

**Economic and Social Council**Distr.: General  
11 August 2014

Original: English

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**Economic Commission for Europe****Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Lighting and Light-Signalling****Seventy-second session**

Geneva, 20–22 October 2014

Item 4 (c) of the provisional agenda

**1958 Agreement - Regulations****Draft Horizontal Reference Document and collective amendments****Proposal for Supplement 5 to the 01 series of amendments to Regulation No. 112 and for Supplement 6 to the 06 series of amendments to Regulation No. 48****Submitted by the experts from Germany, Netherlands and International Electrotechnical Commission (IEC)\***

The text reproduced below was prepared by the experts from Germany, Netherlands and IEC, to introduce requirements to avoid intentional non-approved (voltage) variation of the passing and driving beam, using halogen light sources and to harmonize it with the operating voltage requirements in Regulation No. 48. This document is superseding ECE/TRANS/WP.29/GRE/2013/62 and was prepared after consultation with several experts and in response to discussions on ECE/TRANS/WP.29/GRE/2013/44, ECE/TRANS/WP.29/GRE/2013/62, GRE-70-17, GRE-70-34 and GRE-71-13. The modifications to the existing text of the Regulation are marked in bold for new or strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2012–2016 (ECE/TRANS/224, para. 94 and ECE/TRANS/2012/12, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

## I. Proposal for Supplement 5 to the 01 series of amendments to Regulation No. 112

*Insert a new paragraph 2.1.6., to read:*

- “2.1.6. Whether electronic light source control gear is present and associated with filament lamp(s).**

*Paragraph 2.2.6., amend to read:*

- “2.2.6. One sample of the electronic light source control gear in the headlamp associated with LED module(s) and/or filament lamp(s), if applicable, including documentation on the value of the input voltage (range) for which the lamp is to be approved.”**

*Insert a new paragraph 3.7, to read:*

- “3.7. If an electronic light source control gear associated with a filament lamp is used, the headlamp shall bear the rated input voltage (range).”**

*Paragraph 5.3.1.3., amend to read:*

- “5.3.1.3. Electronic light source control gear located within the body of the headlamp and associated with the operation of the filament lamp shall be considered to be part of the headlamp.**

- 5.3.1.3.1. The effective voltage (root-mean-square, r.m.s.) at the terminals of the filament lamp, supplied by the electronic light source control gear, shall be not more than 7.0 V (6 Volt-Systems), 13.9 V (12 Volt-Systems) or 28.8 V (24 Volt-Systems) and not less than 6.0 V (6 Volt-Systems), 12.0 V (12 Volt-Systems) or 24.0 V (24 Volt-Systems), when the headlamp is supplied with a voltage as described in paragraph 2.2.6.”**

*Paragraph 6.1.3, amend to read:*

- “6.1.3. ~~Apart from LED module(s),~~ The photometric characteristics of the headlamps with filament lamps shall be checked by means of an uncoloured standard (étalon) filament lamp designed for a rated voltage of 12V while the electronic light source control gear, if any, is disconnected.**

- 6.1.3.1. During the checking of the headlamp, the voltage at the terminals of the filament lamp shall be regulated as to obtain the reference luminous flux at 13.2 V as indicated for each filament lamp at the relevant data sheet of Regulation No. 37.**

However if a filament lamp of category H9 or H9B is used for the principal passing beam, the applicant may choose the reference luminous flux at 12.2 V or 13.2 V as indicated in the relevant data sheet of Regulation No. 37 and a reference stating which voltage was chosen for type approval shall be made in item 9 in the communication form of Annex 1.

- 6.1.3.2. In order to protect the standard (étalon) filament lamp during the process of photometric measurement it is permissible to carry out the measurements at a luminous flux that differs from the reference luminous flux at 13.2 V. If the Technical Service chooses to carry out measurements in such a manner, the luminous intensity shall be corrected by multiplying the measured value by the individual factor  $F_{\text{lamp}}$  of the standard (étalon) filament lamp in order to verify the compliance with the photometric requirements where:**

$$F_{\text{lamp}} = \Phi_{\text{reference}} / \Phi_{\text{test}}$$

$\Phi_{\text{reference}}$  is the reference luminous flux at 13.2 V as specified in the relevant data sheet of Regulation No. 37

$\Phi_{\text{test}}$  is the actual luminous flux used for the measurement.

