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Technical Bulletin

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Comparison of the Newly Published EN ISO 16321:2022 Standards with the Previous EN 166:2001 and Other Related Standards

Background Information

Until recently, the main standard for eye and face protection in Europe has been EN 166:2001 and other related standards. These standards have remained unchanged since the last publication in 2001, over 20 years. EN 166:2001 and all other related standards cited in the table below are being superseded by a newEN ISO 16321family of standards. The new EN ISO 16321 standards were harmonised following their publication in the Official Journal of the European Union (OJEU) on 11 May 2023 and therefore have become valid product standards for CE certification for eye and face protection for occupational use within the EU member states. Addition to that information, the OJEU published on 8 October 2024, delayed the withdrawal of EN 166 and associated Standards until 11 November 2025

These new EN ISO 16321 series of standards will run parallel to the existing EN 166 and all other related standards for a period of +12 months from the publication in the OJEU. During the adoption period, which is expected to expire on 11 November 2025, eye and face protection products are considered certified using either the existing EN 166 and related standards or the new EN ISO 16321 series of standards.

Standard	Definition
EN ISO 16321-1:2022	Eye and face protection for occupational use - Part 1: General requirements
EN ISO 16321-2:2021	Eye and face protection for occupational use - Part 2: Additional requirements for protectors used during welding and related techniques
EN ISO 16321-3:2022	Eye and face protection for occupational use - Part 3: Additional requirements for mesh protectors

For test methods, following standards are using with EN ISO 16321.

Standard	Definition
EN ISO 18526-1	Eye and face protection — Test methods — Part 1: Geometrical optical properties
EN ISO 18526-2	Eye and face protection — Test methods — Part 2: Physical optical properties
EN ISO 18526-3	Eye and face protection — Test methods — Part 3: Physical and mechanical properties
EN ISO 18526-4	Eye and face protection — Test methods — Part 4: Headforms

The above standards (EN ISO 16321) supersede the standards described below on November 11, 2025:

Standard	Definition
Requirements:	
EN 166:2001	Personal eye-protection-Specifications
EN 169:2002	Personal eye-protection - Filters for welding and related techniques - Transmittance requirements and recommended use
EN 170:2002	Personal eye-protection - Ultraviolet filters - Transmittance requirements and recommended use
EN 171:2002	Personal eye-protection; infrared filters; transmittance requirements and recommended use
EN 172:1994 as amended by EN 172:1994/ A1:2000 and EN 172:1994/A2:2001	Personal eye protection-Sunglare filters for industrial use

EN 379:2003+A1:2009	Personal eye-protection - Automatic welding filters
EN 1731:2006	Personal eye protection - Mesh eye and face protectors
Test Methods: ** Although the standards for test methods are not directly included in the EN ISO 16321 standard, we can say that they affect these standards as the relevant test methods have also changed.	
EN 167:2001	Personal eye-protection - Optical test methods
EN 168:2001	Personal eye-protection - Non-optical test methods

What are the differences between EN 166:2001 and EN ISO 16321-1:2022?

There are some important differences between EN 166 and other related standards as listed above and new EN ISO 16321 series of requirement standards for eye and face protection products. It is critical for employers to understand the key changes and review their risk assessment to ensure workers remain protected against physical and optical hazards.

The new EN ISO 16321-1:2022 requirement standard describes the specifications of eye and face protectors intended to protect against occupational hazards such as impacts, optical radiation, dust, liquid splashes, molten metals and hot solids, heat and harmful gasses, vapors and aerosols. The changes can be explained as follows.

- The EN ISO 16321-1:2022 standard applies only to plano and prescription eye-protectors for occupational use or used in educational establishments or for “do-it-yourself” tasks.
- The standard does not cover face protectors intended for:
    - live-working to protect against short-circuit electric arcs,
    - laser protectors,
    - protectors specifically intended for sports,
    - protectors for use during medical applications,
    - protectors for medically prescribed applications;
    - protectors specifically designed for protection against solar radiation only,
    - protectors intended to protect against ionizing radiation,
    - the use of these devices is regulated by individual standards.

What is new in EN ISO 16321-1:2022?

Although the new EN ISO 16321 family of standards include three parts as listed in the table above, this technical bulletin will focus mainly on EN ISO 16321-1:2022 requirement standard for eye and face protectors.

