United Nations ECE/TRANS/WP.29/GRE/2017/17

Economic and Social Council

Distr.: General
7 August 2017

Original: English

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 amendments 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 with the aim to introduce new light emitting diode (LED) substitute light source categories C5W/LED, PY21W/LED and R5W/LED. This proposal is based on ECE/TRANS/WP.29/GRE/2017/3, subject to amendments in paragraph 3.3, and is part of a package which also includes amendments to Regulation No. 128. 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.17-13477(E)
1713477

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: • 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 LED substitute light source categories C5W/LED, PY21W/LED and R5W/LED 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 2.1.1.3.1.., to read:

"2.1.1.3.1. "*LED substitute light source*" means a LED light source of a category which has a counterpart light source category producing light by another light generating technology."

Paragraph 3.3., insert at the end new tables for Group 3 and Group 4, to read:

"

Group 3				
RESERVED				

Group 4		
LED substitute light source categories[1] only for use in lamps approved with filament light source(s) of its counterpart light source category		
Category	***Counterpart filament light source category***	***Sheet number(s)***
C5W/LED	**C5W**	**C5W/LED/1 to 4**
PY21W/LED	**PY21W**	**PY21W/LED/1 to 4**
R5W/LED	**R5W**	**R5W/LED/1 to 4**

[1] **Not for use in conformity of production control of lamps**.

Annex 3,

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

"

Sheet number(s)
C5W/LED/1 to 4
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

"

Before sheet LR1/1, insert new sheets C5W/LED/1 to 4, to read (see following pages; one page per sheet):

“ **Category C5W/LED** **Sheet C5W/LED/1**

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

Figure 1
Main drawing

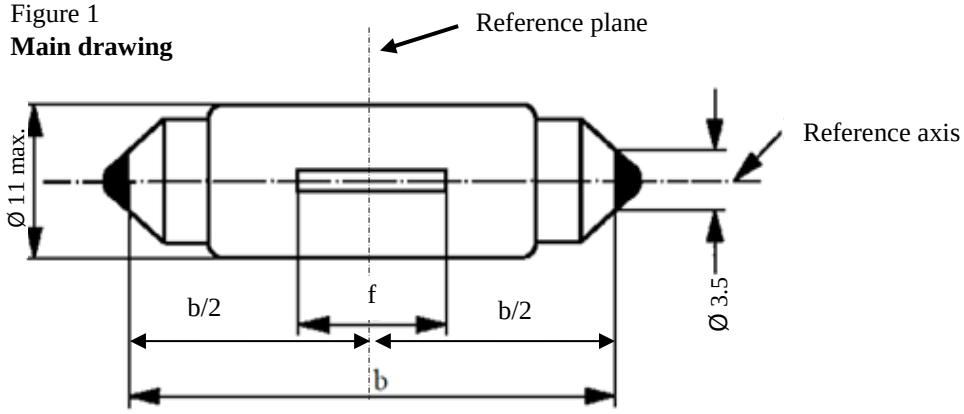


Table 1
Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm		*LED light sources of normal production*			*Standard LED light source*
		min.	*nom.*	*max.*	
b [1/]		34.0	35.0	36.0	35±0.5
e [2/]			0.0		0.0
f [2/]			9.0		9.0
Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)					
Electrical [5/] and photometric characteristics					
Rated values	Volts	12			12
	Watts	2			2
Test voltage	Volts	13.5			13.5
Objective values	Watts	2 max.			2 max.
	Electrical current (in mA at 9-16V DC)	75 min. 170 max.			
	Luminous flux [3/] (in lm at 13.5 V DC)	45 ± 20 % [4/]			45 ± 10 % [4/]
	Luminous flux [3/] (in lm at 9 V DC)	9 min.			9 min.

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 from LED light source shall be white.

4 The value measured at elevated ambient air temperature of 80°C shall be at least 70% of this value.

5 In case of a failure of any of the light emitting elements, 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 25 Ma.

