failure of ocular housing, mesh face screen or frame: an ocular housing or mesh face screen or frame shall be considered to have failed if it separates into two or more pieces, or if it is no longer capable of holding an ocular in position, or if an unbroken ocular detaches from the frame, or if the ball breaks through the housing, mesh face screen or frame.

A mesh face screen tested with an additional or alternative ocular shall be fitted with an ocular meeting the increased robustness requirements. If the use of any cover and/or backing lens is

recommended by the manufacturer, the test shall be performed with a mesh face screen conforming to this recommendation.

4.4.4 Requirements for eye protectors with special characteristics

4.4.4.1 Mesh-type eye protectors protecting against high-speed particles

This requirement is only applicable to mesh eye protectors which comply with 4.3.2.1.

4.4.4.2 Prolonged high-temperature stability

The complete eye protective device, when tested in accordance with A.4 (test 1), shall show no breakage or visible distortion of the body. The complete eye protective device under test shall have been previously conditioned at 50 °C.

4.4.4.3 Extreme high-radiant heat environments

The complete eye protective device, when tested in accordance with A.5 (test 2), shall show no breakage or visible distortion of the body. The complete eye protective device under test shall have been previously conditioned at 50 °C.

4.5 Allocation of requirements, test schedules and application

4.5.1 Requirements, test methods and schedules

4.5.1.1 Non-mesh eye protectors

The individual requirements and test methods to the different types of non-mesh eye protector are allocated and the required number of test specimens defined.

Table 5 specifies those requirements and tests which apply to frames and complete eye protectors.

4.5.1.2 Mesh eye protectors

The individual requirements and test methods for the different types of mesh eye protector are allocated and the required number of test specimens defined.

Table 6 specifies those requirements and tests which apply to mesh-type eye protectors.

4.5.2 Application of eye protector types

The application of eye protector types to the various fields of use is shown in Table 7.

Table 5 — Type examination test schedule for complete eye protectors

Requirement			Test in accordance with		Quantity of sample
			EN	(sub)Clause	
Marking			Visual inspection		All
Information			Visual inspection		All
Construction and materials			Visual inspection		All
Head bands			By measuring		3
Quality of material and surface[b]			167:2001	5	3
Field of vision			168:2001	18	3
Refractive properties			167:2001	3	3
Thermal stability[c]			168:2001	5	3
Transmittance of oculars			167:2001	6	3
Transmittance of frames			167:2001	6	3
Variations in transmittance[b]			167:2001	7	3
Diffusion of light[b]			167:2001	4	3
Ocular reflectance[b]			167:2001	8	3
Lateral protection			168:2001	19	3
UV stability[c]			168:2001	6	3
Minimum robustness[b]			168:2001	4	8
Increased robustness[a] Impact point/test temperature (°C)	1	+55	168:2001	3.2	2
	1	−5	168:2001	3.2	2
	2	+55	168:2001	3.2	2
	2	−5	168:2001	3.2	2
	3	+55	168:2001	3.2	1
	3	−5	168:2001	3.2	1
	4	+55	168:2001	3.2	1
	4	−5	168:2001	3.2	1
Corrosion			168:2001	8	3
Ignition			168:2001	7	3
High-speed particles Impact point		1	168:2001	9	4
		2	168:2001	9	4
		3	168:2001	9	2
		4	168:2001	9	2

It is recommended that testing be performed in the order shown in Figure 2.

The type test evaluation shall allow no defectives and no account shall be taken of measurement uncertainties.

[a] Frames fitted with oculars meeting only the minimum robustness requirements shall only be tested for lateral impact.

[b] If the oculars have been tested for the requirements (see Table 6), these tests on the oculars need not be repeated.

[c] Ensure that each test is performed on two samples for one eye position and on one sample for the other, e.g. one left, two right.

