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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-eighth session**

Geneva, 24–27 October 2017

Item 5 of the provisional agenda

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 1 to the original version of the Consolidated Resolution on the common specification of light source categories****Submitted by the expert from the International Automotive Lighting and Light Signalling Expert Group (GTB)***

The text reproduced below was prepared by the expert from GTB to introduce a new light emitting diode (LED) forward lighting light source category L1/6. The proposal is part of a package which also includes amendments to Regulation No. 128. It is based upon the original version of the Consolidated Resolution on the common specification of light source categories (R.E.5) (ECE/TRANS/WP.29/2016/111). 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 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.

GE.17-13770(E)



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Please recycle The recycling symbol, consisting of three chasing arrows forming a triangle.



I. Proposal

The Status table, amend to read:

"Status table

This consolidated version of this Resolution contains all provisions and amendments adopted so far by the World Forum for Harmonization of Vehicle Regulations (WP.29) and is valid from the date as indicated in the following table until the date on which the next revision of this Resolution becomes valid:

Version of the Resolution	Date * as from which the version is valid	Adopted by WP.29		Clarification
		Session No.	Amendment document No.	
1 (Original)	[2017-xx-xx]	170	ECE/TRANS/WP.29/2016/111	Based upon Annexes 1 of Regulations: <ul style="list-style-type: none"> No. 37, up to and including Supplement 44 No. 99, up to and including Supplement 11 No. 128, up to and including Supplement 5
[2]	[2018-xx-xx]	[173]	[ECE/TRANS/WP.29/2017/xx]	Introduction of new light emitting diode (LED) forward lighting light source categories L1A/6 and L1B/6 as a package with Supplement [7] to Regulation No.128

* This date is the date of adoption of the amendment to the Resolution by WP.29 or the date of entering into force of an amendment to Regulation No. 37, 99 or 128 adopted by AC.1 as a package with the amendment to the Resolution in the same session of WP.29.

Insert a new paragraph 2.5., to read:

"2.5. Thermal characteristics

2.5.1. Thermal point T_b means an optional point on the base of an LED light source of which the temperature is stabilised during photometric measurements."

Paragraph 3.3., group 1, amend to read:

"

<i>"RESERVED"</i>			
Group 1			
LED light source categories without general restrictions:			
	Category		Sheet number(s)
	L1A/6		L1/1 to 5
	L1B/6		L1/1 to 5

"

Paragraph 3.3., group 2, amend to read:

"

Group 2	
LED light source categories only for use in signalling lamps, cornering lamps, reversing lamps and rear registration plate lamps:	
Category	Sheet number(s)
LR1	LR1/1 to 5
LW2	LW2/1 to 5
LR3A	Lx3/1 to 6
LR3B	Lx3/1 to 6
LW3A	Lx3/1 to 6
LW3B	Lx3/1 to 6
LY3A	Lx3/1 to 6
LY3B	Lx3/1 to 6
LR4A	LR4/1 to 5
LR4B	LR4/1 to 5
LR5A	Lx5/1 to 6
LR5B	Lx5/1 to 6
LW5A	Lx5/1 to 6
LW5B	Lx5/1 to 6
LY5A	Lx5/1 to 6
LY5B	Lx5/1 to 6

"

Annex 3, List of sheets for LED light sources and their sequence, amend to read:

"

Sheet number(s)

L1/1 to 5

LR1/1 to 5

LW2/1 to 5

Lx3/1 to 6

LR4/1 to 5

Lx5/1 to 6

"

Annex 3,

Sheets L3/1 to 6, renumber as sheets Lx3/1 to 6.

Sheet L3/1, bottom left, amend to read:

"For the notes see sheet Lx3/2."

Sheets L5/1 to 6, renumber as sheets Lx5/1 to 6.

Before sheet LR1/1, insert new sheets L1/1 to 5, to read (see the following pages; one page per sheet):

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


Projection method: 