Category C5W/LED **Sheet C5W/LED/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 $\gamma = 0°$ (top view)**,** $\gamma = 90°$ (front view)**,** $\gamma = 180°$ (bottom view)**,** $\gamma = 270°$ (rear view), inclined views $\gamma = 45°$, $\gamma = 135°$, $\gamma = 225°$ and $\gamma = 315°$, in the plane C_0 (C, γ 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.

Figure 2
Box definition of the light emitting area

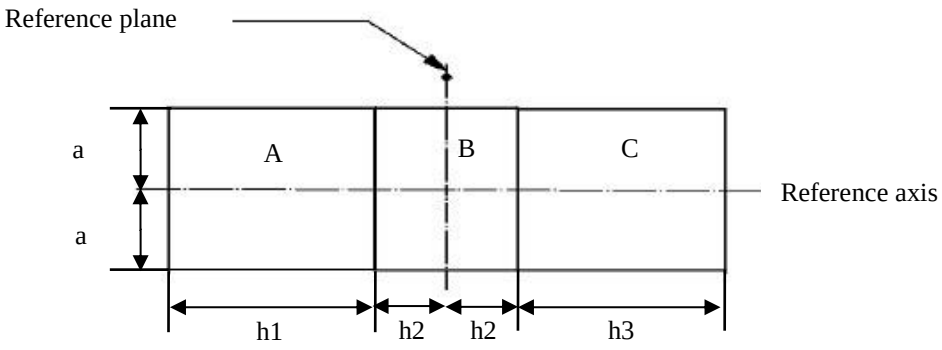


Table 2
Dimensions of the box system in figure 2

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

Category C5W/LED **Sheet C5W/LED/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.

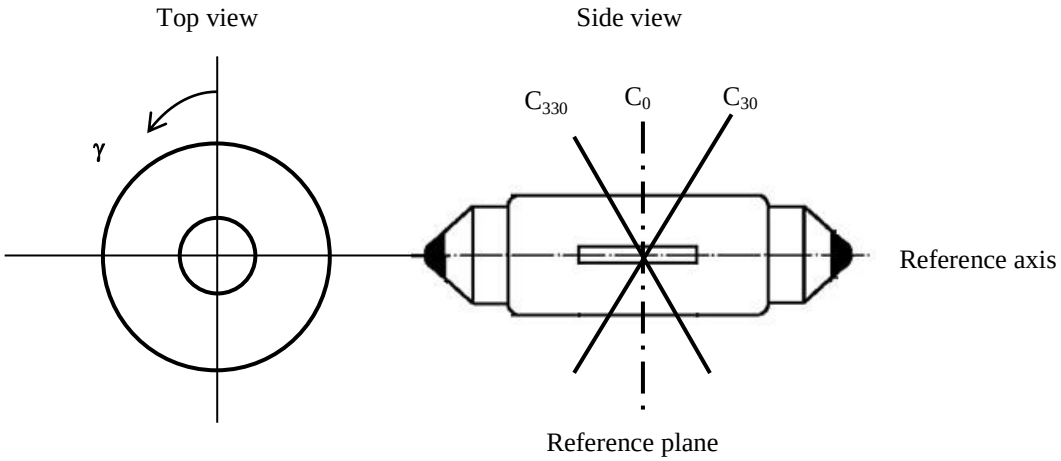
The measurements shall be performed in C-planes, where C_0 shall be the reference plane of the light source. The C-planes to be measured shall be C_0, C_{30} and C_{330}. The test points for each plane and multiple polar angles γ are specified in Table 3.

