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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****Eighty-third session**

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Item 5 of the provisional agenda

UN Regulations Nos. 37 (Filament lamps), 99 (Gas discharge light sources), 128 (Light emitting diodes light sources) and the Consolidated Resolution on the common specification of light source categories**Proposal for amendment to the Consolidated Resolution on the common specification of light source categories****Submitted by the Task Force on Substitutes and Retrofits***

The text reproduced below was prepared by the Task Force on Substitutes and Retrofits (TF SR) as a revision of ECE/TRANS/WP.29/GRE/2019/21, with the aim to introduce a new light emitting diode (LED) substitute light source category H11/LED/6 for road illumination applications. The technical provisions are based on the equivalence criteria (informal document GRE-80-02), as amended for light sources used in road illumination applications (informal document GRE-82-03). The modifications to the existing text of the Resolution are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2020 as outlined in proposed programme budget for 2020 (A/74/6 (part V sect. 20) para 20.37), 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.



I. Proposal

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

[6]	[2019-xx-xx]	[17x]	[ECE/TRANS/WP.29/2020/xx]	Introduction of a new LED substitute light source category H11/LED/6
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Paragraph 3.3., insert a new entry into Group 4, to read:

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<i>Group 4</i>			
<i>LED substitute light source categories¹ only for use in lamps approved with filament light source(s) of its counterpart light source category</i>			
<i>Category</i>		<i>Counterpart filament light source category</i>	<i>Sheet number(s)</i>
C5W/LEDK	²	C5W	C5W/LED/1 to 4
H11/LED/6		H11	H11/LED/1 to 7
PY21W/LED		PY21W	PY21W/LED/1 to 4
R5W/LED		R5W	R5W/LED/1 to 4
W5W/LEDK	²	W5W	W5W/LED/1 to 4
WY5W/LED		WY5W	W5W/LED/1 to 4

Annex 3,

List of sheets for LED light sources and their sequence, amend to read:

“

<i>Sheet number(s)</i>
C5W/LED/1 to 4
H11/LED/1 to 7
L1/1 to 5
LR1/1 to 5
LW2/1 to 5
Lx3/1 to 6
LR4/1 to 5
Lx5/1 to 6
PY21W/LED/1 to 4
R5W/LED/1 to 4
W5W/LED/1 to 4

”

After sheet C5W/LED/4, insert new sheets H11/LED/1 to 7, to read:
(see following pages; one page per sheet)

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

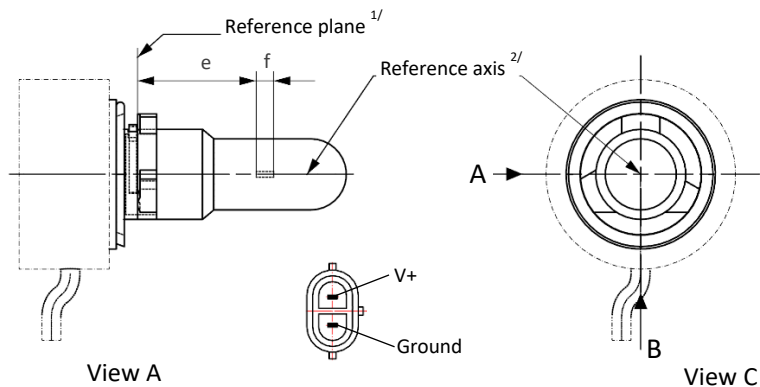


Figure 1: Main drawing

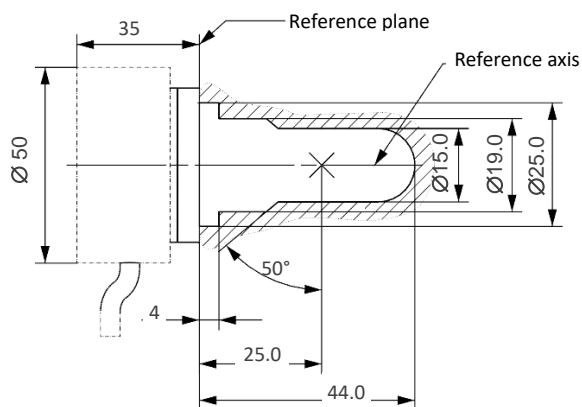


Figure 2: Maximum LED light source outline ^{3/}

- ^{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.

