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World Forum for Harmonization of Vehicle Regulations

Working Party on Lighting and Light-Signalling

Eighty-first session
Geneva, 15-18 April 2019
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 [6] to the Consolidated Resolution on the common specification of light source categories (R.E.5)

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/LEDK and R5W/LED in the Consolidated Resolution on the common specification of light source categories (R.E.5) (ECE/TRANS/WP.29/1127). The modifications to the existing text of the Resolution are marked in bold for new or strikethrough for deleted characters. This proposal is supported by informal document GRE-81-03.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21/Add.1, cluster 3.1), 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.

GE.19-01591(E)
1901591

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]	[174]	[ECE/TRANS/WP.29/2018/32]	Amended details in sheets: C21W/2, H1/1, H3/1, H3/2, H4/4, H9/1, H11/2, H13/4, H14/1, H15/5, H20/3, H20/4, HIR2/1, HS6/1, P13W/3, P21W/1, P21/5W, P27/7W/3, PSX26W/3, R5W/1, R10W/1, T1.4W/1, W15/5W/1, W21/5W/1, WT21W/1
[3]	[2018-xx-xx]	[174]	[ECE/TRANS/WP.29/2018/33/Rev.1]	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
[4]	[2019-xx-xx]	[177]	[ECE/TRANS/WP.29/2019/xx]	Amendment to light source categories LR4 as a package with Supplement [8] to Regulation No.128
[5]	[2019-xx-xx]	[177]	[WP.29/2019/xx]	Introduction of new LED substitute light source category PY21W/LED as a package with Supplement [8] to Regulation No.128
[6]	**[2019-xx-xx]**	**[173]**	**[ECE/TRANS/WP.29/2017/xx]**	**Introduction of new LED substitute light source categories C5W/LEDK and R5W/LED**

* 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.

"

Group 4, amend to read:

"

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/LEDK [2]	**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.

[2] **Not for use behind red and amber lenses**"

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/LEDK** **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

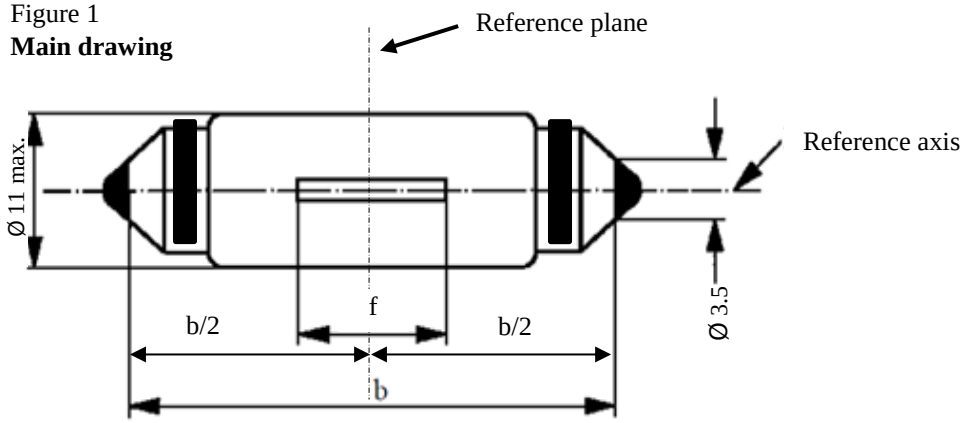


Table 1
Essential electrical and photometrical characteristics of the LED light source

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 SVX8.5 in accordance with IEC Publication 60061 (sheet 7004-81A-1)					
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)	30 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, without a correlated colour temperature restriction.

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 10 mA.

Category C5W/LEDK **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

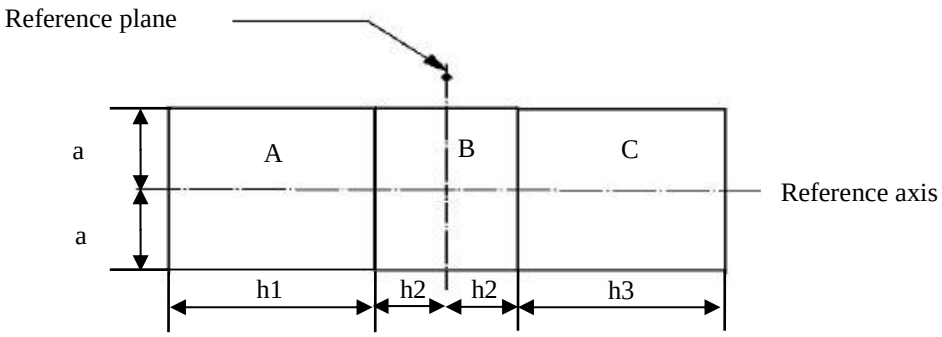


Table 2
Dimensions of the box system in figure 2

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

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.

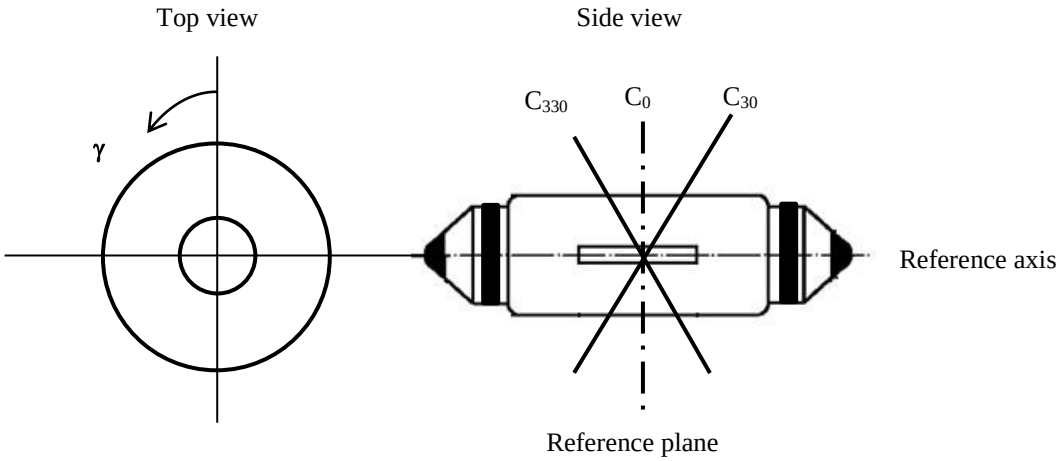
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

