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**Economic Commission for Europe**

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations**

**185th session**

Geneva, 23-25 November 2021

Item 4.15.1 of the provisional agenda

**1958 Agreement:  
Proposal for amendments to the Consolidated Resolution   
on the common specification of light source categories (R.E.5)**

Proposal for amendment 7 to the Consolidated Resolution on the common specification of light source categories (R.E.5)

Submitted by the Working Party on Lighting and Light-Signalling[[1]](#footnote-2)\*

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its eighty-fourth session (ECE/TRANS/WP.29/GRE/84, para. 20). It is based on ECE/TRANS/WP.29/GRE/2020/16/Rev.1 as amended by informal document GRE-84-32 and ECE/TRANS/WP.29/GRE/2021/3. 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 November 2021 sessions.

*The Status table*, insert a new row at the bottom to read:

"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| … | … | … | … | … |
| Amendment 7 to the Original Version | [xx.xx.2022] | 185 | ECE/TRANS/WP.29/2021/145 | Introduction of a new LED replacement light source category H11 as a package with Supplement 48 to the 03 series of amendments to UN Regulation No. 37 |

"

*Insert a new subparagraph 2.1.1.3.2.,* to read:

"2.1.1.3.2. "*LED replacement light source*" means a LED light source designed to replace in a device a counterpart light source with the same category designation, producing light by another light generating technology."

*Paragraph 2.1.4.,* renumber to 2.1.5.

*Insert a new paragraph 2.1.4.,* to read:

"2.1.4. *"AE device"* means an additional electronics device not integrated with, but designed to connect to, a high-efficiency LED replacement light source with the purpose to augment the electrical current without changing the other characteristics of this light source."

*Paragraph 3.1., title*, amend to read:

"3.1. Filament light sources (incandescent technology)"

*Paragraph 3.3., insert* a new Group 5,to read:

|  |  |
| --- | --- |
| *Group 5* | |
| *LED replacement light source categories3, 4 only for use in lamps approved with filament light source(s) with the same category designation* | |
| *Category* | *Sheet number(s)* |
| C5W  H11 | C5W\_LEDr/1 to 4  H11\_LEDr/1 to 7 |

3 not for use in type approval of lamps

4 not for use in conformity of production control of lamps"

*Annex 1, title,* amend to read:

"Sheets for filament light sources (incandescent technology)"

*Annex 3, introductory table,* amend to read:

*"*List of sheets for LED light sources and their sequence in this annex:

|  | *Sheet number(s)* |  |
| --- | --- | --- |
|  | C5W/LED/1 to 4 |  |
|  | C5W\_LEDr/1 to 4 |  |
|  | H11/LED/1 to 7 |  |
|  | H11\_LEDr/1 to 7 |  |
|  | L1/1 to 5 |  |
|  | LR1/1 to 5 |  |
|  | LW2/1 to 5 |  |
|  | L3/1 to 6 |  |
|  | LR4/1 to 5 |  |
|  | L5/1 to 6 |  |
|  | PY21W/LED/1 to 4 |  |
|  | R5W/LED/1 to 4 |  |
|  | W5W/LED/1 to 4 |  |

"

*After sheet C5W1/LED/4, insert new sheets C5W\_LEDr/1 to 4, to read*:

(see the following pages; one page per sheet)

**Category C5W Sheet C5W\_LEDr/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the LED light source.

Reference plane 10

Tcap 6/

Figure 1

**Main drawing**

11

Table 1

b/2

b/2



f

Ø 11 max.

Reference axis

Ø 3.5

**Essential electrical and photometrical characteristics of the LED light source**

| *Dimensions in mm* | | | *LED light sources of normal production* |
| --- | --- | --- | --- |
| b 1/ | | | 35.0 ± 1.0 |
| f 2/ | | | 9.0 nom. |
| Elevated ambient air temperature 4/ | | | 50°C |
| Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4) | | | |
| *Electrical and photometric characteristics 5/* | | | |
| Rated values | | Volts | 12 |
| Watts | 3 9/ |
| Test voltage (DC) | | Volts | 13.5 |
| Objective values | Power 7/ | Watts | 2.5 min.8/  5.5 max. 9/ |
| Electrical current 7/  at 12-14 V DC | mA | 150 min. 8/ |
| Luminous flux 3/ | lm | 45 ± 20 % |
| Luminous flux 3/ at 9V DC | lm | 9 min. |
| Cap temperature Tcap | °C | 75 max. 8/ |

1 This dimension corresponds to a distance between two apertures of 3.5 mm diameter each bearing against one of the caps.

