

Eye & Face Protection

European Standards

The European Standards covering Eye & Face Protection are some of the most comprehensive of all those dealing with any item of PPE. To help explain, in practical terms, what is encompassed within the four most commonly occurring of these i.e. EN166, 169, 170 & 172 we start this section, with a number of examples, to show the way in which the specifications are usually presented.

How do the numbers & letters for EN166 & EN170 work?

Example 1: Pulsafe Millennia Spectacle, Clear Lens

The full specification for this spectacle is shown as

EN166 1F, EN170 3-1.2

The meaning of the various markings is as follows:

1F refers to EN166, the Technical Performance Standard where:

'1' denotes 'optical class 1', the highest optical class

'F' denotes 'low energy impact resistance'

3-1.2 refers to EN170, the Ultraviolet Standard where:

'3' the Code Number denotes a UV filter with good colour recognition - maybe shown as 2C

'1.2' denotes the Shade Number; in this case it indicates almost total light transmission

Example 2: Uvex Ultrasonic Goggle, Clear Lens

The full specification for this spectacle is shown as

EN166 1B349KN, EN170 2-1.2

The meaning of the various markings is as follows:

1B349KN refers to EN166, the Technical Performance Standard where:

'1' denotes 'optical class 1', the highest optical class

'B' denotes 'medium energy impact resistance'

'3' denotes resistance to 'liquids (droplet or splashes)'

'4' denotes resistance to 'dust particles'

'9' denotes resistance to molten 'metal & hot solids'

'K' is optional and denotes a hard coated lens

i.e. 'resistance to abrasion' by fine particles

'N' is optional and denotes 'resistance to misting'

2-1.2 refers to EN170, the

Ultraviolet Standard where:

'2' the Code Number denotes a UV filter which may affect colour recognition

'1.2' denotes the Shade Number; in this case it indicates almost total light transmission

How do the numbers for EN166 & EN172 work?

Example 3: Uvex Skyper SX2, Spectacle, SCT Lens

The full specification for this spectacle is shown as

EN166 1F, EN172 5-2.5

The meaning of the various markings is as follows:

1F refers to EN166, the Technical Performance Standard where:

'1' denotes 'optical class 1', the highest optical class

'F' denotes 'low energy impact resistance'

5-2.5 refers to EN172, the Solar Protection Standard where:

'5' the Code Number denotes 'the solar protection offered by the lens has no infrared element'

'2.5' denotes the Shade Number; in this case it indicates that light transmission is less than 29.1%

How do the numbers for EN166 & EN169 work?

Example 4: Pulsafe V-Maxx Goggle, Green Lens Shade 5

The full specification for this spectacle is shown as **EN166 1F349, EN169 5**

The meaning of the various markings is as follows:

1F349 refers to EN166, the Technical Performance Standard where:

'1' denotes 'optical class 1', the highest optical class

'F' denotes 'low energy impact resistance'

'3' denotes resistance to 'liquids (droplet or splashes)'

'4' denotes resistance to 'dust particles'

'9' denotes resistance to molten 'metal & hot solids'

5 refers to EN169, the Welding Filter Standard where:

'5' denotes the Shade Number; in this case 'a shade 5 green welding lens' - please note, under EN169 only a shade number is given, there is never a Code Number, please see tables (b) & (c) for further information.

These examples contain a considerable amount of information, but the one common strand is that EN166 appears in all of the descriptions. EN166 is the Core Technical Standard and deals with the properties of an eye protector such as Optical Class, Mechanical Strength and Fields of use, each of which is denoted by a number or a letter. Please see Table (A) for a detailed explanation.

The interpretation of EN166 is usually fairly straightforward; however when the 'figures' from other standards such as EN169, 170 & 172 begin to appear, it can more difficult to interpret what is being presented, especially if the standard itself is not referenced, which is often the case. We have therefore included the 'other' EN Standards in all our descriptions, alongside the 'figures' they relate to, so as to make it easier to identify the product that meets your specific requirements.

In the Tables (B), (C), & (D) we explain in greater detail the technical attributes of EN169, 170 & 172 and also EN171 which appears less often than the other standards.

Overview of main standards relating to Eye Protection

Standards - Basic:

EN166 - Technical performance standard - The core technical standard

EN167 - Methods for optical tests

EN168 - Methods for tests other than optical

Standards - Product Type:

EN169 - Filters for welding and related techniques - Transmittance requirements and recommended utilisation

EN170 - Ultraviolet filters - Transmittance requirements and recommended utilisation

EN171 - Infrared filters - Transmittance requirements and recommended use

EN172 - Solar radiation filters - Sunglare filters for industrial use

Standards - Field of Use:

Welding -

EN175 - Equipment for eye and face protection during welding and allied processes

EN379 - Specification for welding filters with switchable and dual luminous transmittance

Laser -

EN207 - Filters and eye protection against laser radiation

EN208 - Eye protection for adjustment work on lasers and laser systems

Mechanical / Heat Protection -

EN1731 - Mesh type eye and face protectors for industrial and non-industrial use against mechanical hazards and / or heat

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Technical Attributes

What is EN166?

