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PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 98

(Headlamps with gas-discharge light sources)

Submitted by the expert from the Working Party "Brussels 1952" (GTB)

Note: The text reproduced below was prepared by the expert from GTB in order to introduce into the Regulation provisions for light-emitting diode (LED) modules to be used to produce bend lighting and/or infrared radiation (IR). The modifications to the existing text of the Regulation (up to Supplement 7 to the original version) are marked in **bold** characters.

Note: This document is distributed to the Experts on Lighting and Light-Signalling only.

A. PROPOSAL

List of annexes, amend to read:

" ….
Annex 9 - Minimum requirements for sampling by an inspector

Annex 10 - Requirements for LED modules and headlamps including LED modules"

Text of the Regulation,

Paragraph 2.2.1., amend to read:

"2.2.1. drawings in triplicate in sufficient detail to permit identification of the type (see paragraphs 3.2. and 4.2. below). The drawings must show the position intended for the approval number and the additional symbols in relation to the circle of the approval mark, **in case of LED module(s) also the space reserved for the specific identification code(s) of the module(s),** and must show the headlamp in vertical (axial) section and in front elevation, with main details of the optical design including the flutings, if applicable."

Paragraph 2.2.2., amend to read:

"2.2.2. A brief technical specification including, where it applies, the make and type of the ballast(s) and, in the case where the headlamp is used to produce bend lighting, the extreme positions according to paragraph 6.2.7. below. **In the case of LED module(s) this shall include:**

(a) a brief technical specification of the LED module(s);

(b) a drawing with dimensions and the basic electrical and photometric values and the objective luminous flux.

In addition, for a distributed lighting system, a brief technical specification including the list of the light-guide(s) and related optical components and information describing the light-generator(s) sufficient to permit identification. This information shall include the part number assigned by the light-generator manufacturer, a drawing with dimensions and the basic electrical and photometric values and an official test report related to paragraph 5.8. of this Regulation."

Insert new paragraphs 3.6. to 3.7.2., to read:

"**3.6. In the case of lamps with LED module(s), the lamp shall bear the marking of the rated voltage and rated wattage and the light source module specific identification code.**

3.7. LED module(s) submitted along with the approval of lamp:

3.7.1. shall bear the trade name or mark of the applicant. This marking shall be clearly legible and indelible;

3.7.2. shall bear the specific identification code of the module. This marking shall be clearly legible and indelible.

This specific identification code shall comprise the starting letters "MD" for "MODULE" followed by the approval marking without the circle as prescribed in paragraph 4.2.1. below and in the case several non identical light source modules are used, followed by additional symbols or characters. This specific identification code shall be shown in the drawings mentioned in paragraph 2.2.1. above. The approval marking does not have to be the same as the one on the lamp in which the module is used, but both markings shall be from the same applicant."

Insert a new paragraph 5.12., to read:

"**5.12. The headlamp (if equipped with LED modules) and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 10 of this Regulation. The compliance with the requirements shall be tested.**"

Paragraphs 6.2.5.1. to 6.2.5.3., amend to read:

"6.2.5.1. One additional light source according to Regulation No. 37 **or one or more additional LED module(s)** may be used inside the passing beam headlamp to contribute to bend lighting.

6.2.5.2. One additional light source according to Regulation No. 37, **or one or more LED module(s)** inside the passing beam headlamp, may be used for the purposes of generating infrared radiation. It**/they** shall only be activated at the same time as the gas-discharge light source. In the event that the gas-discharge light source fails, this additional light source shall be automatically switched off.

The test voltage for the measurement with this additional light source **or LED module(s)** shall be the same as in paragraph 6.2.5.4.

6.2.5.3. In the event of failure of an additional light **source or LED module**, the headlamp shall continue to fulfil the requirements of the passing beam."

Paragraph 6.2.7., amend to read:

"6.2.7. The requirements in paragraph 6.2.6. above shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source **or LED module(s)** referred to in paragraph 6.2.5.2. In the case of …. "

Paragraph 6.2.7.1.3., amend to read:

"6.2.7.1.3. means of one additional light source **or one or more LED module(s)** without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with this light source **or LED module(s)** activated."