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 γ)



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

Category C5W/LED **Sheet C5W/LED/4**

Table 3

Test point values of normalized intensity in the planes C_0, C_{30}, C_{330}

	LED light source of normal production		*Standard LED light source*	
γ	*Minimum intensity in cd /1000 lm*	*Maximum intensity in cd /1000 lm*	*Minimum intensity in cd /1000 lm*	*Maximum intensity in cd /1000 lm*
-175°	60	140	80	120
-150°	60	140	80	120
-125°	60	140	80	120
-100°	60	140	80	120
-75°	60	140	80	120
-50°	60	140	80	120
-25°	60	140	80	120
0°	60	140	80	120
25°	60	140	80	120
50°	60	140	80	120
75°	60	140	80	120
100°	60	140	80	120
125°	60	140	80	120
150°	60	140	80	120
175°	60	140	80	120

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.

After sheet L5/6, insert new sheets PY21W/LED/1 to 4 and R5W/LED/1 to 4, to read (see following pages; one page per sheet):

" **Category PY21W/LED** **Sheet PY21W/LED/1**

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

Figure 1
Main drawing

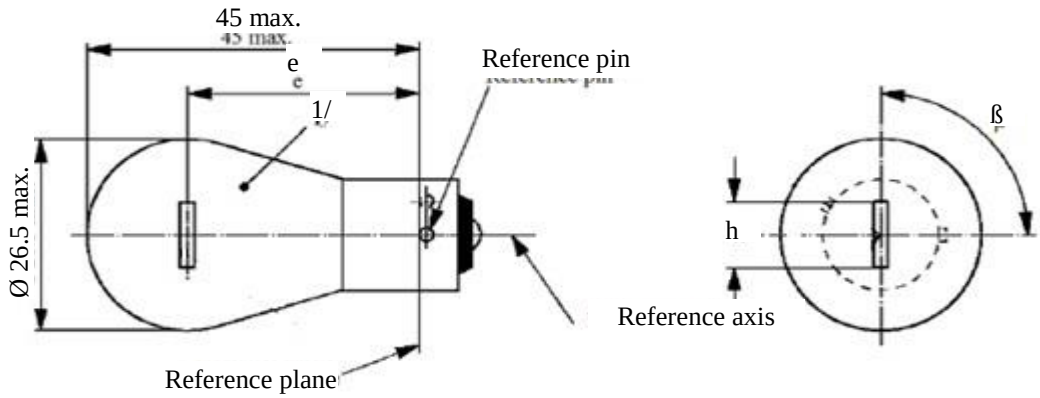


Table 1
Essential electrical and photometric characteristics of LED light sources

Dimensions in mm		*LED light sources of normal production*			*Standard LED light source*
		min.	*nom.*	*max.*	*nom.*
e			31.8 [2/]		31.8 [2/]
h			9.0 [2/]		9.0 [2/]
β		75°	90°	105°	90°±10°
Cap BAU15s in accordance with IEC Publication 60061 (sheet 7004-19-2)					
Electrical[5/] and photometric characteristics					
Rated values	Volts	12	24		12
	Watts	7 [3/]			7 [3/]
Test voltage	Volts	13.5	28.0		13.5
Objective values	Watts	9 max. [3/]	10 max. [3/]		9 max. [3/]
	Electrical current (in mA at 9-16V DC)	150 min. 750 max.			
	Luminous flux[3/, 4/] (in lm at 13.5 V DC)	280 ± 20 %			280 ± 10 %
	Luminous flux[3/] (in lm at 9 V DC)	56 min.			56 min.

1 The light emitted from the LED light source shall be amber.

2 To be checked by means of a "Box-System"; sheet PY21W/LED/2.

3 Operated in flashing mode for 30 minutes (frequency = 1.5 Hz, duty cycle 50 per cent ON, 50 per cent OFF) and measured in the ON-state of flashing mode after 30 minutes of operation.

4 The value measured at elevated ambient temperature of 80°C shall be at least 65% of this value.

5 In case of a failure of any of the light emitting elements, 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 50 mA.