Table 5 *(continued)*

Requirement			Test in accordance with		Quantity of sample
			EN	(sub)Clause	
Marking			Visual inspection		All
Information			Visual inspection		All
Construction and materials			Visual inspection		All
Head bands			By measuring		3
High-speed particles at extremes of temperature Impact point/test temperature (°C)	1	+55	168:2001	9	2
	1	−5	168:2001	9	2
	2	+55	168:2001	9	2
	2	−5	168:2001	9	2
	3	+55	168:2001	9	1
	3	−5	168:2001	9	1
	4	+55	168:2001	9	1
	4	−5	168:2001	9	1
Molten metals and hot solids			168:2001	10, 11	3
Droplets and splashes			168:2001	12	3
Surface damage by fine particles[b]			168:2001	15	4
Large dust			168:2001	13	3
Gas and fine dust particles			168:2001	15	4
Fogging[b]			168:2001	16	4

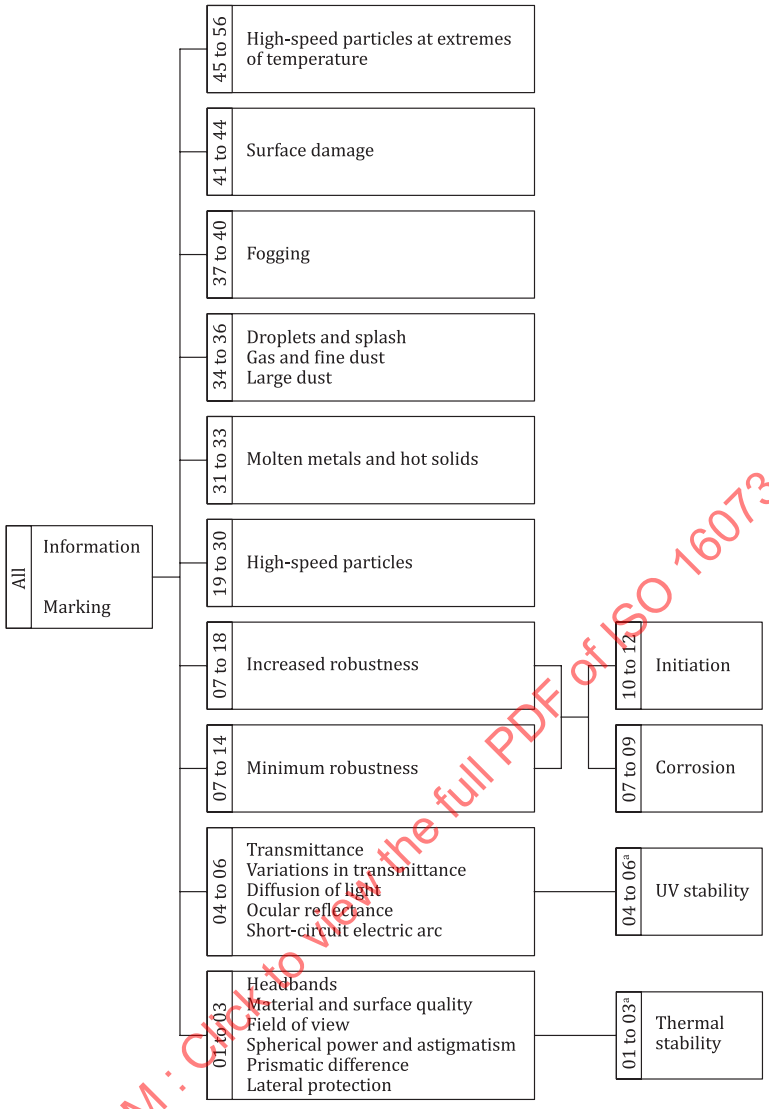
It is recommended that testing be performed in the order shown in Figure 2.

The type test evaluation shall allow no defectives and no account shall be taken of measurement uncertainties.

[a] Frames fitted with oculars meeting only the minimum robustness requirements shall only be tested for lateral impact.

[b] If the oculars have been tested for the requirements (see Table 6), these tests on the oculars need not be repeated.

[c] Ensure that each test is performed on two samples for one eye position and on one sample for the other, e.g. one left, two right.



[a] Ensure that each test is performed in 2 samples for 1 eye position and on 1 sample for the other eye position (e.g. 1 left, 2 right).

NOTE If the properties being determined at samples 4 to 6 and samples 37 to 44 were already measured on the oculars, measurements need not be repeated.

Figure 2 — Flowchart — Testing of complete eye protectors

Table 6 — Allocation of test requirements and type examination test schedule for mesh-type eye protectors

Test order	Requirement (Clause)	Test specimen no.											Allocation of test	
		1	2	3	4	5	6	7	8	9	10	11	Mesh goggles and face screens	Mesh eye protectors against high-speed particles
1	Marking	X											Yes	Yes
2	Information	X											Yes	Yes
3	Cleaning and disinfection	X											Yes	Yes
4	Number of apertures	X											Yes	Yes
5	Design and manufacture	X											Yes	Yes
6	Luminous transmittance		X										Yes	Yes
7	Variations in luminous transmittance			X									Yes	Yes
8	Increased robustness				X	X	X	X					Yes	Yes
9	High-speed particles								X	X	X	X	No	Yes
10	Corrosion		X										Yes	Yes
11	Ignition			X									Yes	Yes

X Testing shall be carried out on indicated specimen.