Table 1
Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm		LED light sources of normal production		Standard LED light sources	
		12V	24V		
e ^{2/}		25.0 nom.			
f ^{2/}		4.5 nom			
Contrast ^{6/}		100 min.			
Elevated ambient air temperature ^{3/}		60°C for H11/LED/6			
Cap H11/LED/6 PGJX19-2 in accordance with IEC Publication 60061 (sheet 7004-110A-1)					
Electrical and photometric characteristics		^{4/}	^{5/}	^{4/}	
Rated values		Volts	12	24	12
		Watts	18	18	18
Test voltage		Volts (DC)	13.2	28.0	13.2
Objective values	Power	Watts	21 max.	21 max.	21 max.
	Electrical current	mA	350 min. 1750 max. (at 9-16 V DC)	175 min. 875 max. (at 16-32 V DC)	350 min. 1750 max. (at 9-16 V DC)
	Luminous flux ^{1/} (at test voltage)	lm	1,350 ± 10%	1,350 ± 10%	1,350 ± 10 %
	Luminous flux ^{1/}	lm	270 min. (at 9 V DC)	150 min. (at 16 V DC)	270 min. (at 9 V DC)

^{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/LED/3

^{3/} The luminous flux measured at the elevated ambient air temperature shall be at least 70% 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/LED/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/LED/1, Figure 1) and from A and -A (see sheet H11/LED/1, Figure 1), i.e. along the C-planes C_0 , C_{90} and C_{270} (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%
(for standard light sources a minimum of 95% applies)
- Area A: $A / (A+B+C)$ shall be not more than 10%
- Areas B_1 , B_2 and B_3 : B_1/B , B_2/B , B_3/B shall each be not less than 15%
- Area B: $B / (A+B+C)$ shall be not less than 72 %
(for standard light sources a minimum of 75% and a maximum of 85% applies)
- Area C: $C / (A+B+C)$ shall be not more than 22%

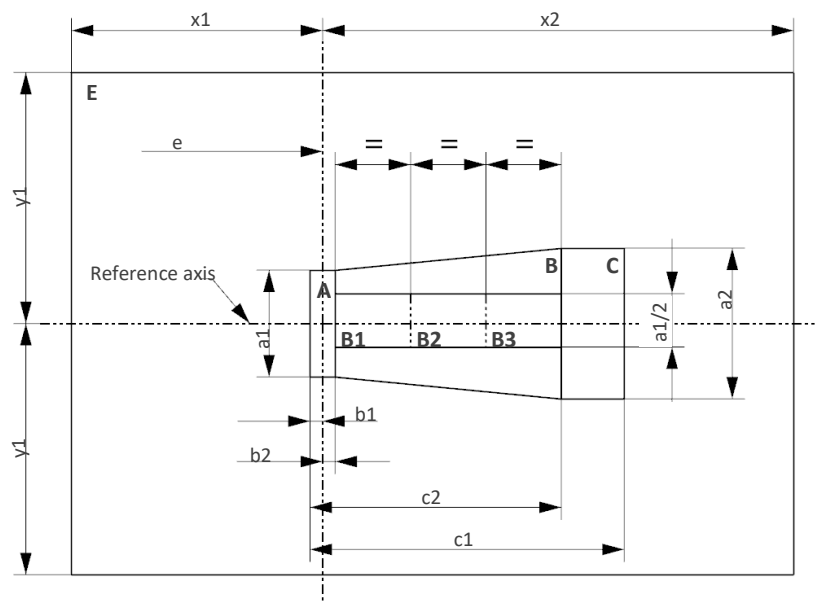


Figure 4: Box definition of the light emitting area (dimensions given in Table 2)

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/LED/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (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).

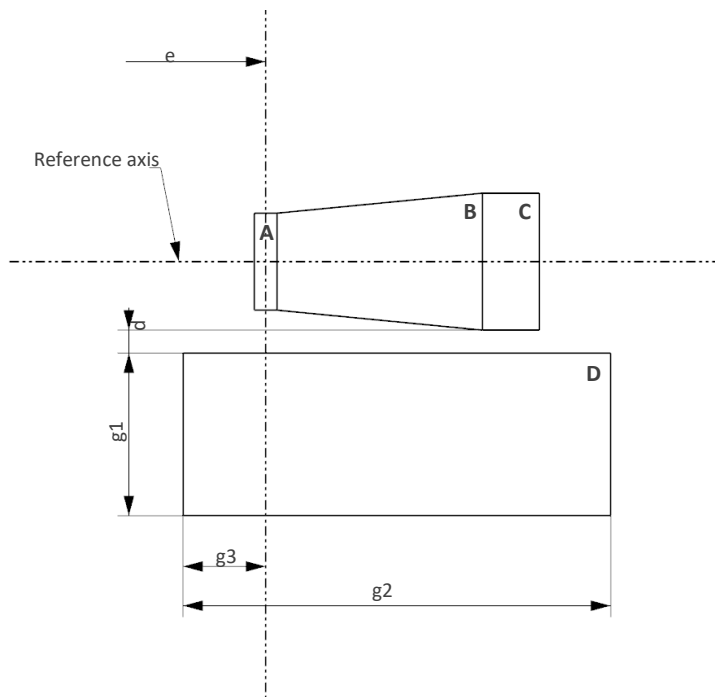


Figure 5: Box definition of the area D (dimensions given in Table 2)

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		

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.

