



Economic and Social Council

Distr.: General
23 December 2015

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

168th session

Geneva, 8-11 March 2016

Item 4.9.10 of the provisional agenda

**1958 Agreement – Consideration of draft amendments
to existing Regulations submitted by GRE**

Proposal for Supplement 5 to the original series of amendments to Regulation No. 128 (Light Emitting Diode (LED) light sources)

Submitted by the Working Party on Lighting and Light-Signalling*

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its seventy-fourth session (ECE/TRANS/WP.29/GRE/74, para. 12). It is based on ECE/TRANS/WP.29/GRE/2015/30. 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 March 2016 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), 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.

Annex 1,

The list of categories of LED light sources and their sheet numbers, amend to read:

"

<u>Category</u>	<u>Sheet number(s)</u>
LR1	LR1/1 to 5
LW2	LW2/1 to 5
LR3A	L3/1 to 6
LR3B	L3/1 to 6
LW3A	L3/1 to 6
LW3B	L3/1 to 6
LY3A	L3/1 to 6
LY3B	L3/1 to 6
LR4A	LR4/1 to 5
LR4B	LR4/1 to 5
LR5A	L5/1 to 6
LR5B	L5/1 to 6
LW5A	L5/1 to 6
LW5B	L5/1 to 6
LY5A	L5/1 to 6
LY5B	L5/1 to 6

"

The list of sheets for LED light sources and their sequence in this annex, amend to read:

"

<u>Sheet number(s)</u>
LR1/1 to 5
LW2/1 to 5
L3/1 to 6
LR4/1 to 5
L5/1 to 6

"

Sheets LR3/1 to 5, replace by new sheets L3/1 to 6, to read (see following pages; one page per sheet):

Sheet LR4/1, replace by new sheet LR4/1, to read (see following pages):

Sheet LR4/4, replace by new sheet LR4/4, to read (see following pages):

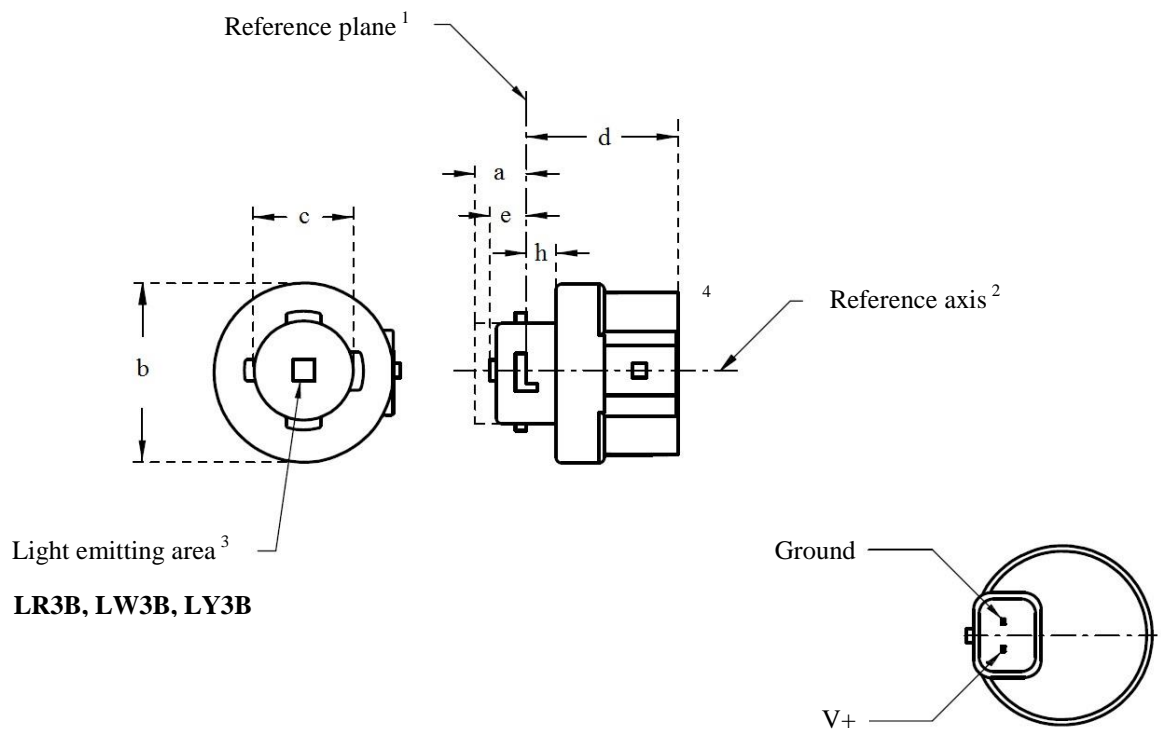
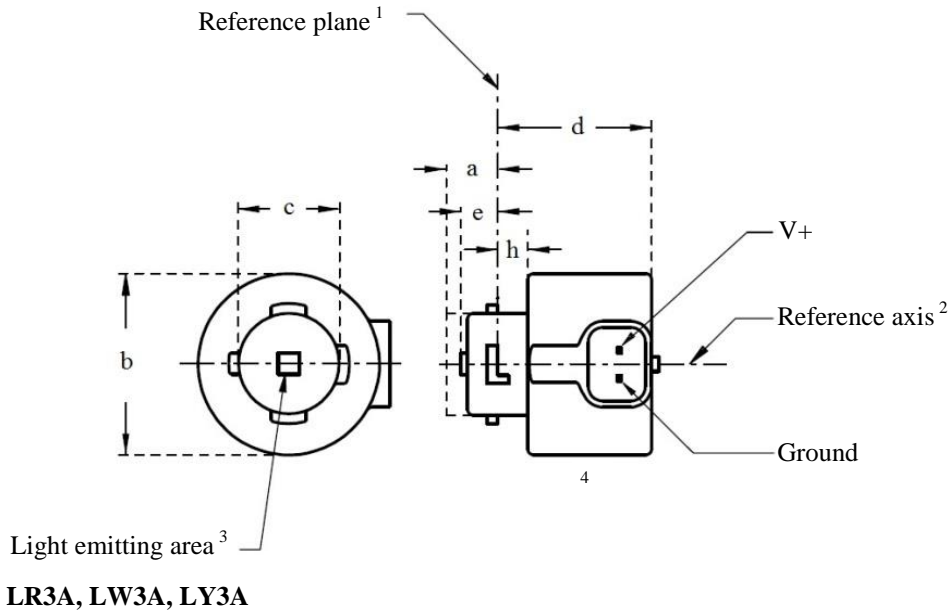
After sheet LR4/5, insert new sheets L5/1 to 6, to read (see following pages; one page per sheet):