Paragraph 6.3.1., amend to read:

"6.3.1. In the case of a headlamp …. requirements referred to in paragraph 6.3. Test voltages are the same as in paragraph **6.2.5.4.**"

Annex 1,

Insert a new item 9.6., to read:

"**9.6. Number and specific identification code(s) of LED module(s):** ……."

Items 9.6. and 9.7. (former), renumber as items 9.7. and 9.8.

Annex 2, insert a new figure 13., to read:

"**Figure 13**

LED modules

MD E3 17325

The LED module bearing the light source module identification code shown above has been approved together with a lamp approved in Italy (E3) under approval number 17325."

Annex 4,

Paragraph 1.1.1.2., amend to read:

"1.1.1.2. Test voltage

The test voltage for the ballast **and for LED module(s), if applicable,** is 13.5 ± 0.1 volts for 12 V network system, or otherwise specified in the application for approval. If there are reciprocally incorporated filament lamps, the voltage producing the reference flux shall be used."

Annex 4 - Appendix, amend to read:

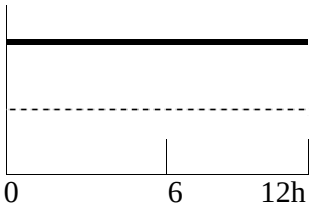
"Annex 4 - Appendix

OVERVIEW OF OPERATIONAL PERIODS
CONCERNING TEST FOR STABILITY OF PHOTOMETRIC PERFORMANCE

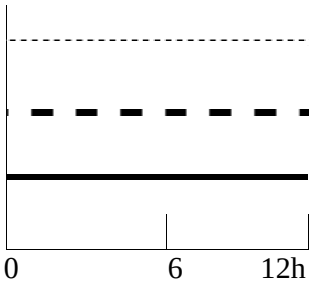
Abbreviations:
P: passing beam lamp
D: driving beam lamp (D_1 + D_2 means two driving beams)
F: front fog lamp
means a cycle of 15 minutes off and 5 minutes lit
means a cycle of 9 minutes off and 1 minutes lit

All following grouped headlamps and front fog lamps together with the added marking symbols are given as examples and are not exhaustive.

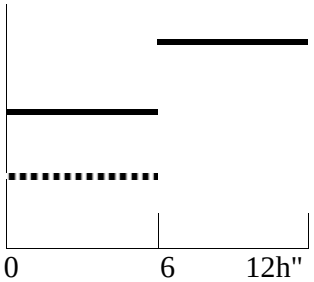
1. P or D or F (HC or HR or B)



2. P+F (HC B) or P+D (HCR)



3. P+F (HC B/) or HC/B or P+D (HC/R)



Annex 7, the last sentence, amend to read:

"None of the filament lamps **and/or LED module(s)** which the headlamp contains is designed for a 24 Volts network system."

Insert a new Annex 10, to read:

"**Annex 10**

REQUIREMENTS FOR LED MODULES AND HEADLAMPS INCLUDING LED MODULES

1. GENERAL SPECIFICATIONS

1.1. Each LED module sample submitted shall conform to the relevant specifications of this Regulation when tested with the supplied electronic light source control-gear(s), if any.

1.2. LED module(s) shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture.

1.3. LED module(s) shall be tamperproof.

1.4. The design of removable LED module(s) shall be such that:

1.4.1. when the LED module is removed and replaced with another module provided by the applicant and bearing the same light source module identification code, the photometric specifications of the headlamp shall be met;

1.4.2. LED modules with different light source module identification codes within the same lamp housing, shall not be interchangeable.

2. MANUFACTURE

2.1. The LED(s) on the LED module shall be equipped with suitable fixation elements.

2.2. The fixation elements shall be strong and firmly secured to the LED(s) and the LED module.

3. TEST CONDITIONS

3.1. Application

3.1.1. All samples shall be tested as specified in paragraph 4. below;

3.1.2. The kind of light sources on a LED MODULE shall be light emitting diodes (LED) as defined in Regulation No. 48 paragraph 2.7.1. in particular with regard to the element of visible radiation. Other kinds of light sources are not permitted.

3.2. Operating conditions

3.2.1. LED module operating conditions

All samples shall be tested under the conditions as specified in paragraphs 6.1.4. and 6.1.5. of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer.

3.2.2. Ambient temperature

For the measurement of electrical and photometric characteristics, the headlamp shall be operated in dry and still atmosphere at an ambient temperature of 23 °C ± 5 °C.

