

IEC comments to GRE/2012/12 concerning voltage control gear in conjunction with halogen filament light sources

1. IEC supports the GTB proposal to allow/ clarify voltage control gear (VCG) according to Regulation No. 48 being placed in the head lamp according to Regulation No. 112, as an option. This support is based upon the facts that:
 - a. The headlamp is still being tested using the reference luminous flux.
 - b. The maximum voltage requirements as specified by paragraph 5.27 in Regulation No. 48 are maintained.

2. However, at the same time, IEC has serious concerns with the proposal, from point of view of the operation of halogen filament light sources. This is because halogen filament light sources should not be operated permanently outside the specifications, at a too low or at too high voltage.
 - a. **In GRE/2012/12 there is no clear correlation between the voltage applied to the halogen filament light source under constant operating conditions and at the time of homologation.**

Head lamps are approved for a reference luminous flux, which is achieved at voltage that is around the test voltage of the light source according to Regulation No. 37. There is no link between this test voltage and the voltage requirements in Regulation 48, except from a maximum voltage to the terminals of the lamp using this light source.
 - b. **Proposal GRE/2012/12 allows continuous low voltage and there is no definition how the voltage control gear should prevent this**

Since voltage requirements in Regulation No. 48 have been introduced and these requirements in paragraph 5.27 are only specifying maximum values for the voltage, it is more and more often forgotten that halogen filament light sources cannot be used permanently at a low voltage. In the past or in the case of absence of a voltage control system, there has never been a problem because the voltage was fluctuating and halogen light sources can repair themselves to a certain degree. Today, there is only a focus on maximising the voltage. VCG in the headlamp may increase dimming down the voltage to light sources below the test voltage (13.2V).
 - c. **Voltage variation has consequences for the correct physical and chemical operation of halogen light sources.**
 - (i) For physical aspects, the effects of voltage variation are fairly known; they are not linear. For lifetime, the effects have been highlighted in the past. In case of the luminous flux, -3% in voltage results in around -10% in luminous flux; -5% in voltage results in around -16% in luminous flux. These are approximate values, because variations occur depending on the use of materials and manufacturing.
 - (ii) The chemical effects cannot be generally specified since they depend to a large extent on the design of the halogen cycle. The chemical characteristics of halogen filament light sources are neither regulated nor standardised. Each manufacturer knows the behaviour of its own products for a small range around the test voltage but, this behaviour is different from manufacturer to manufacturer. There is no general rule and knowledge is empirical. The gas inside the capsule of a halogen filament light source is a mixture and the composition varies per manufacturer, per product, and per year.
 - d. **Low voltages to halogen filament light sources has consequences for road-usage:**
 - (i) Less light on the road
 - (ii) Early failures, due to disturbance of the flow of gas and filament particles.

(iii) Glare, due to filament distortion since filament particles evaporate and land elsewhere.

3. For these reasons, IEC is of the opinion that, when control gear is present, it should be used for achieving operating conditions for which the halogen filament light sources have been designed, specified and approved for. As an exceptional case, H9(B) has been adapted and approved such that it can be applied at two different test voltages; see GRE/2010/51, WP.29/2011/10. Accordingly, manufacturers have designed specific H9(B) light sources that can be approved to these requirements. This is not possible for other light source categories.

4. IEC is requesting for measures to avoid constant low voltage operation (i.e. dimming on purpose) for the principal or basic passing beam, since this is the main application of halogen filament light sources.

- a. If the proposal GRE/2012/12 would have been to allow control gear in Regulation No. 112, a requirement could have been inserted into Regulation No. 112, to prescribe that the voltage control gear in the head lamp shall not dim the voltage to the terminals of the light source, and to limit the voltage to a maximum value; no step up convertors required.
 - b. However, the proposal GRE/2012/12 is to allow the voltage control gear being part of the vehicle approval according to Regulation No. 48. So it seems that paragraph 5.27, in the case of control gear present, needs to be completed with a minimum voltage value offered at the terminals of the head lamp; voltage spikes and/or voltage transients not to be taken into account, and are excluded from the minimum
 - c. [Insertion of this requirement into paragraph 5.27 of Regulation 48 might need to be considered in any case where voltage control gear is present.]
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