Categories LR3A, LR3B, LW3A, LW3B, LY3A and LY3B

The drawings are intended only to illustrate the essential dimensions of the LED light source.

Figure 1*

Main Drawing



For the notes see sheet L3/2.

* Projection method:

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

Dimensions		Production LED light sources	Standard LED light sources	
a	mm	6.0 max.		
b	mm	c + 10.0 min. 38.0 max.		
c	mm	18.5 ± 0.1		
d	mm	28.0 max.		
e	mm	3.0 ± 0.30	3.0 ± 0.15	
h	mm	5.5 + 0.0/ - 0.1		
Cap	LR3A, LR3B LW3A, LW3B LY3A, LY3B	PGJ18.5d-1 PGJ18.5d-24 PGJ18.5d-15	in accordance with IEC Publication 60061 (sheet 7004-185-1)	
<i>Electrical and photometric characteristics</i>				
Rated values	Volts		12	
	Watts	LR3A, LR3B	3	
		LW3A, LW3B LY3A, LY3B	4	
Objective Values ⁸	Watts (at 13.5 V DC)	LR3A, LR3B	3.5 max.	
		LW3A, LW3B	5 max.	
		LY3A, LY3B		
	Luminous flux (in lm at 13.5 V DC)	⁵ LR3A, LR3B	80 ± 20% ⁹	80 ± 10% ¹⁰
		⁶ LW3A, LW3B	250 ± 20%	250 ± 10% ¹¹
		^{7, 12} LY3A, LY3B	150 ± 20% ⁹	150 ± 10% ¹⁰
	Luminous flux (in lm at 9 V DC)	⁵ LR3A, LR3B	19 min	
⁶ LW3A, LW3B		50 min.		
^{7, 12} LY3A, LY3B		30 min		

¹ The reference plane is the plane defined by the contact points of the cap-holder fit.

² The reference axis is perpendicular to the reference plane and passing through the centre of the bayonet core.

³ Light emitting area: to be checked by means of the box system in Figure 2.

⁴ A minimum free air space of 5mm around the light source shall be respected for convection.

⁵ The emitted light shall be red.

⁶ The emitted light shall be white.

⁷ The emitted light shall be amber.

⁸ After continuous operation for 30 minutes at 23 ± 2.5° C.

⁹ The measured value shall be in between 100 per cent and 70 per cent of the value measured after 1 minute.

¹⁰ The measured value shall be in between 85 per cent and 75 per cent of the value measured after 1 minute.

¹¹ The measured value shall be in between 100 per cent and 90 per cent of the value measured after 1 minute.

¹² Operated in flashing mode for 30 minutes (frequency = 1.5 Hz, duty cycle 50 per cent ON, 50 per cent OFF).
Measured in the ON-state of flashing mode after 30 minutes of operation.

Electrical characteristics

In case of LED light source failure (no light emitted) the max. 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 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 the box system defined in Figure 2, which is aligned to the planes C90 and C180 and shows the projection when viewing along direction $\gamma=0^\circ$ (C, γ as defined in Figure 3).

The proportion of the total luminous flux emitted into the viewing direction shall be as described in table 3.

