

For starters, every EN approved visor is marked to identify the manufacturer and that it meets the norm for eye and face protection EN 166. Then, it's a matter of mechanical, chemical, thermal, radiation, electrical and biological hazards existing in the workplace to decide on the appropriate visor version. Many visors are designed for one or more of the hazards. This summary compares 5 hazards with appropriate visor and lists 5 additional things to consider.

1. Mechanical Hazards

Shocks, flying splinters or dust particles are typical hazards in many industries. Depending on the intense of mechanical impact within your application you should select a spectacle, goggle or visor. EN 166 distinguishes between 4 impact protection classes: "S"= increased robustness 5,1 m/s; "F"= Low Impact 45 m/s; "B"= "Medium Impact" 120 m/s; "A"= High Impact 190 m/s. If you need an impact protection ≥ 120 m/s you have to select a visor marked "B" (a spectacle can't get such certification). In case you are exposed to extreme temperatures you should look for a visor with additional certification: "BT" Protection against high speed particles at extreme temperatures (-5°C and +55°C).



Face & Neck coverage: If you can be hurt outside your eyes, you will need a visor to protect your complete face. Visors are available in many sizes, look for the manufacturer which offers several length in case you want alternatives. Most visors curve around the face, but MSAs selected visor versions feature sides of visor contoured towards face for a closer fit and improved resistance to impact and splash hazards. In case users have to work in lying position (e.g. cutting tubes) probably the chin and neck need to be protected as well. MSAs retractable chinguard is the best solution in confined spaces to ensure both- neck protection in most compact format.



The most popular visor material used today for impact-protection is polycarbonate, offering also very good scratch resistance.

2. Chemical Hazards

For solid, liquid or gaseous chemicals often a goggle is used to seal the eye area from hazards. Then, a chemical-resistant visor is needed for chemicals that harm skin. By EN 166 certification marking "3" stands for protection against liquid droplets/ splashes, marking "4" large dust particles > 5 microns, marking "5" gas and fine dust particles < 5 microns.



It depends on the actual **chemical hazard** and ambient conditions to decide which visor is the best. Different visors materials, thicknesses, amount of plasticizer and diverse coatings offer all different performances. MSA performed intensive tests with select chemical families on certain V-Gard Visors. The results of the tests are available in the "MSA Chemical Application Quick Reference Guide". Within this tests V-Gard visors were secured to frames in the "as worn" position – reflecting the real performance, which can be really different to testing them not mounted on frames! While the guide shows the performance against certain chemicals, it is not intended to be all-inclusive. The visor should be tested in real conditions using individual chemicals blend and concentrations. To compare the available visor materials in general:

Polycarbonate has a better optical quality, high impact resistance and good resistance to some types of chemicals, usually acids. It can be recommended to select an injection moulded, thick PC material as this has a higher resistance as NOT stressed as flat visors.

Acetate offers a good resistance to various chemicals (usually solvents) but with a lower density it doesn't offers such a good impact protection like PC or Propionate (Acetate visors are impact certified for F=45m/s). It is also more difficult to pass the optical requirements with acetate visors. Because of this MSA developed Propionate visors with similar chemical resistance.

Propionate provides superior chemical splash resistance mainly against organic chemicals such as solvents. As injection moulded thick version it ensures great optical quality and very good impact protection like PC (B=120 m/s).



In case of **high splash risk** it is important to seal the space between helmet and frame otherwise when visors is lifted above the helmet the chemical may hurt users face. MSAs unique debris control can be easily added to any V-Gard frame and ensures tight sealing.

3. Thermal Hazards

Hot liquids, splashes of molten materials, gases and radiant heat coming from ovens are a serious hazard. Even by EN 166 you could select a goggle which is certified for “9” – splashes of molten metal and hot solids, it seems safer to protect whole face with a visor marked “9”.