For welding and related techniques and for mesh protectors, EN ISO 16321-2:2021 and EN ISO 16321-3:2022 standards need to be reviewed.

General requirements

Eye and Face Protector Types

EN ISO 16321:2022 features new terminology called “eye shield”. Eye shields are defined by their ‘extended orbital protection zone’, which is similar to goggles. The difference between eye shields and goggles is that goggles provide extra coverage (lateral protection) around the eyes, whereas eye shields do not.

While eye shields could be described as short visors, there are still three main categories of eye and face protectors as listed below:

- Spectacles
- Goggles
- Faceshield

Headforms

Within the EN 166:2001 standard, two different headforms are specified, small and medium. However, in EN ISO 16321-1, there are six different headforms in total, split into two different groups with each group comprising of Small, Medium and Large sizes. The two groups are Caucasian, denoted by number 1 in front of the size designation, and Asian, which is denoted by number 2 in front of the size designation. Headform diversity has been increased in order to provide more selection to suit the person's head structure.

For example, products marked 1-M are Medium size protectors designed for the Caucasian population group, while products marked 2-S are Small size protectors for the Asian population group. See table below for more information.

Small	Medium	Large
1-S	1-M	1-L
2-S	2-M	2-L

For testing and certification purposes, if no information about the head size is given by the manufacturer, eye protectors will be tested for the 1-M headform size requirement.

Field of View (FoV)

ISO 16321-1:2022 minimum field of view is wider than EN 166, additionally, eyewear suitable for driving require a wider temporal Field of View.

Headband

While the EN 166:2001 standard requires the headband size to be at least 10 mm wide, no measurement is specified in the EN ISO 16321-1:2022 standard. However, the general requirement is that the protector is fitted securely on the headform when tested in accordance with the “sit and fit” test method EN ISO 18526-3:2020 clause 6.5.

Penetration of vents and gaps

This is a new requirement which applies to eye protectors that have ventilation or gaps between their components. To verify the size of the opening, a rigid rod is deployed to ensure it is no bigger than 1,5 mm in diameter. It will help limit the size of the particle, projectile, etc, that can penetrate into the ocular area

Mandatory Properties

Basic Impact Tests

EN ISO 16321-1:2022 basic impact requirement is mandatory for all eye protectors. EN166:2001 has a similar test called Increased Robustness.

It is performed using a steel ball dropped from 1.27 meter. Both tests are performed at -5°C and 55°C.

Frontal impact on corneal apex, lateral impact on lateral canthus.

	EN 166:2001 Increased Robustness	EN ISO 16321-1:2022 Basic Impact
Diameter	22mm	25,4mm
Weight	43 grams	66,8 grams

ISO 16321-1:2022 standard uses a heavier steel ball than EN166, this is same as used by the US standard ISEA Z87.1-2020. This change was made to reduce the risk of injury.

High-Speed Impact Resistance

A high-speed impact resistance test is an optional requirement applicable to all protective eyewear. In EN 166:2001, the type of eye protector defines the maximum impact energy level as shown in the table below.

	Impact speed of ball		
Type of eye protector	Low energy impact **(F)** (45 m/s)	Medium energy impact **(B)** (120 m/s)	High energy impact **(A)** (190 m/s)
Spectacles	+	-	-
Goggles	+	+	-
Faceshield	+	+	+

There has been a major change in high-speed impact resistance test defined in EN ISO 16321-1:2022 when compared to EN 166:2001. See table below for further details.

The high energy impact test requirement at 190 m/s (A) specified in the EN 166:2001 standard has not been carried forward to EN ISO 16321-1:2022 as it is deemed unrealistically high and not true representation of typical workplace scenario. The new high energy impact is now defined as 120 m/s, and an intermediate medium energy impact level at 80 m/s is introduced. The low energy impact test at 45 m/s remains unchanged.

Other changes include letter code for impact rating i.e. from F, B, A for low energy, medium energy and high energy (as described in EN 166:2001) to C, D and E respectively as explained in the table below.

	45 m/s	80 m/s	120 m/s
Impact Level	**C**	**D**	**E**
Minimum area to be protected	Orbital protection zone (OPZ)	Extended orbital protection zone (EOPZ)	Face protection zone (FPZ)
Spectacles	+	-	-
Goggles	+	+	-
Eye shield	+	+	-
Faceshield	+	+	+

The impact test can also be performed at extreme temperatures, -5°C and +55°C, subsequently the marking being changed to CT, DT and ET.