3.3. Ageing

Upon the request of the applicant the LED module shall be operated for 15 h and cooled down to ambient temperature before starting the tests as specified in this Regulation.

4. SPECIFIC SPECIFICATIONS AND TESTS

4.1. Colour rendering

4.1.1. Red content

In addition to measurements as described in paragraph 7. of this Regulation:

The minimum red content of the light of a LED module or headlamp incorporating LED module(s) tested at 50 V shall be such that:

$$k_{red} = \frac{\int_{\lambda=610\ nm}^{780\ nm} E_e(\lambda)\, V(\lambda)\, d\lambda}{\int_{\lambda=380\ nm}^{780\ nm} E_e(\lambda)\, V(\lambda)\, d\lambda} \geq 0.05$$

where:

$E_e(\lambda)$ (unit: W) is the spectral distribution of the irradiance;

$V(\lambda)$ (unit: 1) is the spectral luminous efficiency;
(λ) (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometre.

4.2. UV-radiation

The UV-radiation of a low-UV-type LED module shall be such that:

$$k_{UV} = \frac{\int_{\lambda=250\,nm}^{400\,nm} E_e(\lambda)\,S(\lambda)\,d\lambda}{k_m \int_{\lambda=380\,nm}^{780\,nm} E_e(\lambda)\,V(\lambda)\,d\lambda} \leq 10^{-5}\ W/lm$$

where:

$S(\lambda)$(unit: 1) is the spectral weighting function;
k_m = 683 lm/W is the maximum value of the luminous efficacy of radiation.

(For definitions of the other symbols see paragraph 4.1.1. above).

This value shall be calculated using intervals of one nanometer. The UV-radiation shall be weighted according to the values as indicated in the Table UV below:

λ	S(λ)	λ	S(λ)	λ	S(λ)
250	0.430	305	0.060	355	0.000 16
255	0.520	310	0.015	360	0.000 13
260	0.650	315	0.003	365	0.000 11
265	0.810	320	0.001	370	0.000 09
270	1.000	325	0.000 50	375	0.000 077
275	0.960	330	0.000 41	380	0.000 064
280	0.880	335	0.000 34	385	0.000 530
285	0.770	340	0.000 28	390	0.000 044
290	0.640	345	0.000 24	395	0.000 036
295	0.540	350	0.000 20	400	0.000 030
300	0.300				

Table UV: Values according to "IRPA/INIRC Guidelines on limits of exposure to ultraviolet radiation". Wavelengths (in nanometres) chosen are representative; other values should be interpolated.

4.3. Temperature stability

4.3.1. Illuminance

4.3.1.1. A photometric measurement of the headlamp shall be made after 1 minute of operation for the specific function at the test point specified below. For these measurements, the aim can be approximate but must be maintained for before and after ratio measurements.

Test points to be measured:

Passing beam 50 V
Driving beam H – V

4.3.1.2. The lamp shall continue operation until photometric stability has occurred. The moment at which the photometry is stable is defined as the point in time at which the variation of the photometric value is less than 3 per cent within any 15 minute period. After stability has occurred, aim for complete photometry shall be performed in accordance with requirements of specific device. Photometer the lamp at all test points required for the specific device.

4.3.1.3. Calculate the ratio between the photometric test point value determined in paragraph 4.3.1.1. and the point value determined in paragraph 4.3.1.2.

4.3.1.4. Once stability of photometry has been achieved, apply the ratio calculated above to each of the remainder of the test points to create a new photometric table that describes the complete photometry based on 1 minute of operation.

4.3.1.5. The illuminance values, measured after one minute and after photometric stability has occurred, shall comply with the minimum and maximum requirements.

4.3.2. Colour

The colour of the light emitted measured after 1 minute and measured after photometric stability has been obtained as described in paragraph 4.3.1.2. of this annex shall both be within the required colour boundaries."

B. JUSTIFICATION

Regulation No. 98 currently allows the use of gas discharge light sources for the principal passing beam and the use of filament lamps to produce bend lighting and infrared radiation (IR). This proposal was drafted to introduce into Regulation No. 98 as an alternative to filament lamps also the option of LED modules to produce bend lighting and infrared radiation. The principal beam would in any case be produced by a gas discharge light source. Especially IR can be produced very effectively with LED modules.

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