Injection moulded visors made of thick (≥ 1.8 mm) polycarbonate offer a good resistance against ambient heat. Except for “Protection against high speed particles at extreme temperatures +55°C” in EN 166 there is no high temperature test method available. For work places with high thermal radiation levels usually reflective visors are used – deflecting a significant amount of heat and IR radiation.



4. Radiation Hazards

The natural electromagnetic spectrum includes visible light, ultraviolet and infrared hazards, artificial includes UV, IR and Laser. Whether a goggle, visor or welding helmet is appropriate depends on the type of exposure when welding, cutting, torching, brazing or using laser beams, etc.

For **UltraViolet** protection select spectacles, goggles and visors marked with “2” UV filter, “2C” UV filter with good colour recognition (EN166 + EN 170). For **sunglare** protection select “5” filter according to EN 172. The lens shade controls the intensity of glare reduction – higher scale number with decreasing luminous transmittance of lens (e.g. 1.2 clear lens, 2.5 smoke lens). MSA is the only manufacturer offering green tinted visors, which help alleviate eye strain and fatigue by reducing excessive glare, especially in outdoor working conditions.

For **infrared** protection the marking “4” stands for IR filter EN 171. Welding Filters EN 169 have no digit, just the scale number e.g. “4-3” or “4-5”.

Special coating reflects IR radiation EN 166 ‘R’ certified: spectral reflectance of IR between 780 nm and 2000 nm is >60 %, helping to protect skin and eyes from IR exposure.



5. Electrical Arc Flash Hazard

The risks from arc flash include ultraviolet and infrared radiation, intense light, convective heat and flying debris. Temperatures can reach 19,400 °C at the arc terminals. Appropriate PPE is crucial even though there is no common global standard against arc flash hazards. The only international commonality is that for arc flash protection visors have to be used, spectacles/goggles are not allowed. MSA offers appropriate, EN 166 and GS-ET-29 tested visors, which should be selected according to each individual risk assessment.

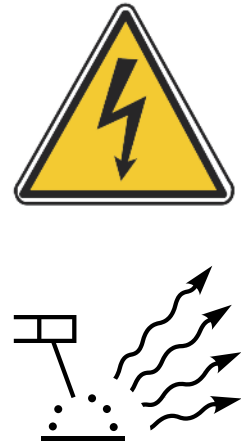
EN 166 marking „8“ indicates visors and frames which protect against an open circuit electric arc of 12 kA max, 380-400 V, 50 Hz nominal for 1 sec max. The requirements are: metal free, defined face coverage, visor thickness minimum 1,4mm with a scale number of 2-1,2 or 2C-1,2. MSA offers 5 visor versions with this certification, all MSA visor frames and chin protectors are approved in combination.

GS-ET-29 “Supplementary requirements for the testing and certification of face shields for electrical works“ first published in 2010 by german DGUV. Whilst an equivalent EN standard is in preparation, some users require visors certified for GS-ET-29. This is “Arc-in-the-Box” testing with parameters of 400 V AC; 50 or 60 Hz for 500ms and has 2 classes:

Class 1: 4 kA, 135kJ/m³

Class 2: 7 kA, 423kJ/m³

The main different to EN 166 “8” is measurement of the temperature behind the visor at eye, mouth and chin level of the test head – maximum safe temperatures are given, to ensure that users will not be injured. MSA offers visors meeting both classes of GS-ET-29. MSA visors, chin protectors, frames and helmets are approved in combination – all offering reliable arc flash protection.



6. Fogging

Fogging of eye protection and visors often occurs in hot and/or humid work environment, outdoors in sticky summer conditions, inside a steam-filled boiler room or food manufacturing plant, changing workplaces with different temperatures/humidity, workers exertion, etc. When the vision is disturbed at the workplace it can lead to dangerous situations/accidents! It is also very critical when workers remove their eyewear/visor during work to wipe the lenses clear of moisture.