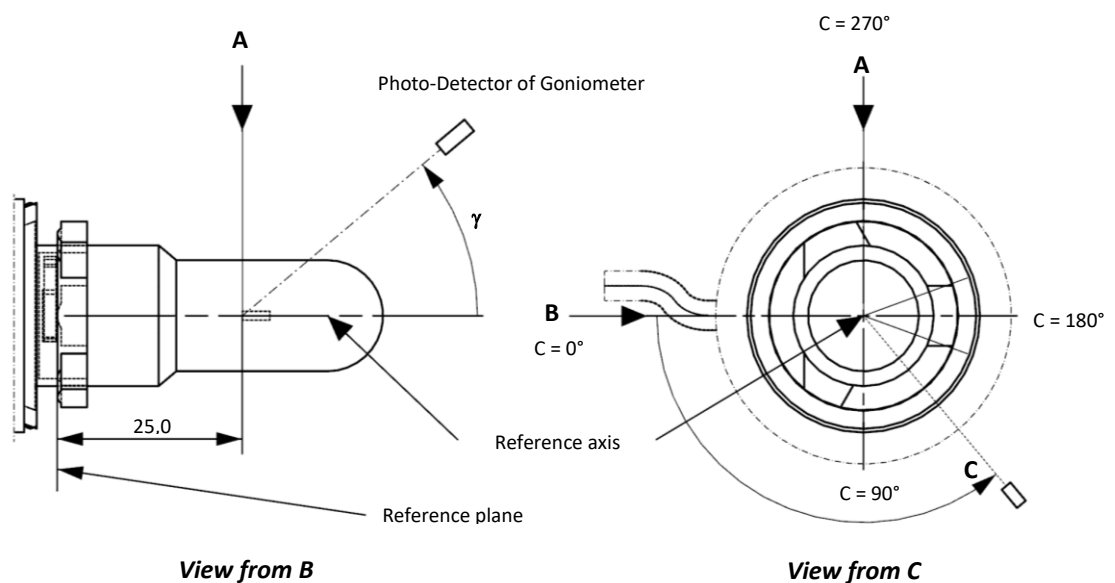


Figure 6 - Setup to measure the luminous intensity distribution and the definition of C-Planes and angle γ

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

Table 3 – Part 1

Test point values of normalized intensity (Black top area)

LED light source of normal production and standard LED light source		
	Minimum intensity (cd/klm)	Maximum intensity (cd/klm)
γ	$C_0, C_{90}, C_{180}, C_{270}$	$C_0, C_{90}, C_{180}, C_{270}$
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 γ_3 in sheet H11/3.

Table 3 – Part 2

Test point values of normalized intensity (Distortion free area)

LED light source of normal production and standard LED light source		
	Minimum intensity (cd/klm)	Maximum intensity (cd/klm)
γ	C_0, C_{90}, C_{270}	C_0, C_{90}, C_{270}
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 C_{90} and C_{270}) 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 γ_2 and γ_1 in sheet H11/3.

Table 3 – Part 3
Test point values of normalized intensity (Shading area of the lead-in wire of the counterpart filament light source)

γ	LED light source of normal production and standard LED light source	
	Minimum intensity (cd/klm)	Maximum intensity (cd/klm)
C-plane	$\gamma = 90^\circ$	$\gamma = 90^\circ$
C ₀	80	130
C ₃₀	80	130
C ₆₀	80	130
C ₉₀	80	130
C ₁₂₀	80	130
C ₁₅₀	80	130
C ₁₈₀	n/a	n/a
C ₂₁₀	80	130
C ₂₄₀	80	130
C ₂₇₀	80	130
C ₃₃₀	80	130
C ₃₃₀	80	130
C ₃₆₀ (= C ₀)	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.

II. Justification

1. This proposal specifies a LED substitute category H11/LED/6 which is equipped with a different connector than the connector of its counterpart filament light source category, to prevent misuse.
 2. This category was developed taking into account informal document GRE-82-03 on the equivalence criteria including those that are specific to road illumination applications: dedicated near-field photometry including homogeneity contrast, dedicated far-field photometry including distortion free zones and block-top region. See also the equivalence reports.
 3. Based on the input during the eighty-second session of GRE and the discussions in the TF SR, the original proposal ECE/TRANS/WP.29/GRE/2019/21 was amended to allow future categories with different / higher elevated ambient air temperature values. As a consequence, the Table 1 with Footnote 3 was modified and the name of the category was changed to “H11/LED/6”. For example, a future category with an elevated ambient air temperature of 80°C would then be named “H11/LED/8”.
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