Category PY21W/LED **Sheet PY21W/LED/2**

Screen projection requirements

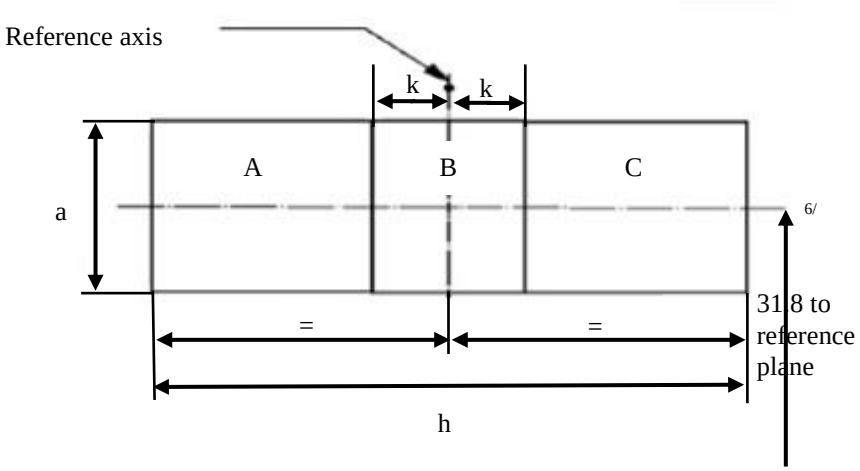
The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by means of a box system defined by the projections when viewing along direction $\gamma = 0°$ (top view), $\gamma = \pm 45°$ (inclined view) and $\gamma = \pm 90°$ (front and rear view) in the plane C_0 (C, γ 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 80 per cent or more;
- B shall be 25 per cent or more;
- A and C shall each be 15 per cent or more.

Figure 2
Box definition of the light emitting area with dimensions as specified in table 2



The lateral position of the light emitting area needs to be centred in the plane containing the reference axis and being perpendicular to the plane containing the reference axis and the reference pin.

Table 2
Dimensions of the box system in figure 2

Dimensions in mm	*a*	*h*	*k*
Top view ($\gamma = 0°$)	5.0	9.0	1.0
Inclined view ($\gamma = \pm 45°$)	7.0		
Front / Rear view ($\gamma = \pm 90°$)	5.0		

[6] This dot and dash line applies to front and rear view only.

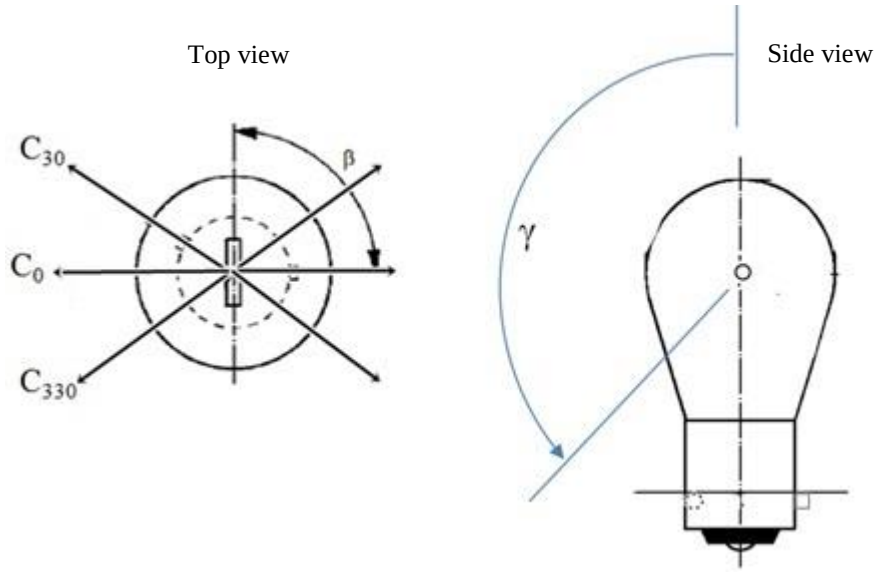
Normalized luminous intensity distribution

The following test is intended to determine the normalized luminous intensity distribution of the light source in the planes containing the reference axis as described in figure 3. The intersection of the reference axis and the 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 source lines up with one of the rotating axis of the goniometer.