Empty field No testing specified.

If testing requires the oculars to be mounted, appropriate frames shall be used.

For testing, frames supplied without oculars fitted shall, where necessary, be fitted with appropriate oculars.

The sequence of tests 1 to 5 is not important and can be changed by the testing laboratory.

A specimen on which the high-speed particle test is being conducted need not be subjected to the increased robustness test.

Type test evaluation shall allow no defectives and no account shall be taken of measurement uncertainty.

Table 7 — Application of eye protector types for the various fields of application

Field of use		Symbol	Type of eye protector		
			Non-mesh		Mesh
			Goggles	Face shield	
Basic use		None	+	+	+
Increased robustness		S	+	+	+
Optical radiation		[a]	+	+	O
High-speed particles[b]	Low-energy impact	+	+	+	+
	Medium-energy impact	+	+	+	+
	High-energy impact	O	O	O	+
Liquid droplets		3	+	O	O
Liquid splashes		3	+	+	O
Large particles		4	+	O	O
Gas and fine dust particles		5	+	O	O
Molten metals and hot solids		9[c]	+	+	O
High-speed particles at extremes of temperature[d]		T	+	+	+

\+ Allowable application

O Prohibited application

[a] The symbol for optical radiation consists of the scale number for the various types of filter and is marked on the ocular. If optical radiation is the only field of use for which protection is required, the frame need only comply with the requirements for basic use. Goggle and face shield housings, if applicable, shall be marked with the maximum compatible filter scale number.

[b] If the symbols F, B and A (see Table 4) are not common to both the ocular and the frame, it is the lower level which shall be assigned to the complete eye protector.

[c] For an eye protector to comply with field of use symbol 9, both the frame and the ocular shall be marked with this symbol together with one of the symbols F, B or A.

[d] Symbol T is used in conjunction with either F, B or A to indicate that the eye protector conforms to the high-speed particle classification at extremes of temperature.

5 Marking and labelling

5.1 General marking requirements

Any labels or accessories shall not adversely affect the performance of any item to which they are attached or present a hazard to the wearer.

5.2 Legibility

Labels or markings when examined at a distance of 300 mm in a well-illuminated area by a person with 6/6 or 20/20 vision or vision corrected to 6/6 or 20/20, shall be legible.

5.3 Conformity marking requirements

Each article of PPE, for which compliance with this document is claimed, shall have a label or marking permanently and conspicuously attached, upon which the following information is printed in letters at least 1,5 mm high:

a) designation of type as appropriate;

b) name, trademark or other means of identifying the manufacturer;

c) style/model designation;

d) size;

e) reference to this document, i.e. ISO 16073-7:—;

f) the pictogram given in Figure 3 with "ISO 16073-7" printed as shown. When it is not physically possible to include the pictogram on a permanently and conspicuously attached label or marking due to the size of the eye and face protection it shall be provided in the form of additional information included with the face and eye protection.

The language used in the pictogram should be the language of the country of publication.

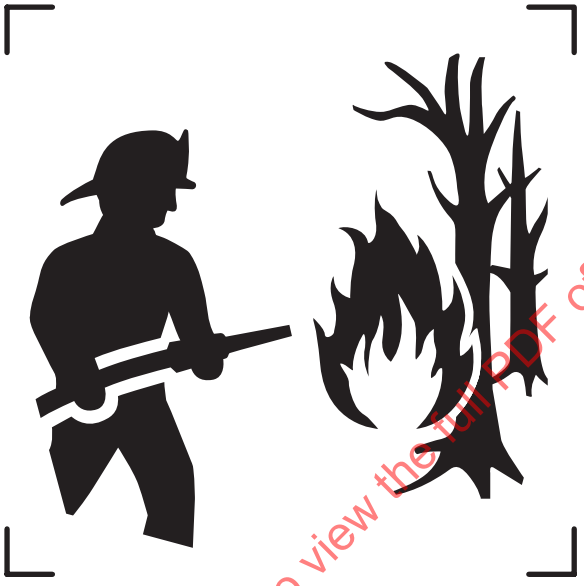


Figure 3 — Protective equipment for wildland firefighting (ISO 7000-3636)

5.4 Additional marking requirements

5.4.1 Eye protectors

5.4.1.1 General

The marking shall be fully visible when the complete eye protector is assembled and shall not encroach into the minimum field of vision. Outside of this area, the marking shall not impede vision when worn.