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

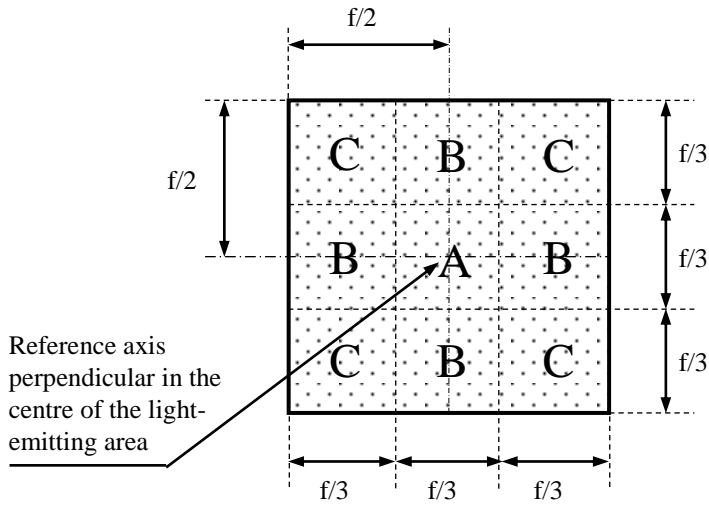


Table 2
Dimensions of the box system in Figure 2

Dimensions in mm	f	
	LR3A, LR3B	LW3A, LW3B LY3A, LY3B
LED light sources of normal production	3.0	4.5
Standard LED light sources	3.0	4.5

Table 3

Proportion of the total luminous flux emitted into the viewing direction from the areas specified in figure 2

<i>Category</i>	<i>Area(s)</i>	<i>LED light sources of normal production</i>	<i>Standard LED light sources</i>
LR3A LR3B	A	$\leq 25\%$	$\leq 10\%$
	Each B individually	$\geq 15\%$	$\geq 20\%$
	Each C individually	-	$\leq 10\%$
	A, all B and all C together	$\geq 90\%$	$\geq 90\%$
LW3A LW3B	Each A,B individually	$\geq 6\%$	$\geq 8\%$
	Each A, B individually	$< 40\%$	$< 30\%$
LY3A LY3B	All A, B together	$\geq 55\%$	$\geq 60\%$
	Each C individually	$< 15\%$	$< 10\%$
	All A, B and C together	$\geq 90\%$	$\geq 90\%$

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 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 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. The corresponding measurement set-up is described in Figure 3.

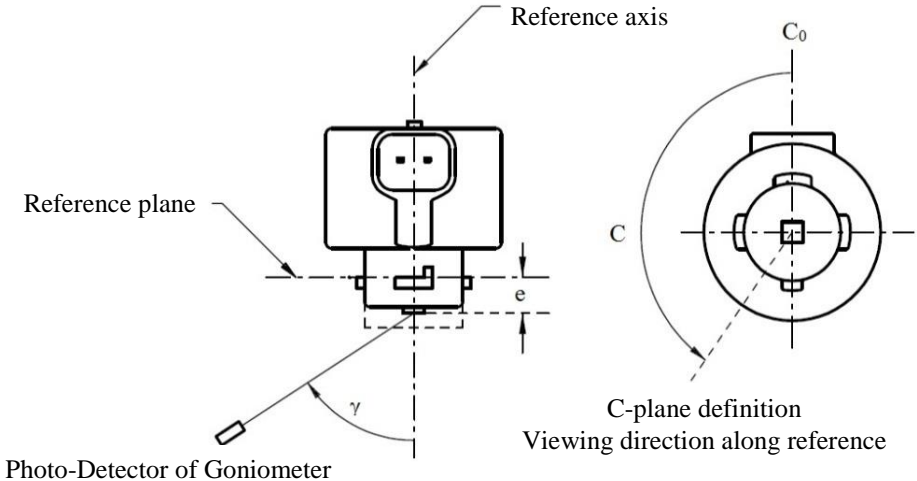
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately, to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes C_0 (C_{180}) and C_{90} (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 Tables 4a and 4b.

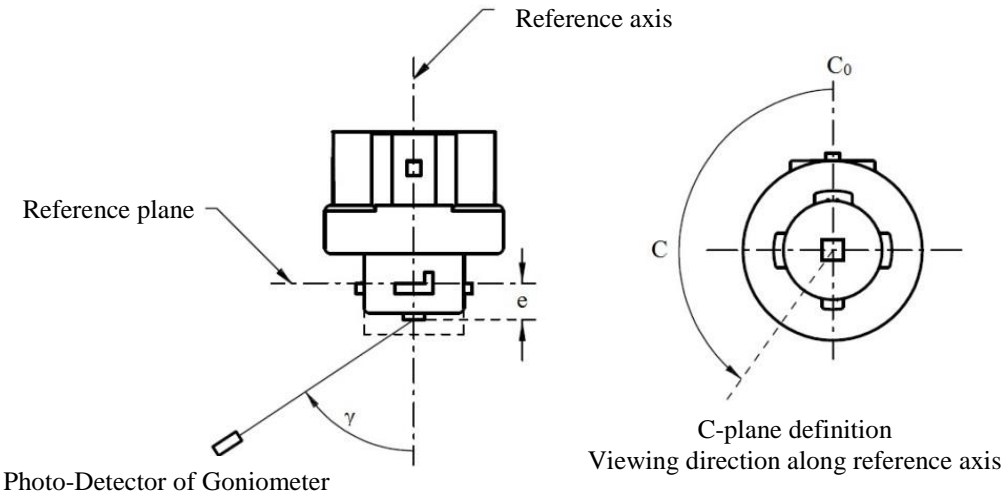
The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1,000 lm light source. The data shall comply with the tolerance band as defined in Tables 4a and 4b.

