



Hella: HEADLIGHTS

Here you will find useful basic information and handy tips relating to vehicle headlamps.

Vehicle headlamps focus the light beams generated by the light source onto the road. On this page, find out about the structure of headlamps, and what lighting technology concepts and legal regulations there are, amongst other things. Here you can also find useful practical tips for dealing with plastic cover lenses.



1. VEHICLE HEADLAMPS – COMPONENTS: BASIC PRINCIPLES

Housing

The housing of the headlamp has the following tasks:

- Carrier of all headlamp components (cable, reflector, etc.)
- Fixing to the vehicle body
- Protection against exterior influences (humidity, heat, etc.)
- Thermoplastics are used as housing material.



Reflector

The major functional aim of the reflector is to capture the greatest possible share of the luminous flux radiated by the bulb and to direct this towards the road. There are various different reflector systems available to enable headlamp designers to meet this requirement as effectively as possible.

Material selection for reflectors

Whereas some years ago most reflectors were made of sheet steel, the demands made on headlamps today, such as production tolerances, design, surface quality, weight etc. lead to the use of mainly plastics (various thermoplastics) for reflectors. These are manufactured with a high accuracy of mold reproducibility. This allows tiered and multiple-chamber systems in particular to be realised. Subsequently, the reflectors are coated to achieve the necessary surface quality. In the case of headlamp systems with a high thermal stress, reflectors may also be manufactured from aluminium or magnesium. In the next step an aluminium reflection layer and then a silicon protective layer are vapor-plated onto the reflector surface.





Projection modules

Due to their exactly demarcated beam path and high luminous flux, projection modules are used very often in modern headlamps. Thanks to different lens diameters, lighting functions, and installation possibilities these modules can be used for a wide range of individual headlamp concepts.

Cover lenses

Cover lenses with dispersion optics have the task of deflecting, scattering or focusing the luminous flux collected by the reflector in such a way that the required light distribution, such as the cut-off line, is produced. This previous standard concept has now almost been completely replaced by non-patterned systems.

Cover lenses without dispersion optics

So-called "clear cover lenses" have no optical elements. They only serve to protect the light from soiling and weather conditions.

They are used for the following headlamp systems:

- Inner lens (DE system), for low beam, high beam (bi-xenon) and fog light



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They are used for the following headlamp systems:

- Inner lens (DE system), for low beam, high beam (bi-xenon) and fog light.
- Separate cover lens within the headlamp, directly in front of the reflector.
- Free-form headlamps (FF), completely without additional patterning.

Material selection for cover lenses

Conventional cover lenses are generally made of glass. This must be free of streaks and bubbles. However, due to the requirements mentioned previously, the cover lenses are increasingly made of plastic (polycarbonate, PC).





2. TIPS FOR CLEANING A HEADLIGHT LENS WITH PLASTIC COVER: PRACTICAL TIPS

In order to avoid damage to plastic cover lenses, the following information should be observed:

- Never clean plastic cover lenses with a dry cloth (danger of scratches)!
- Before adding anything to the water in the lens cleaning system, such as a cleaning agent or antifreeze, always check the instructions in the vehicle handbook.
- Cleaning chemicals which are too aggressive or of the wrong type can destroy plastic cover lenses.
- Never use impermissible high-wattage bulbs!
- Only use bulbs with a UV-filter!

LIGHTING TECHNOLOGY CONCEPTS: COMPARISON

With today's headlamps, the light distribution on the road is based on two different technical lighting concepts using reflection and projection technology. While the outstanding features of reflection systems are large-surface reflectors behind a clear or patterned cover lens, projector-type systems have a small light exit with a characteristic lens.



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HEADLAMP SYSTEMS: OVERVIEW

There are four typical headlamp systems



PARABOLOID HEADLAMPS
e.g. Audi 100 high & low



FF-H4 HEADLAMPS
e.g. VW Bora



FREE-FORM (FF) HEADLAMPS
e.g. Skoda Roomster



SUPER-DE HEADLAMPS (COMBINED WITH FF HEADLAMPS)
e.g. Skoda Superb