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Item 4.9.3 of the provisional agenda

1958 Agreement:**Consideration of draft amendments****to existing UN Regulations submitted by GRE****Proposal for Supplement 7 to the original version of UN
Regulation No. 128 (Light emitting diode light sources)****Submitted by the Working Party on Lighting and Light-Signalling***

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its seventy-eighth session (ECE/TRANS/WP.29/GRE/78, para. 20). It is based on ECE/TRANS/WP.29/GRE/2017/20. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration at their March 2018 sessions. This proposal is submitted in a package with the proposal for Amendment 2 to the Resolution on the common specification of light source categories (R.E.5) (ECE/TRANS/WP.29/2018/33).

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), 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.

Supplement 7 to the original version of UN Regulation No. 128 (Light emitting diode light sources)

Paragraph 2.2.2.3., amend to read:

"2.2.2.3. Five samples; "

Paragraph 2.4.6., amend to read:

"2.4.6. The marks and inscriptions specified in paragraphs 2.3.1. and 2.4.4. shall be clearly legible and be indelible."

Paragraph 3.2.3., amend to read:

"3.2.3. LED light sources shall exhibit no scores or spots on their optical surfaces which might impair their efficiency and their optical performance. This shall be verified when commencing approval testing and when required in the respective paragraphs in this Regulation."

Paragraph 3.7.2., amend to read:

"3.7.2. The colour of the light emitted shall be measured by the method specified in Annex 4. The measured integral value of the chromaticity coordinates shall lie within the required chromaticity area."

Insert a new paragraph 3.7.2.1., to read:

"3.7.2.1. Moreover, in the case of LED light sources emitting white light and for use in forward lighting devices, the colour shall be measured in the same directions as where the luminous intensity distribution is specified in the relevant data sheet, but only where the specified minimum luminous intensity is exceeding 50 cd/klm. Each measured value of the chromaticity coordinates shall lie within a tolerance area of 0.025 units in the x direction and 0.050 units in the y direction, containing the measured integral value. The measured value in the direction of maximum luminous intensity and all measured values for a standard (étalon) LED light source shall also lie within the required chromaticity area for white light."

Insert a new paragraph 3.10., to read:

"3.10. Maximum test temperature

In case a maximum test temperature is specified in the relevant data sheet of Annex 1, the following requirements shall apply:

3.10.1. When measured according to the conditions specified in Annex 4, paragraph 5:

- (a) The luminous flux values at elevated temperatures shall be within the limits given in the relevant data sheet of Annex 1; and
- (b) The colour variation shall not exceed 0.010.

3.10.2. After completion of the measurement procedure as prescribed in paragraph 3.10.1., the LED light source shall be continuously operated during 1000 h at the relevant test voltage(s); and

- (a) In case of an integrated heatsink at an ambient temperature corresponding to the maximum test temperature as specified in the relevant data sheet of Annex I;

- (b) In case of a specified T_b -point at a T_b -value corresponding to the maximum test temperature as specified in the relevant data sheet of Annex I.
- 3.10.3. After completion of the procedure as prescribed in paragraph 3.10.2., when measured according to the conditions specified in Annex 4, paragraph 5:
- (a) The luminous flux values at elevated temperatures shall not deviate by more than ± 10 per cent from the corresponding values of the individual sample measured according to paragraph 3.10.1.; and
- (b) The colour variation shall not deviate from the corresponding values of the individual sample measured according to paragraph 3.10.1. by more than ± 0.010 .
- 3.10.4. After completion of the measurement procedure as prescribed by paragraph 3.10.3., the requirements in 3.2.3. shall be verified again."

Insert a new paragraph 3.11., to read:

- "3.11. LED light sources without general restrictions
- 3.11.1. Light emitting area characteristics
- The size and position of the nominal emitter box as well as the side(s) of the light emitting area capable to generate the cut-off are specified in the relevant data sheet of Annex 1.
- The values of the following characteristics shall be determined by using the method described in Annex 9:
- (a) Luminance contrast;
- (b) Size and position of zone 1a and zone 1b;
- (c) Surface ratio $R_{0,1}$ and $R_{0,7}$
- (d) Value of maximum deviation ΔL .
- 3.11.2. Luminance contrast of the light emitting area
- 3.11.2.1. The value(s) of luminance contrast of the light emitting area shall be within the limits given on the relevant data sheet of Annex 1.
- 3.11.2.2. In case in the relevant data sheet only one side of the light emitting area is specified as to generate the cut-off, zone 1b shall have a position closer to the corresponding side of zone 1a than to the opposite side.
- 3.11.3. Luminance uniformity of the light emitting area
- 3.11.3.1. The area of zone 1a (light emitting area) shall be within the nominal emitter box as specified in the relevant data sheet of Annex 1, and the size of the light emitting area shall be within the limits given on the relevant data sheet of Annex 1.
- 3.11.3.2. The value of $R_{0,1}$ shall be within the limits given on the relevant data sheet of Annex 1.
- 3.11.3.3. The value of $R_{0,7}$ shall be within the limits given on the relevant data sheet of Annex 1.
- 3.11.3.4. The deviation of the luminance ΔL shall not exceed ± 20 per cent."