Figure 1***

Main Drawing, L1A/6

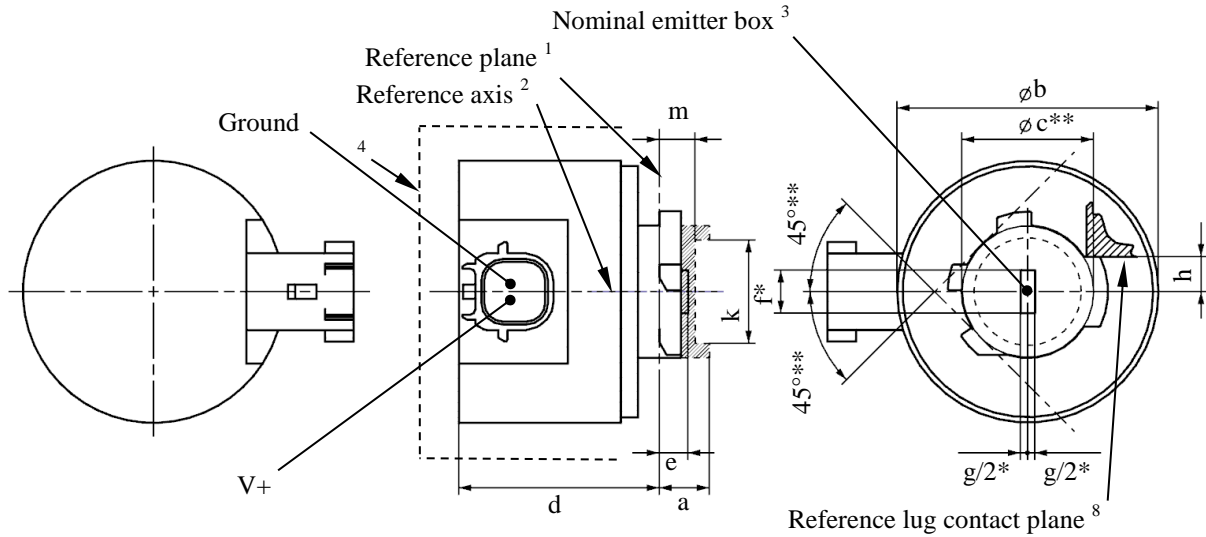
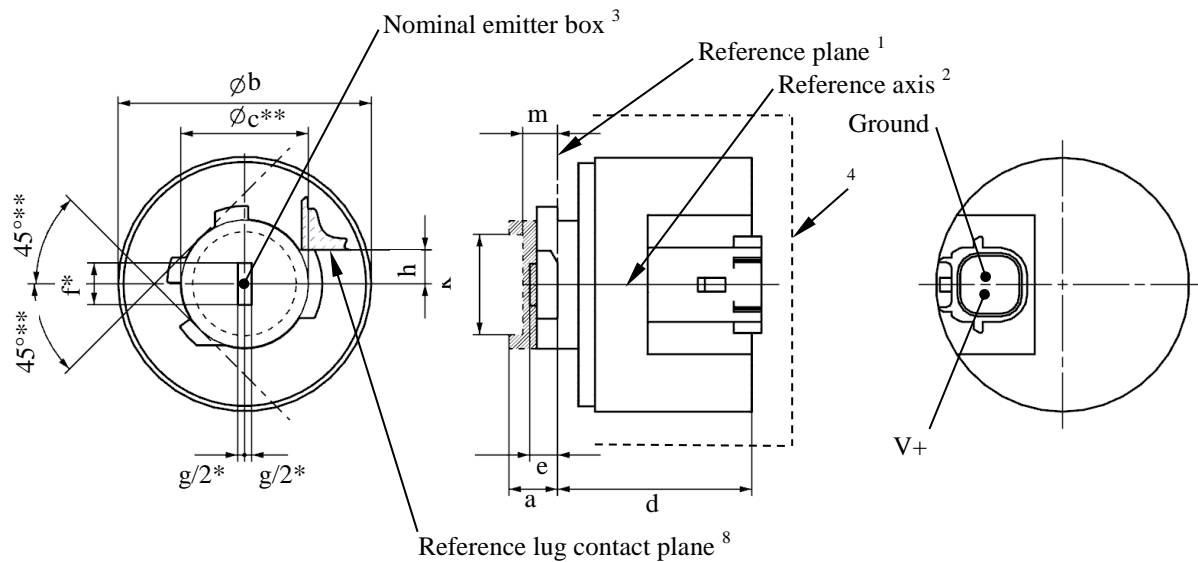


Figure 2***

Main Drawing, L1B/6



* Dimensions f and g see table 2.