Luminous intensity data is recorded 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.

Figure 3
Setup to measure the luminous intensity distribution (Definition of C-Planes and angle γ)



The measurements shall be performed in C-planes, which contain the reference axis of the light source. The C-planes shall be C_0, C_{30} and C_{330}. 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.

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

Category PY21W/LED **Sheet PY21W/LED/4**

Table 3

Test point values of normalized intensity in the planes C_0, C_{30}, C_{330}

	LED light source of normal production		*Standard LED light source*	
γ	*Minimum intensity in cd /1000 lm*	*Maximum intensity in cd/1000 lm*	*Minimum intensity in cd /1000 lm*	*Maximum intensity in cd/1000 lm*
-150°	60	140	80	120
-125°	60	140	80	120
-100°	60	140	80	120
-75°	60	140	80	120
-50°	60	140	80	120
-25°	60	140	80	120
0°	60	140	80	120
25°	60	140	80	120
50°	60	140	80	120
75°	60	140	80	120
100°	60	140	80	120
125°	60	140	80	120
150°	60	140	80	120

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.

Category R5W/LED **Sheet R5W/1/LED**

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

Figure 1
Main drawing

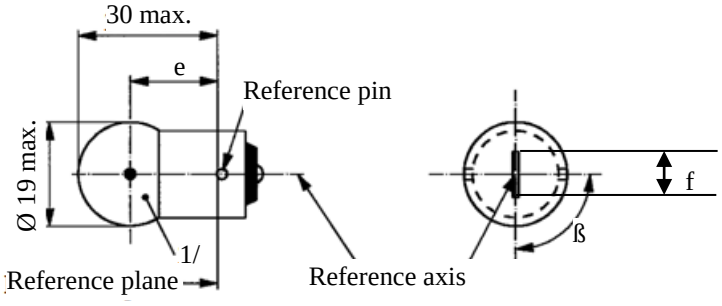


Table 1
Essential electrical and photometric characteristics of the LED light source

Dimensions in mm		*LED light sources of normal production*			*Standard LED light source*
		min.	*nom.*	*max.*	*nom.*
e [2/]			19.0		19.0
f [2/]			4.0		4.0
β [2/]			90°		90°
Cap: R5W: BA15s in accordance with IEC Publication 60061 (sheet 7004-11A-9)					
Electrical[4/] and photometric characteristics					
Rated values	Volts	12		24	12
	Watts	2			2
Test voltage	Volts	13.5		28.0	13.5
Objective values	Watts	2 max.		2 max.	2 max.
	Electrical current (in mA at 9-16V DC)	75 min. 170 max.			
	Luminous flux [1/, 3/] (in lm at 13.5 V DC)	50 ± 20 %			50 ± 10 %
	Luminous flux [1/] (in lm at 9 V DC)	10 min.			10 min.

1 The light emitted from LED light source shall be white.
2 To be checked by means of a "box system", sheet R5W/2/LED.
3 The value measured at elevated ambient temperature of 80°C shall be at least 70% of this value.
4 In case of a failure of any of the light emitting elements, 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 25 Ma.

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 by the projections when viewing along the direction $\gamma = 0°$ (top view), $\gamma = \pm 45°$ (inclined view) and $\gamma = \pm 90°$ (front, rear view) in the plane C_0 (C, γ 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 more than 15 per cent.