2 To be checked by a "box system", see Figure 2.

3 The light emitted shall be white, without a correlated colour temperature restriction.

4The luminous flux measured at the elevated ambient air temperature shall be at least 70% of the objective luminous flux (both measured at test voltage).

5 In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby in the latter case the electrical current draw, when operated between 12 V and 14 V, shall be less than 10 mA.

6 Measurement point for cap temperature Tcap

7 Including AE device, if any

8 Not applicable for high-efficiency type (if no AE device is specified)

9 For high-efficiency type 1W rated value and 2W max. objective value applies

10 The reference plane is perpendicular to the reference axis and passing through the centre of the light source as defined by the dimension b/2

11 Position of polarity marking, in case of particular electrical polarity

**Category C5W Sheet C5W\_LEDr/2**

Screen projection requirements

The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by means of a box system defined by the projections when viewing along the direction = 0° (top view)**,** = 90° (front view)**,** =180° (bottom view)**,** = 270° (rear view) in the plane C0  (C, as defined in Figure 3).

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in figure 2:

• A, B and C together shall be 70 per cent or more;

• B shall be 20 per cent or more;

• A and C shall each be 15 per cent or more.

These values shall be calculated as percentage of the total luminous flux emitted into the viewing direction from the maximum light source outline, i.e. a rectangle of length *b* = 36.0 mm and a height of 11 mm, aligned symmetrically to the reference axis and reference plane (see Figure 1).

Figure 2

**Box definition of the light emitting area**



Reference plane

C

B

A

a

Reference axis

a

h3

h2

h1

h2

Table 2

**Dimensions of the box system in Figure 2**

|  |  |  |  |
| --- | --- | --- | --- |
| *Dimension (mm)* | *a* | *h1, h3* | *h2* |
| All views  (as specified above) | 2.5 | 6 | 2 |

**Category C5W Sheet C5W­\_LEDr/3**

Normalized luminous intensity distribution

The following test is intended to determine the normalized luminous intensity distribution of the light source in the C-planes as described in figure 3. The intersection of the reference axis and the reference plane is used as the coordinate system origin.

The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in figure 3.

Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes, where C0 (C180) shall be the reference plane of the light source. The C-planes to be measured shall be those specified in Table 3. The test points for each plane and multiple polar angles γ are specified in Table 3.

The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1000 lm light source. These data shall comply with the tolerance band as defined in Table 3.

Figure 3  
**Setup to measure the luminous intensity distribution**

**(Definition of C-Planes and angle )**



C0

C330

C30

Reference axis

Reference plane

****

View along reference axis

Side view

C150

C210

C180

C-planes: See CIE publication 70-1987, "The measurement of absolute intensity distributions".

**Category C5W Sheet C5W\_LEDr/4**

Table 3

**Test point values of normalized intensity in the planes C0, C30, C150, C180,C210, C330**

|  |  |  |
| --- | --- | --- |
|  | *LED light source of normal production* | |
| *γ* | *Minimum intensity  in cd /1000 lm* | *Maximum intensity  in cd /1000 lm* |
| 0° | 60 | 140 |
| 30° | 60 | 140 |
| 60° | 60 | 140 |
| 90° | 60 | 140 |
| 120° | 60 | 140 |
| 150° | 60 | 140 |

The luminous intensity distribution as described in Table 3 shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3.

*After sheet H11/LED/7, insert new sheets H11\_LEDr/1 to 7, to read*:

(see the following pages; one page per sheet)

**Category H11 Sheet H11\_LEDr/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the LED light source.

Figure 1

**Main drawings**

# 

Tcap 5/

View C

View A

Reference plane 1/

Reference axis 2/

A

B

e

f

4/

Figure 2

**Maximum LED light source outline 3/**

35

**∅**15.0

25.0

4

44.0

**∅**19.0

**∅**25.0

**∅** 50

50°

Reference plane

Reference axis



1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.

3/ The LED light source shall not exceed the envelope as indicated in Figure 2.

4/ The light source shall function in either voltage polarity.