Spectral Transmittance

There are differences in spectral transmittance between EN166:2001 and EN ISO 16321-1:2022 standard requirements.

To improve the protection level, the wavelength range is extended in the Ultraviolet from 210 nm to 200 nm and for Infrared from 2000 nm to 3000 nm.

Optional Properties

Optical Performance

According to EN 166 Optical Class 1 is for work with particularly high vision requirements for permanent use, while Optical Class 2 is for work with average vision requirements, and Optical Class 3 is for rough work without any special vision requirements (only intended for exceptional cases and not for permanent use).

Regarding the assessment and specification of optical requirements, there have been minor changes in EN ISO 16321-1:2022 when compared with EN166:2001. In the new EN ISO 16321-1:2022 the default minimum optical performance requirement is the same as EN166 Optical Class 2, but manufacturers have the option of claiming enhanced optical performance indicated by lens marking “1”. Optical Class 3 requirement that was included in EN 166 have been deleted altogether.

Detection of Signal Lights

The EN172:1994 standard has a mandatory recognition of signal lights requirement as the sunglare filter could be used for driving.The “enhanced color recognition” is an optional requirement for UV, IR and Welding filters.

The letter “C” was added after the filter code number to verify enhanced colour recognition. For examples, 2C-1,2 is the filter code for a UV filter with enhanced colour recognition.

The EN ISO 16321-1:2022 has a similar requirement named “detection of signal lights” using light distribution for quartz halogen bulbs, it is mandatory for sunglare filters (G) and optional for UV, IR and Welding filters.

A letter “L” is added after the filter letter code for example UL1,2 for a UV filter meeting the requirement for “detection of signal lights”.

High Mass Impact (HM)

Adopted from ANSI/ISEA Z87.1-2020, an optional High Mass Impact resistance clause has been added to EN ISO 16321-1:2022, where a pointed steel projectile weighing 500 g is dropped on the protector from 1.27 m height. The high-mass test is a good indicator of a product’s strength and is meant to simulate an impact like a slipping tool that can fall onto a worker’s face or a lens collision with a stationary object. This helps assess product integrity.

This test can be performed at extreme temperatures (-5°C to +55°C), whereby all testing requirements remain the same with a minimum exposure time of 60 minutes.

Products meeting this clause will be marked with the code “HM” or "HMT if passes the test at extremes of temperature".

Thermal exposure

When tested in accordance with EN ISO 16321 Clause 7.5, no deformation of any part of the protector shall be observed after exposure to a temperature of 55°C for 2 hours. EN 166 conditioning was limited to 1 hour and was named as “‘Stability at elevated temperature”.

Protection Against Droplets (3)

EN 166:2001 clause 7.2.4 had a dual requirement:

Protection against droplet applicable to goggles which was tested using an atomizer and indicator paper.

Protection against splashes of liquids for faceshields only which was tested simply by confirmation of coverage of a defined area on the headfrom.

This test has now been split.

In EN ISO 16321-1:2022, the “Protection against droplets” test applies only to goggles; eye-shields and faceshields (except mesh faceshields) covering the Extended Orbital Protection Zone (EOPZ). This test is conducted using an atomizer.

Streams of Liquid (6)

EN166:2001 faceshield test for “Protection against splash of liquids” which was used for checking coverage only and not included in EN ISO 16321-1:2022.

However, new optional test in EN ISO 16321-1:2022 applying to eye protectors covering the Extended Orbital Protection Zone.

Test device using 6 jets of pressurized water which are aimed at the eye protector.

Radiant Heat (7)

This is a new and optional requirement. The radiant heat test is intended to determine whether the protector will protect the wearer’s face from radiant heat for a specified time. The radiant heat claim may only be used for faceshields with IR filter (marking RR or RRL).

Molten Metal (9)

The optional test for molten metals and hot solids remains the same as described in EN 166:2001.

An important change is that protection against molten metal and hot solids can only be claimed for faceshields, but no longer for goggles.

Chemical Resistance (CH)

This is a new and optional requirement. The chemical resistance of eye and face protectors is intended to establish whether the safety features of the protector (e.g. Impact resistance) are maintained after exposure to specific chemicals. There is a minimum list of chemicals that a protector must be tested against and is explained below.

If the product pass the explained test / requirements, product has a (CH) marking.