Figure 2
Box definition of the light emitting area

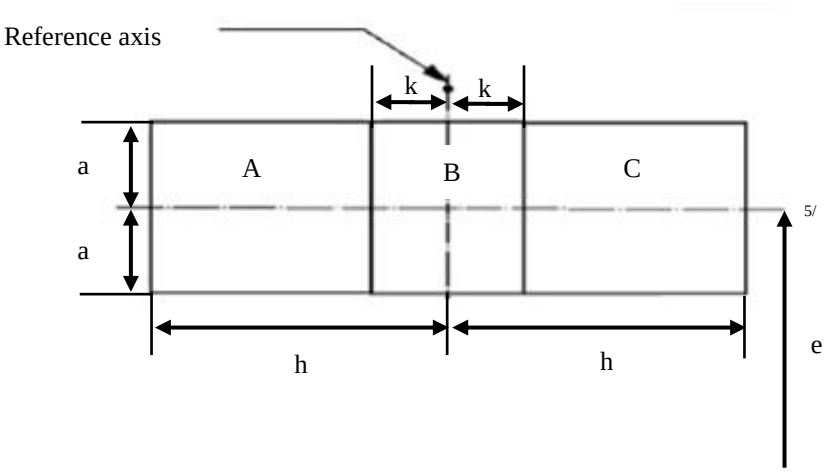


Table 2
Dimensions of the box system in figure 2

Dimensions in mm	*a*	*h*	*k*
Top view ($\gamma = 0°$)	3	4	0.5
Inclined views ($\gamma = \pm 45°$)	4.5	4	0.5
Front/ Rear view ($\gamma = \pm 90°$)	3	4	0.5

[5] This dot and dash line applies to front and rear view only.

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 parallel plane to the reference plane in distance e is used as the coordinate system origin.

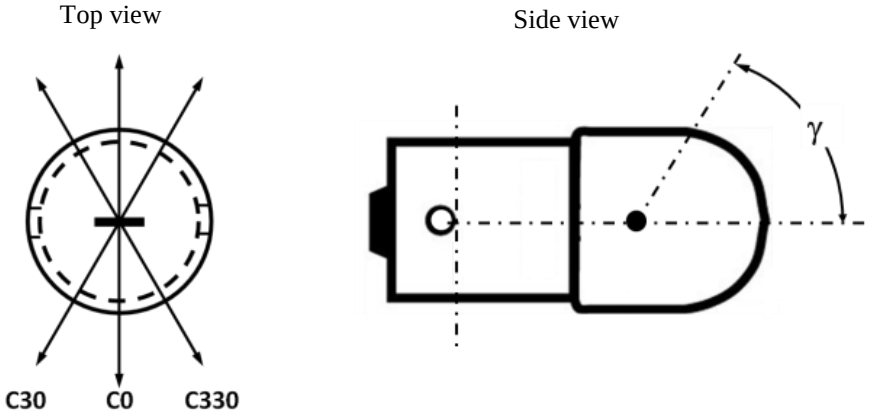
The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in figure 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, which contain the reference axis of the light source. The C-planes to be measured shall be C_0, C_{30} and C_{330}. 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
Illustration of C, γ System



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

Category R5W/LED **Sheet R5W/4/LED**

Table 3
Test point values of normalized intensity in the planes C_0, C_{30}, C_{330}

γ	*LED light source of normal production*		*Standard LED light source*	
	Minimum intensity in cd /1000 lm	*Maximum intensity in cd /1000 lm*	*Minimum intensity in cd /1000 lm*	*Maximum intensity in cd /1000 lm*
-100°	60	140	80	120
-75°	60	140	80	120
-50°	60	140	80	120
-25°	60	140	80	120
0°	60	140	80	120
25°	60	140	80	120
50°	60	140	80	120
75°	60	140	80	120
100°	60	140	80	120

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.”

II. Justification

This proposal is part of a package with a related proposal for amendment to Regulation No. 128 to introduce LED substitute light sources. The three categories were developed taking into account informal document GRE-77-02 on equivalence criteria (photometric, electrical, dimensional and thermal), including among others: near-field photometry, far-field photometry, colour, spectral content, failure behaviour, minimum and maximum electrical current, voltage behaviour, thermal behaviour, mechanical dimensions, cap. See also the equivalence reports in GRE-77-03.