** Reference system for the emitter box: for detailed dimensions see relevant cap data sheet.

*** For the notes see sheet L1/2.

Category L1A/6, L1B/6

Sheet L1/2

Table 1

Essential electrical and photometric characteristics of the LED light source

<i>Dimensions</i>		<i>Production LED light sources</i>	<i>Standard LED light sources</i>	
a	mm	6.0 max.		
b	mm	c + 10.0 min. 38.0 max.		
c	mm	18.60		
d	mm	28.0 max.		
e	mm	3.00 ± 0.30	3.00 ± 0.10	
h ⁸	mm	4.88		
k ⁹	mm	7 min.		
m ⁹	mm	4.5 max.		
Cap PGJ18.5d-29 in accordance with IEC Publication 60061 (sheet 7004-185-[2]) ¹⁰				
<i>Electrical and photometric characteristics⁵</i>				
Rated Values	Voltage (in Volts)		12	
	Power (in Watts)		4.0	
Objective values ⁶	Power (in Watts)	at 13.2V DC at 13.5V DC	6.0 max 6.0 max	
	Luminous Flux (in lumen)	at 13.2V DC at 13.5V DC	350 ± 20% 355 ± 20%	350 ± 10% ⁷ 355 ± 10%
	Luminous Flux (in lumen)	at 9V DC	70 min.	
<i>Characteristics of the light-emitting area</i>				
Contrast		200 min.	200 min. 400 max.	
Size of light emitting area in relation to size of nominal emitter box ³		75% min.	75% min.	
Uniformity R _{0,1} – surface ratio with luminance exceeding 10% of average luminance		75% min.	85% min.	
Uniformity R _{0,7} – surface ratio with luminance exceeding 70% of average luminance		55% min.	65% min.	
<i>Specific thermal test conditions</i>				
Maximum test temperature		65 °C	65 °C	

Notes:

¹ The reference plane is defined on the cap and holder fit system according the IEC Publication 60061.

² The reference axis is perpendicular to the reference plane and concentric with the reference diameter c of the cap, intended passing through the centre of the nominal emitter box in figure 3.

³ To be checked by means of the box system in Figure 3.

⁴ A minimum free air space of 5 mm around the light source shall be respected for convection; the connector interface can be neglected.

⁵ The emitted light shall be white.

⁶ After continuous operation for 30 minutes at 23 ± 2.5 °C.

⁷ The measured value shall be in between 100 per cent and 90 per cent of the value measured after 1 minute.

⁸ The Light source shall be rotated in the (measuring) holder until the reference lug contacts the plane as defined with dimension h from the (measuring) holder.

⁹ The bounded area defined with the dimensions c, k and m defines the maximum outline in relation to the reference system.

¹⁰ LED light source L1A/6 shall be equipped with the right-angle cap and LED light source L1B/6 with the straight cap.

Electrical characteristics, failure condition behaviour:

In case of LED light source failure (no light emitted) the maximum electrical current draw, when operated between 12 V and 14 V, shall be less than 20 mA (open circuit condition).

Screen projection requirements:

The following test is intended to define the requirements for the 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, the contrast and the uniformity of the light emitting area are checked by the nominal emitter box system defined in figure 3, which shows the projection when viewing along direction of the reference axis ($\text{Gamma} = 0^\circ$) as defined in Figure 4.