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

Figure 3
Set-up to measure the luminous intensity distribution



LR3A, LW3A, LY3A



LR3B, LW3B, LY3B

The light pattern as described in Tables 4a and 4b 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 Tables 4a and 4b.

Table 4a

Test point values of normalized intensities for categories LR3A and LR3B

Angle γ	LED light sources of normal production		Standard LED light sources	
	Minimum Intensity in cd /1000 lm	Maximum Intensity in cd/1000 lm	Minimum Intensity in cd /1000 lm	Maximum Intensity in cd /1000 lm
-90°	0	38	0	25
-75°	0	160	0	140
-60°	98	246	127	220
-45°	142	305	181	275
-30°	169	352	213	315
-15°	192	389	239	340
0°	200	401	248	352
15°	192	389	239	340
30°	169	352	213	315
45°	142	305	181	275
60°	98	246	127	220
75°	0	160	0	140
90°	0	38	0	25

Table 4b

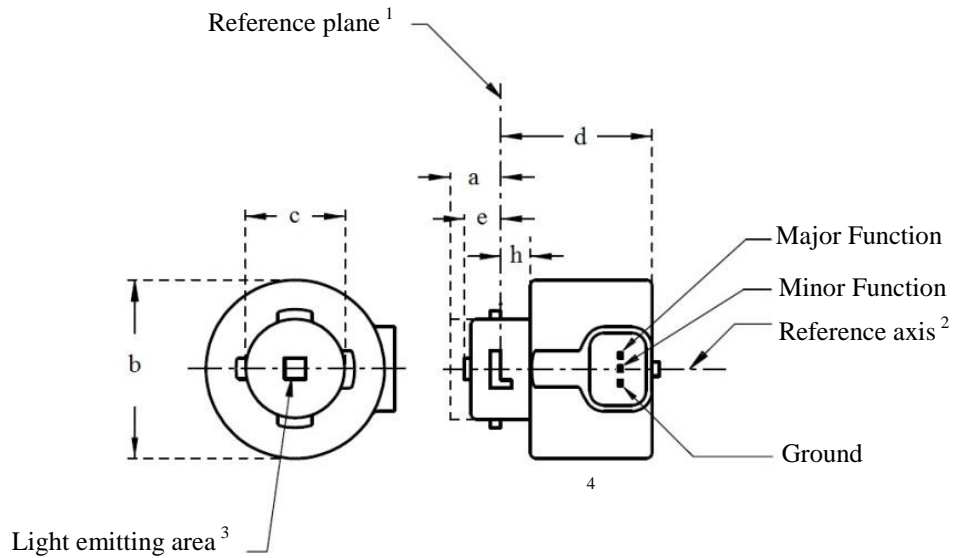
Test point values of normalized intensities for categories LW3A, LW3B, LY3A and LY3B

Angle γ	LED light sources of normal production		Standard LED light sources	
	Minimum Intensity in cd /1000 lm	Maximum Intensity in cd/1000 lm	Minimum Intensity in cd /1000 lm	Maximum Intensity in cd /1000 lm
-90°	0	70	0	65
-75°	0	160	0	150
-60°	85	245	105	220
-45°	145	310	180	275
-30°	170	380	220	335
-15°	190	415	240	370
0°	200	425	250	390
15°	190	415	240	370
30°	170	380	220	335
45°	145	310	180	275
60°	85	245	105	220
75°	0	160	0	150
90°	0	70	0	65