The reference to this document (i.e. ISO 16073-7:—) shall be applied to frames and housings, but need not be applied to oculars.

The frame and ocular shall be marked separately. If the ocular and frame form a single unit, the complete marking shall be applied to the frame.

5.4.1.2 Ocular marking

The marking of oculars shall contain the relevant technical information presented in a horizontal line in the following order:

a) scale number (filters only);

b) identification of the manufacturer;

c) symbol for mechanical strength (if applicable);

d) symbol for non-adherence of molten metal and resistance to penetration of hot solids (if applicable);

e) symbol for resistance to surface damage by fine particles (if applicable);

f) symbol for resistance to fogging of oculars (if applicable);

g) symbol for enhanced reflectance (if applicable);

h) symbol for original or replacement ocular (optional);

i) possible inclusion of a mark to assist correct fitting of laminated oculars.

5.4.1.3 Optical class

One of the two optical classes shall be included in the marking in the position shown.

5.4.1.4 Mechanical strength

Symbols relating to oculars that withstand one of the various mechanical strength tests shall be included in the marking. The identification of the symbols is given in Table 11.

Table 11 — Identification symbols for mechanical strength

Symbol	Mechanical strength requirement
F	Low-energy impact
B	Medium-energy impact
A	High-energy impact

5.4.1.5 Resistance to surface damage by fine particles

Oculars that meet the requirements shall be marked with the symbol K.

5.4.1.6 Resistance to fogging of oculars

Oculars that meet the requirements shall be marked with the symbol N.

5.4.1.7 Original/replacement oculars

To identify whether an ocular is an original or a replacement, the manufacturer may use the symbols "O" (original) or "∇" (replacement).

5.4.1.8 Resistance to high-speed particles at extremes of temperature

Oculars that meet the requirements shall be marked with one of the impact symbols followed by the letter "T", i.e. FT, BT or AT. See Table 11.

5.4.1.9 Frame marking

The marking of frames shall contain the relevant technical information presented in a horizontal line in the following order:

a) identity of the manufacturer;

b) reference to this document, i.e. ISO 16073-7:—;

c) field(s) of use (if applicable);

d) symbol for increased robustness/resistance to high-speed particles/extremes of temperature (if applicable);

e) symbol indicating that the eye protector is designed to fit a small head (if applicable);

f) highest ocular scale number(s) compatible with the frame (if applicable).

5.4.1.10 Field of use

The frames of eye protectors shall be marked to indicate their intended field of use. The marking symbol shall comprise a single digit number, as defined in Table 12. If the eye protector covers more than one field of use, the appropriate numbers shall be applied consecutively on the frame in ascending numerical value.

Table 12 — Symbols for field of use

Symbol	Designation	Description of fields of use
No symbol	Basic use	Unspecified mechanical hazards and hazards arising from ultraviolet, visible, infra-red and solar radiation
3	Liquids	Liquids (droplets or splashes)
4	Large dust particles	Dust with a particle size >5 µm
5	Gas and fine dust particles	Gases, vapours, sprays, smoke and dust with a particle size <5 µm

5.4.1.11 Increased robustness and resistance to high-speed particles

Frames that satisfy the requirements shall be marked with the appropriate symbol given in Table 13.

Table 13 — Symbols for resistance to increased robustness and high-speed particles

Symbol	Description of the level of impact
S	Increased robustness
F	Low-energy impact
B	Medium-energy impact
A	High-energy impact
NOTE Symbols S and F can be applied to all types of eye protectors. Symbol B can be applied to goggles and face shields only. Symbol A can be applied to face shields only.	

5.4.1.12 Resistance to high-speed particles at extremes of temperature

Frames that meet the requirements shall be marked with one of the impact symbols followed by the letter T, i.e. FT, BT or AT. See Table 11.

5.4.1.13 Frames designed to fit a small head

If the frame is designed to fit a small head it shall be marked with the letter H.

5.4.1.14 Highest ocular scale number

Housings of goggles and face shields intended to provide protection against optical radiation shall be marked with the maximum scale number(s) of filtering ocular which may be fitted.