EN166 is the core technical standard to which all PPE involved in protecting the eyes or face must be approved. Within the standard, there are numerous levels of compliance, depending on the end use of the piece of equipment in question. Table (A) describes the

TABLE A

Description of Mark Under EN166	Symbol & Location		Type of Eye-Protector & Comments
	Frame	Lens	
Optical Class - The first digit seen after EN166 notation			
Class 1 (high optical quality) Suitable for occasional wear. Refractive power of ± 0.06 dioptres		1	Normal optical quality for all safety spectacles & goggles
Class 2 (medium optical quality) Suitable for occasional wear. Refractive power of ± 0.12 dioptres		2	When seen within a specification the figure 2 usually refers to the standard EN170 and not optical class, see tables b, c & d
Class 3 (low optical quality) Only suitable for exceptional wear. Refractive power of ± 0.25 dioptres		3	When seen within a specification the figure 3 usually refers to the standard EN170 and not optical class, see tables b, c & d
Mechanical Strength			
Minimum Robustness	N/A	N/A	
Increased Robustness (12m/s)		S	Spectacles with reinforced mineral lenses
Low Energy Impact (45m/s)	F	F	Faceshields, goggles & spectacles
Medium Energy Impact (120m/s)	B	B	Faceshields & goggles
High Energy Impact (190m/s)	A	A	Polycarbonate faceshields (High Energy Impact is rarely required in industrial use and can adversely affect the optical class)
Resistance to high speed particles at extremes of temperature -5°C to +55°C	(T)	(T)	Can be seen in conjunction with symbols F, B or A
Field(s) of Use			
Liquids (droplets or splashes)		3	Goggles (indirect vent & unvented) & faceshields
Large Dust Particles (particles size $>5\mu\text{m}$)		4	Goggles (indirect vent & unvented)
Gas & Fine Dust Particles (smoke/dust with particle size $<5\mu\text{m}$)		5	Goggles (unvented)
Resistance to Short Circuit Electric Arc		8	Faceshields minimum thickness 1.4mm. 99.9% UV filtration
Molten Metal and Hot Solids		9	Goggles & faceshields
Hard Coat - resistance to damage by fine particles (optional)		K	
Non-Mist - resistance to misting (optional)		N	
Enhanced reflectance (optional)		R	Gold coated visors
Radiant Heat - mesh type protection only		G	
Eye protector designed to fit a small head		H	

What do EN169, 170, 171 & 172 relate to?

These are the standards that deal with the shade and filtering characteristics of the lenses of eye protectors. They indicate the levels of protection afforded against Ultraviolet light, Infrared light, Sunlight and against the high intensity light produced during Welding processes. The numbers used to describe these characteristics appear only on the lenses of the eye protector; table (B) below illustrates how these numbers relate to specific European Standards.

TABLE B

Description of Mark Under EN169, 170, 171, & 172	Marking on Lens	See tables (C) & (D) for more in depth explanations
The 1st digit after the EN ref is the ' Code Number ' indicating the type of filter, except for EN169 where only a shade number appears	2 & 3	2 & 3 = UV Filters to EN170
	4	4 = IR Filter to EN171
	5 & 6	5 & 6 = Solar Filters (sun protection) to EN172
The 2nd & 3rd digits after the EN ref are the ' Shade Numbers ' and indicate the shade of the lens	1.2 to 16	1.2 to 16 = Welding Filters for spectacles & goggles to EN169 . Shades greater than 7 require a face shield

Eye & Face Protection

Technical Attributes

Shade Numbers

Table (C) explains in greater depth what the Shade Numbers on a lens (2nd & 3rd digit) represent. It also gives a brief outline of some of the applications for which eye protectors meeting these EN approvals can be used.

Table (D) explains in even greater detail the meaning of the 'numbers' relating to EN170 and 172

TABLE C

European Standard	Nature of Protection	Code Number 1st digit (type of filter)	Shade Number 2nd & 3rd digit	Applications	Appropriate Lens Colours
EN169	Welding Filters	The Welding standard only requires a Shade Number	1.2 to 16	Welder's assistant (shade 1.7) Braze welding (shade 3 to 5) Oxy-cutting (shade 5 to 7) Arc welding (shades greater than 7 require a face shield)	IR Shades: 1.7, 3.5 Welding Glass
EN170	Ultraviolet (UV) Filters	2 & 2C (2C was previously 3)	1.2 to 5	Welding - short circuit Electric Arc Sunlight	Clear Amber Blue HDL Yellow (high definition lens)
EN171	Infrared (IR) Filters	4	1.2 to 10	Arc welding Glass manufacturing Foundry work Sunlight	IR Shades: 1.7, 3.5 Blue Cobalt
EN172	Solar (sun protection) Filters	5 & 6	1.1 to 4.1	High intensity solar glare Outdoor work	I/O Silver (indoor/outdoor) TSR Grey (traffic signal recognition) SCT400 (spectrum control technology) Cappuccino Blue Mirror Silver Mirror

TABLE D

1st digit Code Number (type of filter)	Description of Property
2 2C 5 6	UV Protection (EN170). The number 2 indicates the filter may effect colour recognition UV Protection (EN170). The number 2C (previously 3) indicates the filter allows good colour recognition Solar Protection (EN172). i.e. sunglare protection - with no infrared (IR) protection Solar Protection (EN172). i.e. sunglare protection - with infrared (IR) protection
2nd & 3rd digit Shade Number	Description of Property
1.2 1.7 2.5 3.1	Allows more than 74.4% light transmission, but less than 100% Allows more than 43.2% light transmission, but less than 58.1% Allows more than 17.8% light transmission, but less than 29.1% Allows more than 8.0% light transmission, but less than 17.8%