However, where the reference luminous flux of 12.2 V as specified in the data sheet for the category H9 or H9B is chosen, this procedure is not permitted.

**6.1.3.3. In the case of the use of an electronic light source control gear according to paragraph 5.3.1.3., the luminous intensity values measured at reference luminous flux shall be corrected by the factor  $F_v$ , whereas**

$$F_v = (sV_1/V_2)^k$$

$$k = 3.5$$

$$s = \begin{aligned} &= 2.10 \text{ for 6 Volt-Systems} \\ &= 1.00 \text{ for 12 Volt-Systems} \\ &= 0.47 \text{ for 24 Volt-Systems} \end{aligned}$$

$V_1$  is the output voltage (range) of the electronic light source control gear at the terminals of the filament lamp as measured according to paragraph 5.3.1.3.1.

$V_2$  is the exact voltage at which the standard filament lamp used for the photometric measurements for approval of the headlamp is producing its reference luminous flux.

**6.1.3.4.** The headlamp shall be considered acceptable if it meets the requirements of paragraph 6. with at least one standard (étalon) filament lamp, which may be submitted with the headlamp."

*Insert a new paragraph 10.8., to read:*

**"10.8. Paragraph 6.1.3.3. of this Regulation is disregarded."**

*Annex 1, item 9., amend to read:*

"9. Brief description:

Category as described by the relevant marking<sup>3</sup>: .....

Number and category(s) of filament lamp(s): .....

Reference luminous flux used for the principal passing-beam (lm):.....

Principal passing-beam operated at approximately (V): .....

Measures according to paragraph 5.8. of this Regulation: .....

Number and specific identification code(s) of LED module(s) and for each LED module a statement whether it is replaceable or not: yes/no<sup>2</sup>

Number and specific identification code(s) of electronic light source control gear(s) **which is not part of a LED module and is used to operate a LED module(s)**

Total objective luminous flux as described in paragraph 5.9. exceeds 2,000 lumens: yes/no/does not apply<sup>2</sup>

The adjustment of the cut-off has been determined at: 10 m/25 m/does not apply<sup>2</sup>

The determination of the minimum sharpness of the "cut-off" has been carried out at: 10 m/25 m/does not apply<sup>23</sup>

*Annex 4, paragraph 1.1.1.2.*, delete indent (b) and renumber the subsequent indents (c) to (f) into (b) to (e).

~~“(b) In case of replaceable gas discharge light source(s): The test voltage for the electronic light source control gear is  $13.2 \pm 0.1$  volts for 12 V vehicle voltage system, or otherwise specified in the application for approval.”~~

## II. Supplement 6 to the 06 series of amendments to Regulation No. 48

*Paragraph 5.27.*, amend to read:

- 5.27. For vehicles of M and N categories, the applicant shall demonstrate to the Technical Service responsible for type approval testing that the electric power supply conditions for the devices indicated in paragraphs 2.7.9., 2.7.10., 2.7.12., 2.7.14. and 2.7.15. above comply, when the electrical system of the vehicle is in a constant voltage operating condition, representative for the relevant category of powered vehicle as specified by the applicant, with the following provisions:
- 5.27.1. The voltage supplied at the terminals of devices which, according to their type approval documentation, have been tested by the application of a special power supply/electronic light source control gear, or in a secondary operating mode or at a voltage requested by the applicant, shall not exceed the voltage specified for the relevant devices or functions as they have been approved.
- 5.27.2. In all cases of electric power supply conditions not covered by paragraph 5.27.1., the voltage at the terminals of the device(s) or function(s) shall not exceed 6.75 V (6 Volt-Systems), 13.5 V (12 Volt-Systems) or 28 V (24 Volt-Systems) by more than 3 per cent. ~~The means of controlling the maximum voltage at the terminals of the device may, for convenience, be located within the body of the device.~~
- 5.27.3. The provisions of paragraphs 5.27.1. and 5.27.2. shall not apply to devices which include an electronic light source control gear or a variable intensity control being part of the device.
- 5.27.4. A report shall be attached to the approval documentation describing the methods used to demonstrate compliance and the results obtained."