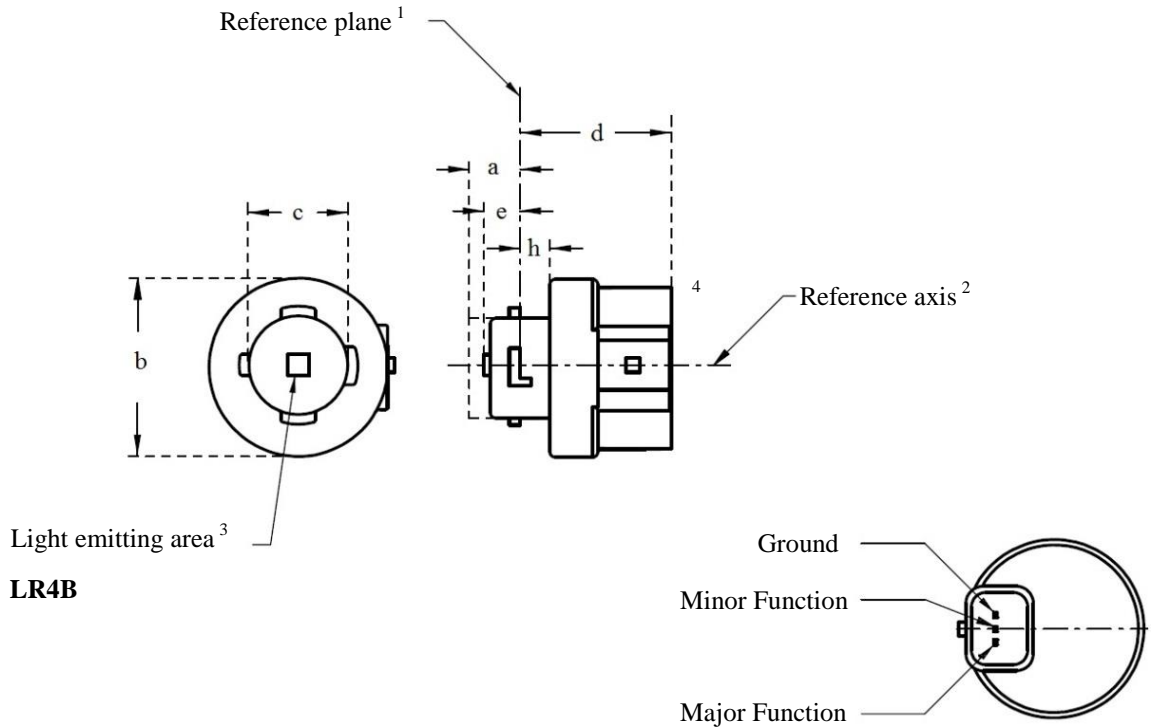
The drawings are intended only to illustrate the essential dimensions of the LED light source.

Figure 1*

Main Drawing

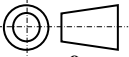


LR4A



LR4B

For the notes see sheet LR4/2.

* Projection method:  9

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 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 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. The corresponding measurement set-up is described in Figure 3.

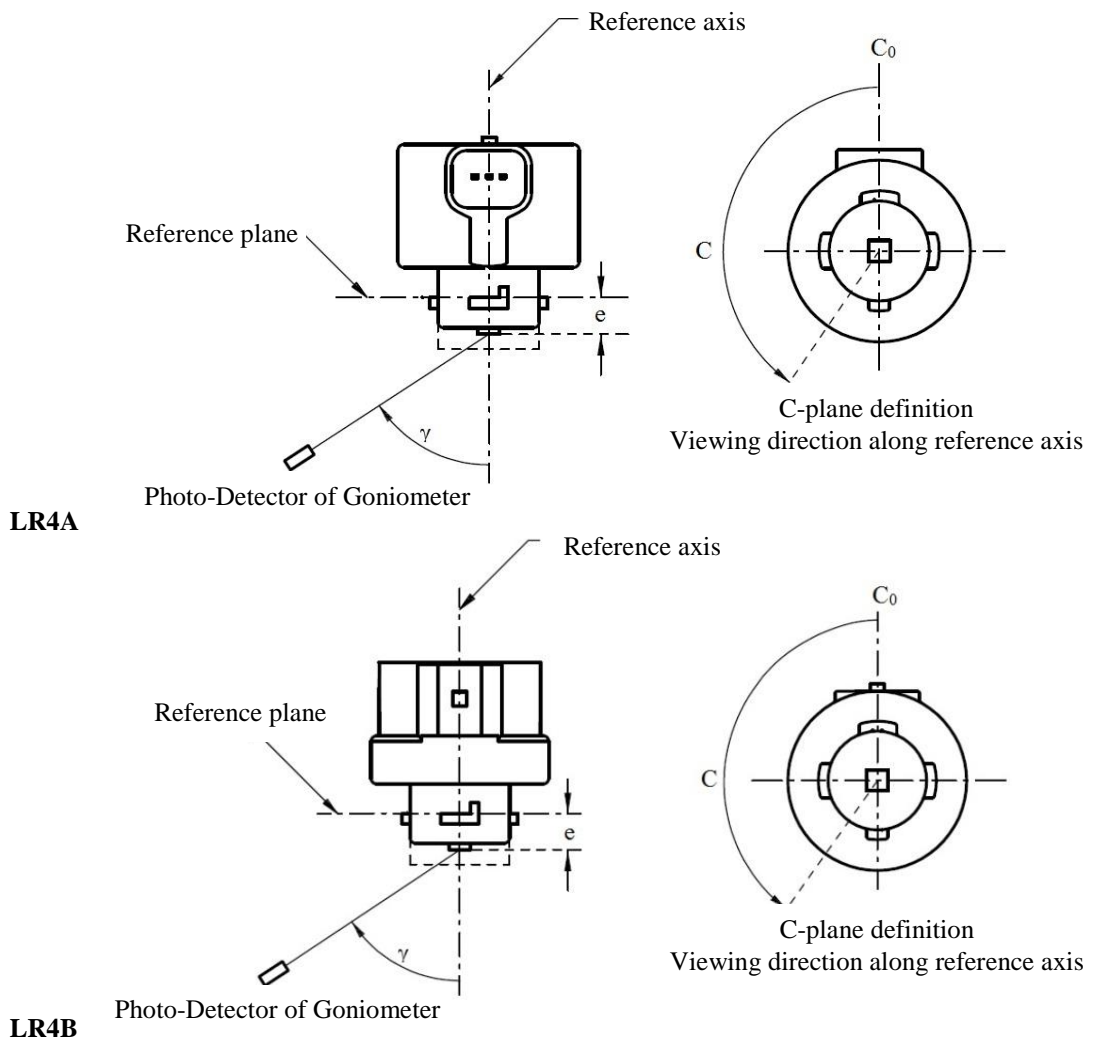
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately, to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes C_0 (C_{180}) and C_{90} (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 4.