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/LEDK **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 PY21W/LED, insert new sheets R5W/LED/1 to 4, to read (see following pages; one page per sheet):

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

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

Figure 1
Main drawing

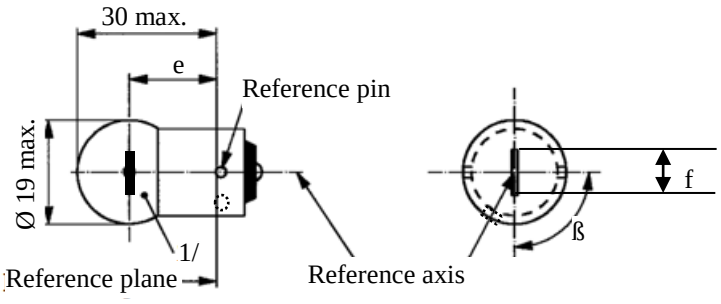


Table 1
Essential electrical and photometric characteristics of the LED light source

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°
R5W/LED: Cap BA15s-3(110°) in accordance with IEC Publication 60061 (sheet 7004-19A-1)					
Electrical and photometric characteristics		[4/]		[5/]	[4/]
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) 30 min. 170 max.		(at 16-32V DC) 30 min. 170 max.	(at 9-16V DC) 30 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, for R5W/LED with a maximum correlated colour temperature of 3000K.

2 To be checked by means of a “box system”, sheet R5W/2/LED/2.

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 10 mA.

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 24 V and 28 V, shall be less than 10 mA.

Category R5W/LED **Sheet R5W/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 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

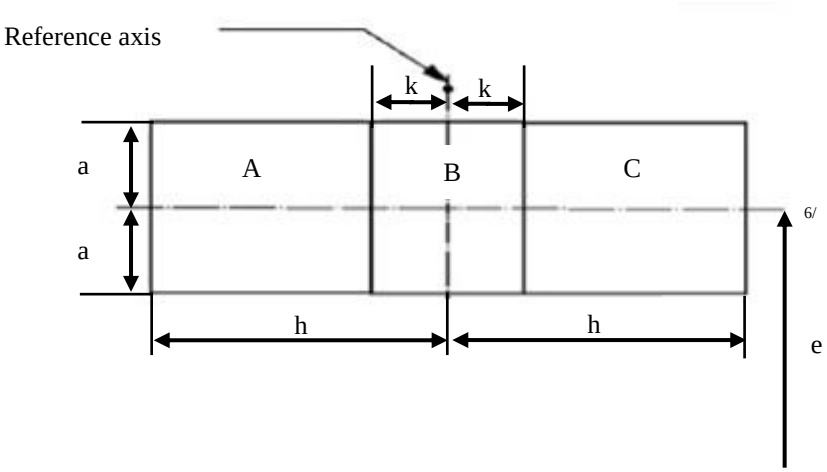


Table 2
Dimensions of the box system in figure 2

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

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 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.

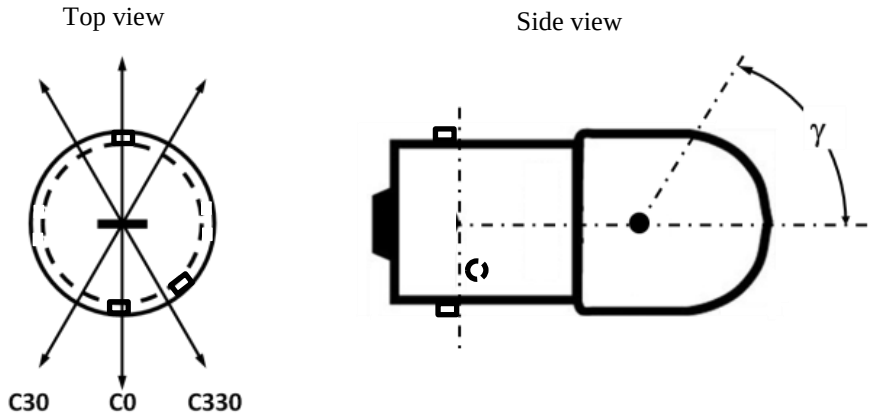
The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in figure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

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 is a proposal for the addition of two LED substitute light source categories to the Consolidated Resolution on the common specification of light source categories (R.E.5). The two categories were developed taking into account informal document GRE-80-02 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-81-03. This proposal is brought in line with the LED substitute light sources proposal that was adopted at the eightieth session of GRE, in particular with respect to the requirements on the correlated color temperature in UN Regulation No. 128, paragraph 3.12.4. Accordingly, the suffix "K" in the category name (C5W/LEDK) is introduced to indicate that there is no correlated color temperature restriction on the white light for this category. The C5W/LEDK also has a unique base keying. Furthermore, the International Electrotechnical Commission (IEC) caps of both light sources are of a design that incorporates an interlock in accordance with what is proposed by the GRE Task Force on Substitutes and Retrofits (TF SR) (see GRE-80-02) for caps of substitute light sources, and adopted at the eightieth session of GRE.