Chemical	**Concentration (mass) %**
Sulfuric acid (purity 96%)	30 ± 2 (aqueous)
Sodium hydroxide (purity 99%)	10 ± 1 (aqueous)
p-xylene (purity 99%)	Undiluted
Butan-1-ol (purity 99%)	Undiluted
n-heptane (purity 99%)	Undiluted

Use in Explosive Atmospheres

This is a new and optional requirement. Annex D of EN ISO 80079-36 describes the test to decide whether a non-conductive material is capable of being charged to produce brush discharges and therefore can act as an ignition source for an explosive gas/air or vapor/air mixture.

Protection Against Short Circuit Electric Arc

Protection against short circuit electric arc defined in Clause 7.2.7 in EN 166:2001 is no longer covered in EN ISO 16321-1:2022.

However, a new standard IEC 62819:2022 Live working - Eye, face and head protectors against the effects of electric arc - Performance requirements and test methods will apply as soon as it is published in the OJEU.

Solar Blue Light/Solar UV Light

If there is a claim of both solar blue light and solar UV light for a given protector, the necessary calculations are explained in the standard.

Anti-Reflective Coated Lenses

This is a new and optional feature if the eye protectors have a claim on anti-reflective coating.

Marking Codes

EN 166: 2001	**Definition**	**EN ISO 16321:2022**	**Definition**
EN 166	Standard marking	16321	Standard marking
Filter Types			
2	Ultraviolet filter	U	Ultraviolet filter
2C	Ultraviolet filter, good colour recognition	UL	Ultraviolet filter, detection of Signal Light
4	Infrared filter	R	Infrared filter
4C	Infrared filter, good colour recognition	RL	Infrared filter, detection of Signal Lights
-	-	RR	Infrared filter, Enhanced IR Reflectance
5	Filter for sunglare	G	Sunglare filter
6	Filter for sunglare with Infrared specification	GR	Sunglare filter with Infrared Protection
Shade number	Welding filter	W	Welding Filter

-	-	WL	Welding filter, Detection of Signal Lights
Mechanical Strengths			
A	High energy impact (190 m/s)	-	Dropped from EN ISO 16321-1:2022
B	Medium energy impact (120 m/s)	E	High energy impact (120 m/s)
-	-	D	*NEW for EN ISO 16321-1:2022* Medium Energy Impact (80m/s)
F	Low energy impact (45 m/s)	C	Low energy Impact (45 m/s)
S	Increased robustness (12 m/s)	No mark	Basic Impact
T	Extreme temperature (-5°C to +55°C)	T	Extreme temperature (-5 °C to +55 °C)
-	-	HM	High Mass Impact
Optional Markings			
3	Droplets and splashes of liquids	**3**	Protection against Droplets
4	Large dust particles	4	Protection against Large dust particles
5	Gases and fine dust particles	5	Protection against Gas and fine dust particles
-	-	6	*NEW for EN ISO 16321-1:2022* Protection against Streams of liquids
-	-	7	*NEW for EN ISO 16321-1:2022* Radiant Heat
8	Short circuit electric arc	-	-
9	Molten metal and hot solids	9	Protection against Molten metals and Hot solids Faceshields only
-	-	CH	*NEW for EN ISO 16321-1:2022* Chemical resistance
K	Surface damage by fine particles	K	Resistance to Surface damage by fine particles
N	Fogging of ocular	N	Resistance to fogging
		SF	Filters for Glass Blowing

There are some marking changes as indicated in table below.

MANDATORY	
FRAME	**LENS/FILTER**
Number of standard	manufacturer's identifying mark or manufacturer's trade mark;
Manufacturer name/trademark	filtering performance code letter (U, R, GL, GLR, SF, etc.), if applicable;
Filter codes	enhanced infrared absorption or reflection if applicable;
Maximum shade number	shade number(s), if applicable;
Impact level	impact level
Head size (if applicable)	
OPTIONAL	
Model	**Model**

Extremes of temperature for mechanical tests;	Enhanced optical performance
Resistance to droplets;	Extremes of temperature for mechanical tests;
Resistance to streams of liquids;	Resistance to surface damage
Resistance to large dust particles;	Resistance of lens/filter to fogging
Resistance to gas/fine dust;	Resistance to chemicals;
Resistance to chemicals;	Resistance to molten metals and hot solids;
Resistance to molten metals and hot solids;	Protection against radiant heat.
Protection against radiant heat.	

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