After measurement the data shall be normalized to 1,000 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 4.

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

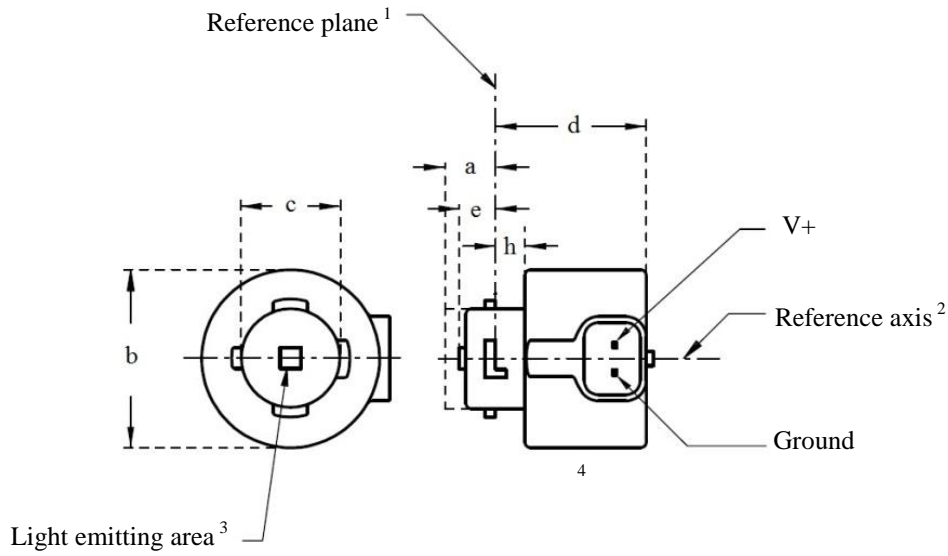
Figure 3*
Set-up to measure the luminous intensity distribution



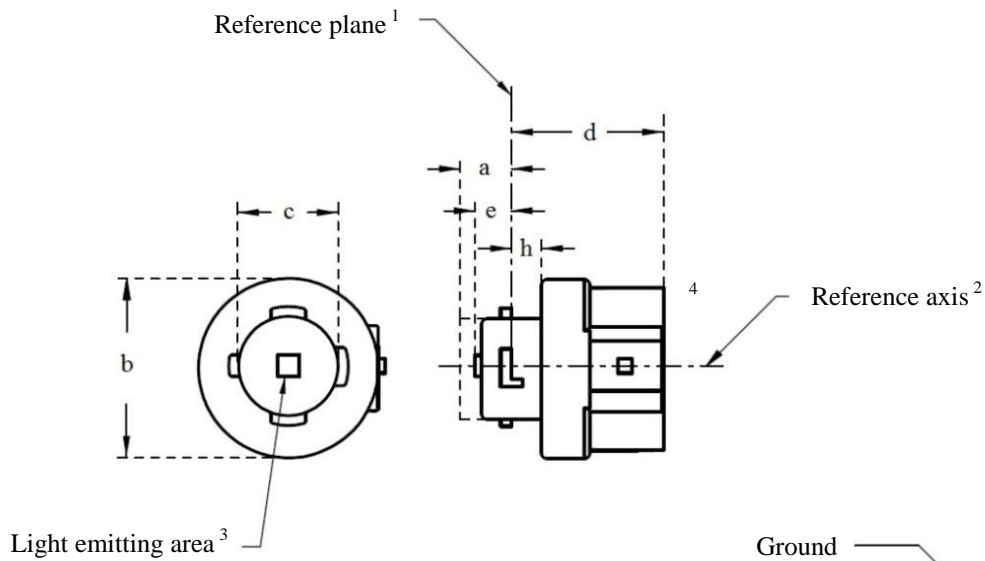
Categories LR5A, LR5B, LW5A, LW5B, LY5A, LY5B

The drawings are intended only to illustrate the essential dimensions of the LED light source.