Annex 4,

Introductory part, amend to read:

"LED light sources of all categories with integrated heatsink shall be measured at ambient temperature of (23 ± 2) °C in still air. For these measurements, the minimum free air space as defined in the data sheets shall be maintained.

LED light sources of all categories with definition of a temperature T_b shall be measured by stabilising the T_b -point at the specific temperature defined on the category data sheet.

In case a maximum test temperature is specified in the relevant data sheet of Annex 1 additional measurements shall be carried out at elevated temperatures according to the method described in paragraph 5 of this annex."

Paragraph 2.1., amend to read:

- "2.1. The luminous intensity measurements shall be started
- (a) In case of an integrated heatsink after 30 minutes of operation; or
 - (b) In case of a T_b point, specified in the relevant data sheet, after stabilisation of the temperature at this T_b point."

Paragraph 2.3., amend to read:

- "2.3 Normalized luminous intensity of a test sample is calculated by dividing the luminous intensity distribution as measured under paragraph 2.1. and 2.2. of this annex by the luminous flux as determined under paragraph 1.2. of this annex."

Paragraph 2.4., amend to read:

- "2.4. Cumulative luminous flux of a test sample is calculated according to CIE publication 84-1989, section 4.3 by integrating the luminous intensity values as measured under 2.1 and 2.2 within a cone enclosing a solid angle."

Insert a new paragraph 5., to read:

- "5. Photometric measurements in case a maximum test temperature is specified
- 5.1. Temperature and temperature range
 - 5.1.1. Photometric measurements as specified in paragraphs 5.3., 5.4. and 5.5. shall be carried out at elevated temperatures T in steps not larger than 25° C, while the LED light source is continuously operated.
 - 5.1.1.1. In case of LED light sources of a category with integrated heatsink the temperature range is defined by the ambient temperature of (23 ± 2) °C elevated up to and including the maximum test temperature as specified in the relevant data sheet of Annex 1, whereas the minimum free air space as defined in the relevant data sheet shall be maintained and a period of 30 minutes of operation shall be awaited after each increase of the ambient temperature.
 - 5.1.1.2. In case of LED light sources of a category, for which a temperature T_b is specified, the temperature range is defined by the temperature T_b specified in the relevant data sheet elevated up to and including the maximum test temperature as specified in the relevant data sheet of

Annex 1, whereas the temperature at the T_b -point is stabilised before each measurement.

5.2. Voltage

Measurements shall be carried out at relevant test voltage.

5.3. Measurement direction of luminous intensity and colour coordinates

All the values of luminous intensity and the colour coordinates in the temperature range as specified by paragraph 5.1. may be measured in one and the same direction. This direction shall be such that the luminous intensity is exceeding 20 cd for all measurements.

5.4. Luminous flux values at elevated temperatures

The values of the luminous flux at elevated temperatures T in the range as specified by paragraph 5.1. may be calculated by correcting the value of the luminous flux as measured according to paragraph 1.2. of this annex, by the ratio of the luminous intensity values as described in paragraph 5.3. and the luminous intensity value measured at:

- (a) 23° C, in case of an integrated heatsink;
- (b) T_b , in case a temperature T_b is defined.

5.5. Colour variation

The colour variation is the maximum deviation of all colour points (given by the chromaticity coordinates x , y) at elevated temperatures T in the range as specified by paragraph 5.1., from the colour point (x_0, y_0) at:

- (a) 23° C, in case of an integrated heatsink:

$$\max \{ \sqrt{[(x(T)-x_0(23^\circ \text{C}))^2 + (y(T)-y_0(23^\circ \text{C}))^2]} \};$$
- (b) T_b , in case a temperature value T_b is defined:

$$\max \{ \sqrt{[(x(T)-x_0(T_b))^2 + (y(T)-y_0(T_b))^2]} \}. "$$

Insert a new Annex 9, to read:

"Annex 9

Method for the measurement of luminance contrast and luminance uniformity of the light emitting area

1. The luminance measurement equipment shall be capable to distinguish clearly whether the luminance contrast of the light emitting area is above or below the required level for the LED light source under test.