5/ Measurement point for cap temperature Tcap

**Category H11 Sheet H11\_LEDr/2**

Table 1

**Essential electrical and photometrical characteristics of the LED light source**

| *Dimensions in mm* | | | *LED light sources of normal production* | |
| --- | --- | --- | --- | --- |
| e 2/ | | | 25.0 nom. | |
| f 2/ | | | 4.5 nom. | |
| Contrast 6/ | | | 100 min. | |
| Elevated ambient air temperature 3/ | | | 60°C | |
| Cap H11 PGJ19-2 9/ in accordance with IEC Publication 60061 (sheet 7004-110-3) | | | | |
| *Electrical and photometric characteristics* | | | *4/* | *5/* |
| Rated values | | Volts | 12 | 24 |
| Watts | 27 11/ | 27 11/ |
| Test voltage (DC) | | Volts (DC) | 13.2 | 28.0 |
| Objective values | Power 8/ | Watts | 27 min. 10/  62 max. 11/ | 27 min. 10/  62 max. 11/ |
| Cap temperature Tcap | °C | 120 max. 10/ | 120 max. 10/ |
| Electrical current 8/ | mA | 2000 min. 10/  (at 12-14 V DC) | 1000 min. 10/  (at 24-28 V DC) |
| Luminous flux 1/ 3/ | lm | 1,350 ± 10% | |
| Luminous flux deviation 7/  (voltage range limits) | lm | ±10% (at 12V)  ±10% (at 14V) | ±10% (at 24V)  ±10% (at 28V) |

1/ The light emitted shall be white without a correlated colour temperature restriction.

2/ To be checked by means of a "box system", sheet H11 LEDr/3

3/ The luminous flux measured at the elevated ambient air temperature shall be at least 75% of the objective luminous flux (both measured at test voltage)

4/ In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby, in the latter case, the electrical current draw, when operated between 12 V and 14 V, shall be less than 100 mA

5/ In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby, in the latter case, the electrical current draw, when operated between 24 V and 28 V, shall be less than 50 mA

6/ The contrast is the proportion of luminous flux originating from two different areas, see details in sheet H11  
 LEDr/3

7/ The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the specified voltage range.

8/ Including AE device, if any

9/ The maximum specifications of parameters G and K are excluded, but the maximum outline dimensions in Figure 2 apply

10/ Not applicable for high-efficiency type (if no AE device is specified)

11/ For high-efficiency type 18W rated value and 21W max. objective value applies

**Category H11 Sheet H11\_LEDr/3**

Screen projection requirements

The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by a box system defined in Figure 4 when operated at test voltage, which shows the projections when viewing from B (see sheet H11 LEDr/1, Figure 1) and from A and –A (see sheet H11 LEDr/1, Figure 1), i.e. along the C-planes C0, C90 and C270 (as defined in Figure 6).

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in Figure 4:

•  Total box area: (A+B+C) / E shall be not less than 90%

•  Area A: A / (A+B+C) shall be not more than 10%

•  Areas B1, B2 and B3: B1/B, B2/B, B3/B shall each be not less than 15%

•  Area B: B / (A+B+C) shall be not less than 72 %

•  Area C: C / (A+B+C) shall be not more than 22%

Figure 4

**Box definition of the light emitting area (dimensions given in Table 2)**

c1

x1

x2

c2

b1

b2

y1

y1

e

a1/2

a2

**E**

**B1**

**B2**

**B3**

**C**

**B**

**A**

Reference axis



a1

The contrast is checked by a box system defined in Figure 5 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H11 LEDr/1, Figure 1), i.e. along the C-planes C90 and C270 (as defined in Figure 6).

The contrast is the proportion of the total luminous flux values emitted into these viewing directions from the corresponding areas (A+B+C) and D. The value of the contrast (A+B+C) / D shall be within the limits given in Table 1 (see Figure 5 for the definition of the area D).