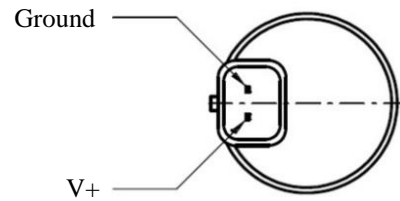
Figure 1*
Main Drawing



LR5A, LW5A, LY5A



LR5B, LW5B, LY5B



For the notes see sheet L5/2

* Projection method:

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

Dimensions		Production LED light sources	Standard LED light sources	
a	mm	6.0 max.		
b	mm	c + 10.0 min. 38.0 max.		
c	mm	18.5 ± 0.1		
d	mm	28.0 max.		
e	mm	3.0 ± 0.30	3.0 ± 0.15	
h	mm	5.5 + 0.0/ - 0.1		
Cap	LR5A, LR5B LW5A, LW5B LY5A, LY5B	PGJ18.5d-10 PGJ18.5d-28 PGJ18.5d-19	in accordance with IEC Publication 60061 (sheet 7004-185-1)	
<i>Electrical and photometric characteristics</i>				
Rated values	Volts		12	
	Watts	LR5A, LR5B	3	
		LW5A, LW5B LY5A, LY5B	6	
Objective Values ⁸	Watts (at 13.5 V DC)	LR5A, LR5B	3.5 max.	
		LW5A, LW5B	8 max.	
		LY5A, LY5B		
	Luminous flux (in lm at 13.5 V DC)	⁵ LR5A, LR5B	120 ± 15%	120 ± 5% ⁹
		⁶ LW5A, LW5B	350 ± 20%	350 ± 10% ⁹
		^{7, 10} LY5A, LY5B	280 ± 20%	280 ± 10% ⁹
	Luminous flux (in lm at 9 V DC)	⁵ LR5A, LR5B	28 min.	
		⁶ LW5A, LW5B	65 min.	
		^{7, 10} LY5A, LY5B	55 min.	

¹ The reference plane is the plane defined by the contact points of the cap-holder fit.

² The reference axis is perpendicular to the reference plane and passing through the centre of the bayonet core.

³ Light emitting area: to be checked by means of the box system in Figure 2

⁴ A minimum free air space of 5mm around the light source shall be respected for convection.

⁵ The emitted light shall be red.

⁶ The emitted light shall be white.

⁷ The emitted light shall be amber.

⁸ After continuous operation for 30 minutes at 23 ± 2.5° C.

⁹ The measured value shall be in between 100 per cent and 90 per cent of the value measured after 1 minute.

¹⁰ Operated in flashing mode for 30 minutes (frequency = 1.5 Hz, duty cycle 50 per cent ON, 50 per cent OFF).
Measured in the ON-state of flashing mode after 30 minutes of operation.

Electrical characteristics

In case of LED light source failure (no light emitted) the max. 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 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 the box system defined in Figure 2, which is aligned to the planes C90 and C180 and shows the projection when viewing along direction $\gamma=0^\circ$ (C, γ as defined in Figure 3).

The proportion of the total luminous flux emitted into the viewing direction shall be as described in table 3.

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

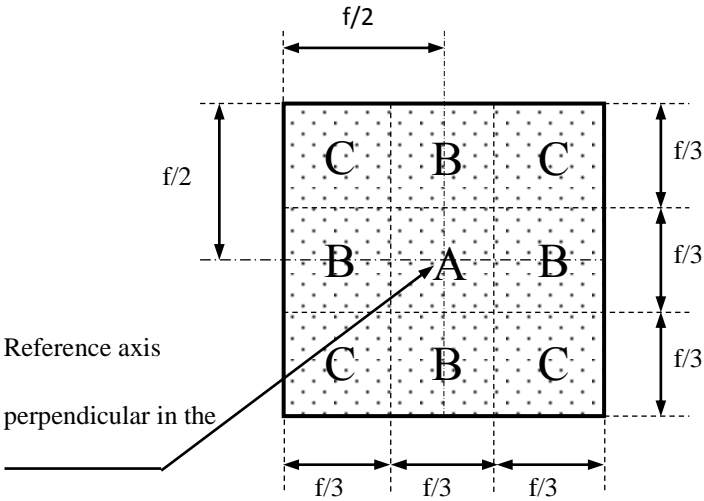


Table 2
Dimensions of the box system in Figure 2

<i>Dimensions in mm</i>	<i>f</i>
LED light sources of normal production	4.5
Standard LED light sources	4.5

Table 3

Proportion of the total luminous flux emitted into the viewing direction from the areas specified in figure 2

<i>Category</i>	<i>Area(s)</i>	<i>LED light sources of normal production</i>	<i>Standard LED light sources</i>
LR5A LR5B	Each B individually	$\geq 10\%$	$\geq 15\%$
	Each A, B individually	$< 40\%$	$< 30\%$
	All B together	$\geq 60\%$	$\geq 65\%$
	Each C individually	-	$< 10\%$
	All A, B and C together	$\geq 90\%$	$\geq 90\%$
LW5A LW5B LY5A LY5B	Each A,B individually	$\geq 6\%$	$\geq 8\%$
	Each A, B individually	$< 40\%$	$< 30\%$
	All A, B together	$\geq 55\%$	$\geq 60\%$
	Each C individually	$< 15\%$	$< 10\%$
	All A, B and C together	$\geq 90\%$	$\geq 90\%$

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 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 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. The corresponding measurement set-up is described in Figure 3.