## III. Justification

1. The objectives of this proposal are:
  - (a) To clarify the existence of electronics in the headlamp during type approval;
  - (b) To restrict the allowed voltage (range) at headlamps equipped with halogen filament lamps, to avoid (semi-)permanent too low or too high luminous intensity of the headlamp and subsequent shorter lifetime of the halogen light source. After the Operating Voltage Issues Group (OVIG) with high voltage values, there is now a trend to lower the voltage values so to achieve emission targets. This may compromise traffic safety in terms of low illuminance on the road or failing light sources.

2. In response to the comments made during the seventy-first session of GRE, the following changes to document GRE-71-13 were made:

(a) The comment from the expert from Italy that there is a circular reference with No. 48, paragraph 5.27. is acknowledged:

(i) Regulation No. 48, paragraph 5.27.2. allows locating, for convenience, a means of controlling the (maximum) voltage to the device to be located in the body of the device.

(ii) "Means of controlling the maximum voltage" to the device, once located in the headlamp, is to control the voltage to the light source, which is then by definition an electronic light source control gear.

(iii) Electronic light source control gear is addressed in Regulation No. 48, paragraph 5.27.3.

(iv) Requirements in Regulation No. 48, paragraphs 5.27.2. and 5.27.3. are contradictory, and the expert from Italy is right.

Now that electronic light source control gear is proposed as an option in Regulation No. 112, the allowance to locate "Means of controlling the maximum voltage" in the body of the device as described in Regulation No. 48, paragraph 5.27.2. and the related provision for the headlamp as described in Regulation No. 112, paragraph 5.1.3.1. are no longer necessary and should be deleted.

(b) The comment from several experts that a reference to the normal operating conditions at the vehicle is meeting practical problems is acknowledged. This reference was removed from this proposal. The voltage (range) for which the lamp is to be approved shall now be specified by the applicant and must be marked on the headlamp; paragraphs 2.2.6. and 3.7. Moreover, in paragraphs 2.1.6. and 3.7. the electronic light source control gear shall be identified including whether the electronic light source control gear is in association with filament lamps because electronic light source control gear is already described for LED modules. Moreover, provisions in paragraph 2.2.6. and Annex 1, item 9 have been clarified whether they are in association with LED modules or with filament lamps.

(c) The question from the expert from Austria and the expert from the European Association of Automotive Suppliers (CLEPA) if control gear in the board net was included is clarified in paragraph 5.3.1.4. This is not the case.

(d) The comments from the experts from Austria and France that the proposed provisions for 24V systems were not appropriate are correct.

- Etalon light sources are only available in 12V versions.
- This implies that photometric beam performance can only be verified by a measurement with a 12V etalon light source followed by a calculation.

Solution:

- Since the emitted luminous flux at the same voltage is different per light source, since the reference luminous flux is fixed and the voltage at which this flux is achieved is known, it is proposed to continue photometric measurements at reference luminous flux and calculate the effects of the electronic light source control gear for all three voltage systems, including the dual reference flux option of H9 and H9B. This procedure is described in a new paragraph 6.1.3.4.

- By using a formula, the optical performance of the headlamp can be measured without influence of the electronic light source control gear. This is beneficial to headlamp makers when testing the optics only.
  - By using a DC voltage for generating the reference luminous flux, fast scanning photometric equipment can be used. This is not possible when using electronic light source control gear because these are usually working on PWM, which creates a ripple on the luminous output of the filament lamp.
  - Clarification to the values for s:
    - = 2.10 for 6 Volt-Systems  $2.10=13.2/6.3$
    - = 0.47 for 24 Volt-Systems  $0.47=13.2/28.0$
  - For simplification of conformity of production (CoP), the calculations and use of the formula are skipped.
- (e) Disconnection of the electronic light source control gear for photometric measurements is moved from paragraph 5.3.1.3. to paragraph 6.1.3. because the disconnection is only necessary for photometric measurements at reference luminous flux.
3. While verifying all paragraphs in Regulation No. 112 on the appearance of “electronic light source control gear”, it was discovered that Annex 4, paragraph 1.1.1.2. , indent (b) contained a previous copy/paste error since references to gas discharge light sources are not allowed in this Regulation.
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