Figure 3

Definition of the nominal emitter box with dimensions as specified in table 2

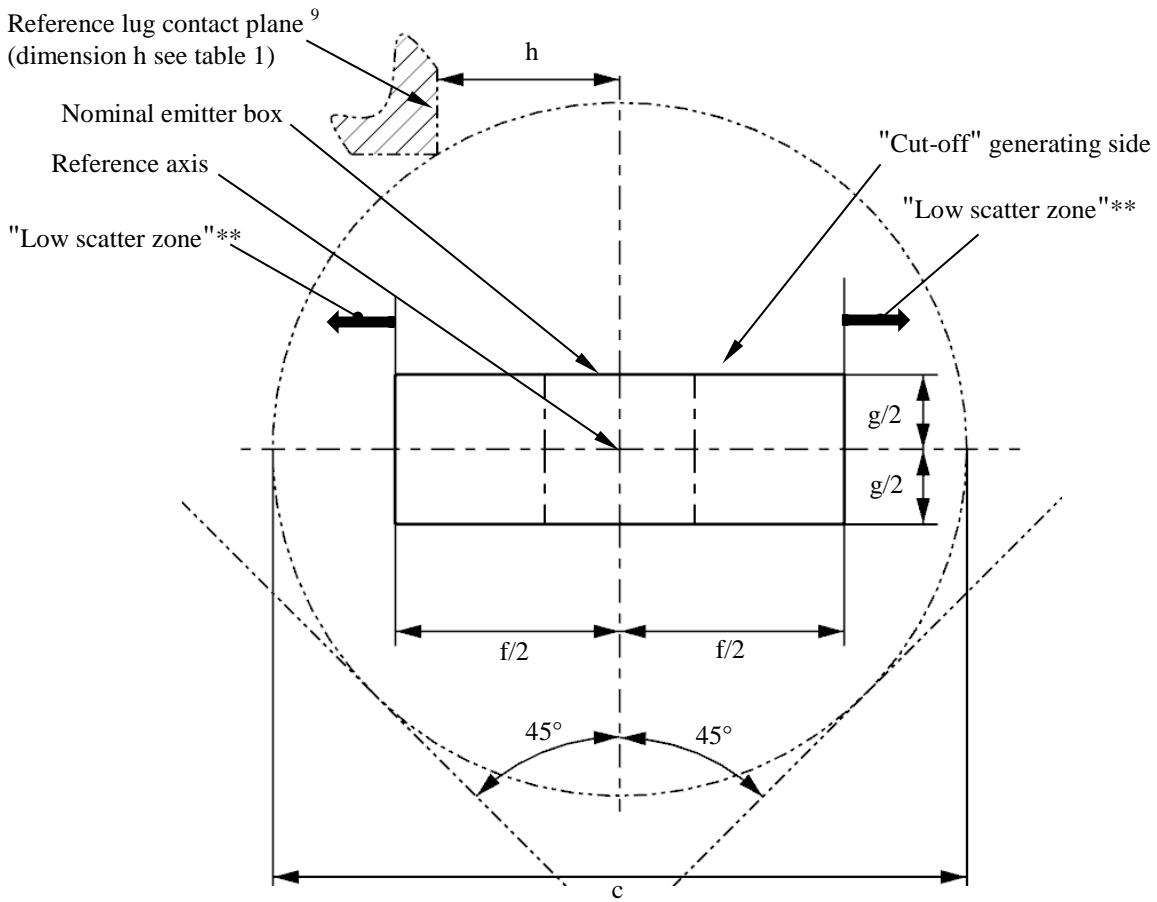


Table 2

Dimensions of the nominal emitter box in Figure 3

Dimensions	f	g	
	mm	4.0	1.4
Number of equidistant subdivision to control deviation of luminance	3	2	

** The value of the maximum luminance in the "low scatter zone" expressed as a percentage of the average luminance of the light emitting area shall be not higher than 10 per cent.

Normalized luminous intensity distribution:

The following test is intended to determine the normalized luminous intensity distribution of the light source in an arbitrary plane containing the reference axis. The intersection of the reference axis and the upper edge of the box is used as the coordinate system origin.

The light source is mounted on a flat plate with the corresponding mounting lug features. The plate is mounted to the goniometer table by a bracket, so that the reference axis of the light set-up is described in Figure 4.

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

The measurements shall be performed in C-planes C_0 , C_{90} , C_{180} and C_{270} , which contain the reference axis of the light source. The test points for each plane for multiple polar angles γ are specified in Table 3.

After measurement the data shall be normalized to 1000 lm according to Paragraph 3.1.11 using the luminous flux of the individual light source under test. The data shall comply with the tolerance band as defined in Table 3.

The drawings are intended only to illustrate the essential set-up for measurement of the LED light source