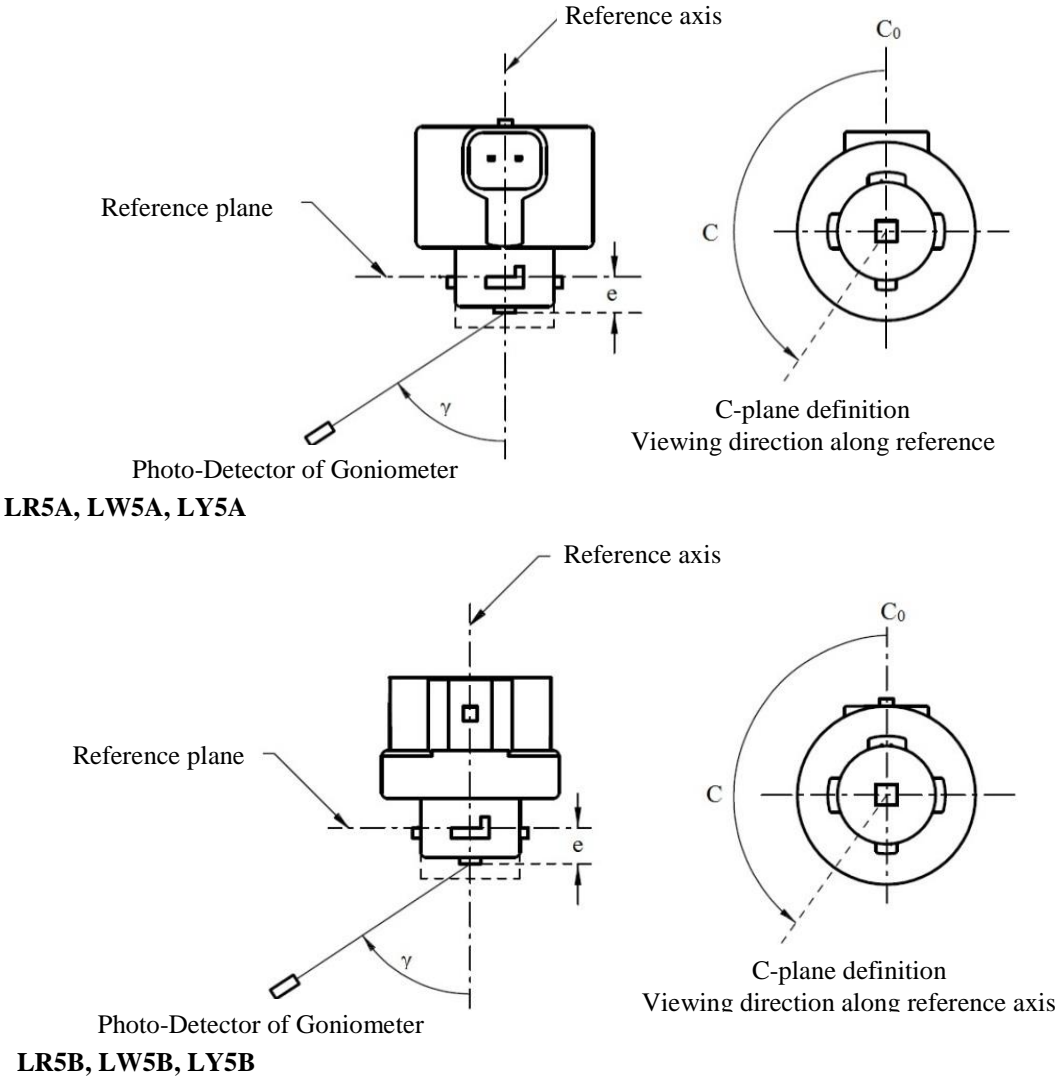
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately, to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes C_0 (C_{180}) and C_{90} (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 4.

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 1,000 lm light source. The data shall comply with the tolerance band as defined in Table 4.

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

Figure 3
Set-up to measure the luminous intensity distribution



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 4

Test point values of normalized intensities for categories LR5A, LR5B, LW5A, LW5B, LY5A and LY5B

Angle γ	<i>LED light sources of normal production</i>		<i>Standard LED light sources</i>	
	<i>Minimum Intensity in cd /1000 lm</i>	<i>Maximum Intensity in cd/1000 lm</i>	<i>Minimum Intensity in cd /1000 lm</i>	<i>Maximum Intensity in cd /1000 lm</i>
-90°	0	70	0	65
-75°	0	160	0	150
-60°	85	245	105	220
-45°	145	310	180	275
-30°	170	380	220	335
-15°	190	415	240	370
0°	200	425	250	390
15°	190	415	240	370
30°	170	380	220	335
45°	145	310	180	275
60°	85	245	105	220
75°	0	160	0	150
90°	0	70	0	65

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