Further, this equipment shall have a resolution of 20 μm or smaller in an area that is larger than the light emitting area of the LED light source under test. In case this equipment has a resolution of less than 10 μm , adjacent luminance measurement values shall be arithmetically averaged so as to represent a luminance value of an area of between 10 μm and 20 μm .
2. The luminance measurements of an area shall be done in an equidistant grid in both directions.
3. Zone 1a and zone 1b shall be determined from luminance measurements of an area which consists of the nominal emitter box as specified in the relevant data sheet of Annex 1 and enlarged to all sides by 10 per cent of the corresponding box dimension (see figure 1). The value L_{98} is the 98th percentile of all values of these luminance measurements.
- 3.1. Zone 1a (light emitting area) shall be the smallest circumferential rectangle having the same orientation as the nominal emitter box and containing all luminance measurements with a value of 10 per cent or more of the value L_{98} . The value L_1 shall be the arithmetic average of the values of all luminance measurements in zone 1a (see figure 2). The value of $R_{0.1}$ shall be the surface ratio of zone 1a where the luminance value is exceeding 10 per cent of the value L_1 . The value of $R_{0.7}$ shall be the surface ratio of zone 1a where the luminance value is exceeding 70 per cent of the value L_1 .
- 3.2. Zone 1b shall be the smallest circumferential rectangle having the same orientation as the nominal emitter box and containing all luminance measurements with a value of 70 per cent or more of the value L_{98} .
4. Zone 2 shall have in both directions 1,5 times the size of the nominal emitter box as specified in the relevant data sheet of Annex 1 and it shall be positioned symmetrically to the nominal emitter box at a distance of $d_0=0.2$ mm to zone 1a, unless otherwise specified on the data sheet (see figure 3). The value L_2 shall be the arithmetic average of 1 per cent of all measured luminance values in zone 2 which represent the highest values.

In case in the relevant data sheet more than one side of zone 1a (light emitting area) is specified as to generate the cut-off, for each of these sides a value L_2 shall be determined as described above.
5. The luminance contrast value(s) shall be the ratio of the luminance value L_1 of zone 1a and the luminance value L_2 of zone(s) 2.
6. In case the nominal emitter box as specified in the relevant data sheet of Annex 1 is subdivided in n areas (e.g. $n = 1 \times 4$), the same subdivision shall also apply to zone 1a.

- 6.1. For each of the n areas the value $L_{1,i}$ ($i = 1, \dots, n$) shall be the arithmetic average of the values of all luminance measurements in the corresponding area.
- 6.2. The value ΔL shall be the maximum relative deviation of all luminance values $L_{1,i}$ from the luminance value L_1 .

$$\Delta L = \text{Max} \{ (L_{1,i} - L_1)/L_1; i = 1, \dots, n \}$$

Figure 1
Enlargement of the nominal emitter box

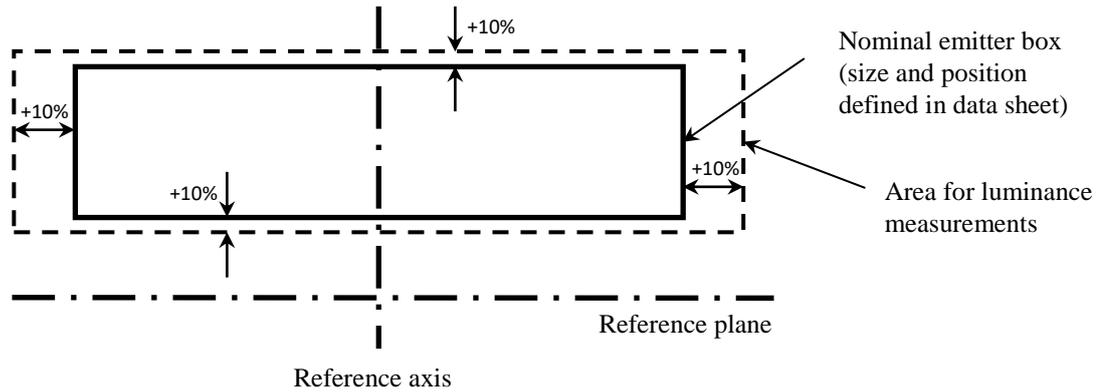


Figure 2
Definition of zones 1a and 1b

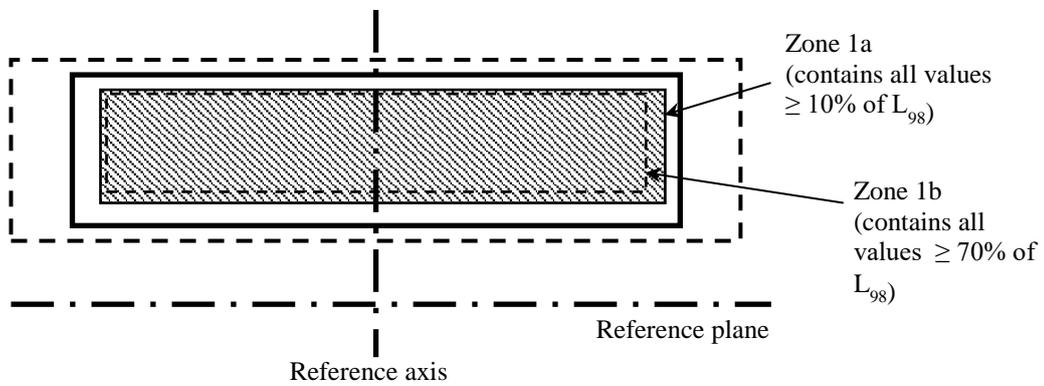


Figure 3
Definition of zone 2