Figure 4

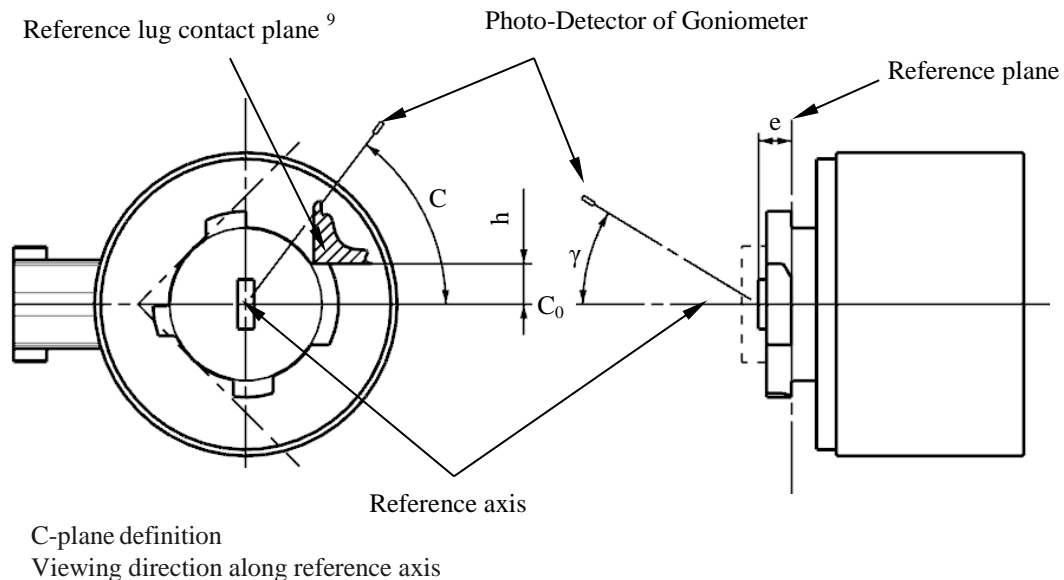
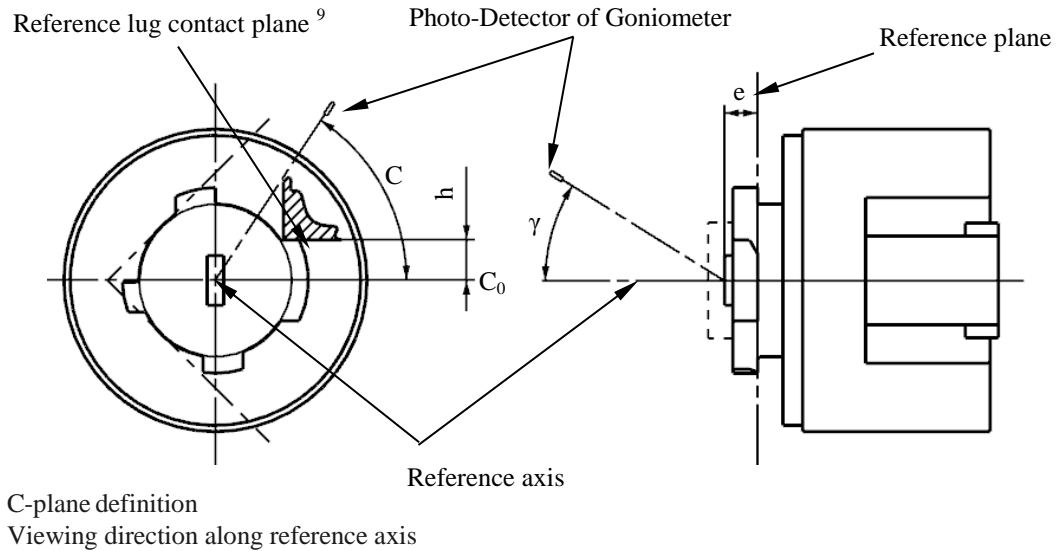
Set-up to measure the luminous intensity distribution for L1A/6

Figure 5
Set-up to measure the luminous intensity distribution for L1B/6



The light pattern as described in Table 4 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 4.

Table 3
Test point values of normalized intensities of normal production and standard lamps, respectively

	<i>LED Light sources of normal production and Standard LED light sources</i>	
<i>Angle γ</i>	<i>Minimum Intensity in cd/1000 lm</i>	<i>Maximum intensity in cd/1000 lm</i>
	<i>C0° / C90° / C180° / C270°</i>	<i>C0° / C90° / C180° / C270°</i>
0°	266	389
15°	257	376
30°	228	339
45°	183	281
60°	123	205
70°	70	149
75°	40	116
80°	0	84
90°	0	21

II. Justification

1. This proposal is part of a package with a related proposal for amendment to Regulation No. 128 to introduce LED forward lighting light sources.
 2. GTB proposes one category L1/6 with “maximum test temperature” 65 °C. The definition of the maximum test temperature is necessary to ensure interchangeability between approved light sources from different manufacturers. A separate (unique) light source category is specified for every "maximum test temperature". The choice of installation of a light source with a given maximum test temperature is based on the application in the vehicle and determined by due diligence of the car maker and set maker, in the same way as is now the case with LED modules.
 3. In the future GTB may propose an additional category with a different “maximum test temperature” and based on the above mentioned principle this will then be a separate light source category. By taking this approach there will be type approval traceability from the light source, through the device approval and to the installation on the vehicle; thereby incorrect replacement of the light sources will be avoided due to the different "keying" in the cap and holder design.
 4. The L1/6 category is introduced in the Consolidated Resolution on the common specification of light source categories as the first LED category having no general use restriction (i.e. also allowed in forward lighting applications). The L1/6 was developed taking into account the reference document GRE-77-04 "Introduction and Evaluation of LED Light Source Categories Intended for Forward Lighting Applications". The L1/6 is specified to meet the stringent requirements to fulfill more challenging beam patterns (sharp cut-off, limited glare) on the one hand, and on the other hand fulfill the required interchangeability under potential higher thermal load conditions that are associated with the use of higher lumen packages in these light sources.
 5. As the L1/6 category has no general use restriction, it can also be applied to other lighting functions with white light (e.g. daytime running lamps, cornering light). Therefore the proposed L1/ category sheet includes specifications at 13.5V in Table 2 (Essential electrical and photometric characteristics of the LED light source).
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