Effective indirect ventilation system on goggles and adjustable distance of visor to the face can prevent fogging. In addition more and more safety officers look today for antifog coated visors and eyewear. Many lenses in the market are NOT coated to prevent fogging, and those coated deliver different performance. The reason is that the **term “Antifog” is descriptive, not fixed**. The face protection standard EN 166 includes an antifog option. In this optional test the visor must remain free from fogging for a minimum of 8 s when tested [clause 16 EN 168:2001]. A premium, robust coating is required to successfully pass the test after all the necessary conditioning.

Only **visors marked EN166 “N” are certified as having the required level of Antifog** to meet the standard’s requirements. Some manufacturers argue to have visors with „Antifog“ properties but often they are not so performant as the requirement of the EN 166 “N” option. MSA offers several visors which have passed this intensive antifog test and these are marked with “N” from EN 166.

The wearer should consider that no anti-fog coating can last forever. With daily washings every coating available will disappear slowly in some weeks/month. It is recommended to refresh the coating using a Antifog and cleaning spray.

Visors and eyewear with effective anti-fog coating significantly can improve worker safety and productivity.



7. Scratching

Scratched eye protection and visors are very common in practice and reasonable in tough working conditions. When the vision is disturbed it can lead to dangerous situations/accidents. Many safety officers look today for an antiscratch coated visor. The problem is that the term **“Antiscratch” is descriptive, not fixed.**

EN 166 includes an optional requirement on “Resistance to surface damage by fine particles” using “K” for the product marking. Sand is used to test the robustness and light scattering is measured afterwards [clause 15 of EN 168:2001]. Only visors marked EN 166 “K” are certified as having the required level of Antiscratch to meet the standard’s requirements. Some manufacturers argue to have visors with „Antiscratch“ properties but often they are not so performant as the requirement of the EN 166 “K” option.



MSA offers several visors which have passed this intensive test and these are marked with “K” from EN 166. They improve vision under tough conditions by preventing scratching that easily happens during the course of the work day. Additionally, this coatings extend the life and use of the visor, improving overall costs.

8. Practical Use

Many workers use visors stand-by position (medium) during work. The visors parking position (lift above head) is used for longer breaks. So when selecting a visor model pay attention that the visor frame ensures all reliable positions: wearing, stand-by and parking.

If visor mounting to the helmet or changing is difficult, the risk increases that the visor will not be worn at all! Therefore it is critical that visor, frame and helmet are developed and certified in combination and can be quickly combined or disassembled as the situation changes.

9. Optical Class

Most economic visors are flat ones, produced in a sheet, cutted in specific shape. Those are very often sufficient where impact and splash hazards exist. Injection moulded visors are thicker offering higher protection. They are optically corrected and therefore offer very good view and reduce fatigue during work – important when visor has to be worn all day.

MSAs offers both, flat and moulded visors to offer always best price/performance ratio. Both are certified for EN 166 best optical class “1” EN 166 but tests showed that the optical performance is better with the moulded versions.

10. Certified Combination with Frames and other PPE

The American Norm ANSI Z87.1 for eye and face protection states that visors must be worn over eye protection. The current EN 166 doesn’t states this, even in some cases it could be appropriate. It is up to the customer to decide.

EN 166 requires that a visor is always certified with its **matching visor frame**, unmatched combinations are not allowed, even if it is possible to fit the pieces together. Frequently visors/frame sets are combined with a helmet from another manufacturer. Although this is not absolutely prohibited in EN 166, the exact protective performance of the visor cannot be confirmed and may be easily dislodged and fail to meet the standard.

When wearing **respiratory masks** below the visor select a visor/frame where you can adjust the distance to the face.

Using **ear muffs** in combination it is important to select a visor which is shaped to allow a perfect combination.

All V-Gard visors easily fit and are certified with V-Gard Headgear brow guard and V-Gard frames for all V-Gard helmets. They feature above mentioned benefits.

For more info on MSAs visor range please see the MSA visor selection guide and visor technical datasheets. This guide can’t replace a detailed hazard/working environment assessment.