**Category H11 Sheet H11\_LEDr/4**

Figure 5

**Box definition of the area D (dimensions given in Table 2)**



g2

g3

d

g1

**A**

**D**

**C**

**B**

e

Reference axis

Table 2

**Dimensions of the box definitions in Figure 4 and Figure 5**

|  |  |  |  |
| --- | --- | --- | --- |
| *All views*  *(as specified above)* | *Dimensions in mm* | *All views*  *(as specified above)* | *Dimensions in mm* |
| a1 | 1.7 | x1 | 25 |
| a2 | 1.9 | x2 | 19 |
| b1 | 0.2 | y1 | 12.5 |
| b2 | 0.2 | g1 | 2.85 |
| c1 | 5.0 | g2 | 7.5 |
| c2 | 4.0 | g3 | 1.45 |
| d | 0.4 |  | |

**Category H11 Sheet H11\_LEDr/5**

Normalized luminous intensity distribution

The following test is intended to determine the normalized luminous intensity distribution of the light source in the C-planes as described in Figure 6 when operated at test voltage. The intersection of the reference axis and the plane parallel to the reference plane at distance e = 25.0 mm is used as the coordinate system origin.

The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in Figure 6.

Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes for which the line of intersection coincides with the reference axis of the light source. The test points for each plane and polar angles γ are specified in Table 3.

The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1000 lm light source. These data shall comply with the limits as defined in Table 3.

Figure 6

**Setup to measure the luminous intensity distribution and the definition of C-Planes and angle **



25,0

***View from B***

***View from C***

Reference plane

Reference axis

**B**

**A**

C = 270°

C = 90°

C = 180°

**C**

C = 0°

****

**A**

Photo-Detector of Goniometer

C-planes: see CIE publication 70-1987, "The measurement of absolute intensity distributions".

**Category H11 Sheet H11\_LEDr/6**

Table 3 – Part 1

**Test point values of normalized intensity (Black top area)**

|  |  |  |
| --- | --- | --- |
| *LED light source of normal production* | | |
|  | *Minimum intensity (cd/klm)* | *Maximum intensity (cd/klm)* |
|  | C0, C90, C180, C270 | C0, C90, C180, C270 |
| 0° | n/a | 10 |
| 10° | n/a | 10 |
| 20° | n/a | 10 |
| 30° | n/a | 10 |

The light pattern as described in Table 3 – part 1 shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 1.

*Note: The angular range in Table 3 – Part 1 is equivalent to the black top of its counterpart H11 filament light source specified by 3 in sheet H11/3.*

Table 3 – Part 2

**Test point values of normalized intensity (Distortion free area)**

|  |  |  |
| --- | --- | --- |
|  | *LED light source of normal production* | |
|  | *Minimum intensity (cd/klm)* | *Maximum intensity (cd/klm)* |
|  | C0, C90, C270 | C0, C90, C270 |
| 50° | 80 | 130 |
| 60° | 80 | 130 |
| 70° | 80 | 130 |
| 80° | 80 | 130 |
| 90° | 80 | 130 |
| 100° | 80 | 130 |
| 110° | 80 | 130 |
| 120° | 80 | 130 |
| 130° | 80 | 130 |
| 140° | 80 | 130 |

The light pattern as described in Table 3 – part 2 (excluding the section between C90 and C270) shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 2.

*Note:* *The angular range in Table 3 – Part 2 is equivalent to the distortion free area of its counterpart H11 filament light source specified by* 2 *and* 1 *in sheet H11/3.*

**Category H11 Sheet H11\_LEDr/7**

Table 3 – Part 3

**Test point values of normalized intensity (Shading area of the lead-in wire of the counterpart filament light source)**

|  |  |  |
| --- | --- | --- |
|  | *LED light source of normal production* | |
|  | *Minimum intensity (cd/klm)* | *Maximum intensity (cd/klm)* |
| C-plane | = 90° | = 90° |
| C0 | 80 | 130 |
| C30 | 80 | 130 |
| C60 | 80 | 130 |
| C90 | 80 | 130 |
| C120 | 80 | 130 |
| C150 | 80 | 130 |
| C180 | n/a | n/a |
| C210 | 80 | 130 |
| C240 | 80 | 130 |
| C270 | 80 | 130 |
| C300 | 80 | 130 |
| C330 | 80 | 130 |
| C360 (= C0) | 80 | 130 |

The light pattern as described in Table 3 – part 3 (excluding the section between C150 and C210) shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 3.

*Note: Due to the shading area created by the lead-in wire of its counterpart H11 filament light source (opposite to the metal-free zone; see Figure 4 on sheet H11/2) there is no requirement in the C180-plane.*"

1. \* In accordance with the programme of work of the Inland Transport Committee for 2021 as outlined in proposed programme budget for 2021 (A/75/6 (part V sect. 20) para 20.51), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate. [↑](#footnote-ref-2)