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1958 Agreement:
Proposals for amendments to the Consolidated Resolution on the common specification of light source categories (R.E.5)

Proposal for Amendment 12 to the Consolidated Resolution on the common specification of light source categories

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 ninety-third session (ECE/TRANS/WP.29/GRE/93, paras. 10 and 11). It is based on ECE/TRANS/WP.29/GRE/2025/15 and ECE/TRANS/WP.29/GRE/2025/17. 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 2026 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2026 as outlined in proposed programme budget for 2026 (A/80/6 (Sect. 20), table 20.7), 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.

The *Status table*, insert new rows 10, 11 and 12 at the bottom to read:

"

Version of the Resolution	***Date* as from which the version is valid***	***Adopted by WP.29***		***Clarification***
		Session No.	***Amendment document No.***	
….				
10	13.11.2024	194	ECE/TRANS/WP.29/2024/156	Amended detail in sheets H11_LEDr/3, H11_LEDr/6, H11_LEDr/7 to introduce Configuration-2
11	05.03.2025	195	ECE/TRANS/WP.29/2025/40	Introduction of new LED light source categories LW7A and LW7B
12	11.03.2026	198	ECE/TRANS/WP.29/2026/41	Amended details in paragraph 3.1, group 1, group 2, and group 3, concerning phase out of certain light source categories Introduction of new LED replacement light source categories H8, H16 and HB4 Introduction of new LED light source categories LRR8A and LRR8B

* 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 UN 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."

Paragraph 3.1.,

Group 1, amend to read:

"

Group 1				
Filament light source categories (or types within these categories) without general restrictions:				
	Category	*Note(s)*	*Sheet number(s)*	
	H1	*[6]	H1/1 to 3	
	H3	*[6]	H3/1 to 4	
	H4		H4/1 to 5	
	H7		H7/1 to 4	
	H8		H8/1 to 4	
	H9	*[3]	H9/1 to 4	
	H10		H10/1 to 3	
	H11		H11/1 to 4	
	H13		H13/1 to 4	
	H15		H15/1 to 5	
	H16		H16/1 to 4	
	H17		H17/1 to 6	
	H18		H18/1 to 4	
	H19		H19/1 to 5	
	H21W	*[2]	H21W/1 to 2	
	HB3		HB3/1 to 4	

Group 1				
Filament light source categories (or types within these categories) without general restrictions:				
	Category	*Note(s)*	*Sheet number(s)*	
	HB4		HB4/1 to 4	
	HIR2		HIR2/1 to 3	
	HS1	*6	HS1/1 to 5	
	S2	*5,*6	S1/S2/1 to 2	

"

Group 2, amend to read:

"

Group 2				
Filament light source categories (or types within these categories) only for use in signalling lamps, cornering lamps, reversing lamps and rear registration plate lamps:				
	Category	*Note(s)*	*Sheet number(s)*	
	C5W	*6	C5W/1	
	H6W		H6W/1	
	HY6W		H6W/1	
	HY21W		H21W/1 to 2	
	P13W		P13W/1 to 3	
	P21W	*6	P21W/1 to 2	
	P21/4W		P21/4W/1	(P21/5W/2 to 3)
	P21/5W	*6	P21/5W/1 to 3	
	P27W		P27W/1 to 2	
	P27/7W		P27/7W/1 to 3	
	PR21W		PR21W/1	(P21W/2)
	PR21/5W		PR21/5W/1	(P21/5W/2 to 3)
	PY21W		PY21W/1	(P21W/2)
	PY27/7W		PY27/7W/1	(P27/7W/2 to 3)
	R5W	*6	R5W/1	
	R10W	*6	R10W/1	
	RR5W		R5W/1	
	RR10W		R10W/1	
	RY10W	*6	R10W/1	
	W2.3W		W2.3W/1	
	W3W	*6	W3W/1	
	W5W	*6	W5W/1	
	W10W	*6	W10W/1	
	W15/5W		W15/5W/1 to 3	
	W16W		W16W/1	
	W21W		W21W/1 to 2	
	W21/5W		W21/5W/1 to 3	
	WR5W		W5W/1	

Group 2				
Filament light source categories (or types within these categories) only for use in signalling lamps, cornering lamps, reversing lamps and rear registration plate lamps:				
	Category	*Note(s)*	*Sheet number(s)*	
	WR21/5W		WR21/5W/1	(W21/5W/2 to 3)
	WT21W		WT21W/1 to 2	
	WT21/7W		WT21/7W/1 to 3	
	WTY21W		WT21W/1 to 2	
	WTY21/7W		WT21/7W/1 to 3	
	WY5W	*6	W5W/1	
	WY10W	*6	W10W/1	
	WY16W		W16W/1	
	WY21W		WY21W/1 to 2	

"

Group 3, amend to read:

"

Group 3				
Filament light source categories (or types within these categories) only for use in lamps as replacement parts for lamps on vehicles in use originally equipped with such lamps:				
	Category	*Note(s)*	*Sheet number(s)*	*From date onwards***
	C5W	*7, *8	C5W/1	26 July 2013
	C21W	*8	C21W/1 to 2	11 June 2008
	H1	*7	H1/1 to 3	26 July 2013
	H3	*7	H3/1 to 4	26 July 2013
	H8B		H8/1 to 4	1 April 2028
	H9B	*3	H9/1 to 4	1 April 2028
	H10W/1	*8	H10W/1 to 2	1 April 2028
	H11B		H11/1 to 4	1 April 2028
	H12		H12/1 to 3	15 July 2015
	H13A		H13/1 to 4	15 July 2015
	H14		H14/1 to 4	26 July 2013
	H16B		H16/1 to 4	1 April 2028
	H20		H20/1 to 4	1 April 2028
	H27W/1		H27W/1 to 3	1 April 2028
	H27W/2		H27W/1 to 3	1 April 2028
	HB3A		HB3/1 to 4	15 July 2018
	HB4A		HB4/1 to 4	15 July 2018
	HIR1	*3	HIR1/1 to 3	15 July 2015
	HS1	*7	HS1/1 to 5	26 July 2013
	HS2	*7 *6	HS2/1 to 3	26 July 2013 1 September 2018
	HS5	*5	HS5/1 to 4	1 April 2028
	HS5A	*5	HS5A/1 to 3	1 September 2018

Group 3				
Filament light source categories (or types within these categories) only for use in lamps as replacement parts for lamps on vehicles in use originally equipped with such lamps:				
	Category	*Note(s)*	*Sheet number(s)*	*From date onwards***
	HS6	*4	HS6/1 to 4	15 July 2018
	HY10W/1	*8	H10W/1 to 2	1 April 2028
	P19W	*8	P19W/1 to 3	28 October 2016
	P21W	*7, *8	P21W/1 to 2	26 July 2013
	P21/5W	*7, *8	P21/5W/1 to 3	26 July 2013
	P24W	*8	P24W/1 to 3	1 September 2018
	PC16W	*8	PC16W/1 to 3	28 October 2016
	PCR16W	*8	PC16W/1 to 3	28 October 2012
	PCY16W	*8	PC16W/1 to 3	28 October 2016
	PR19W	*8	P19W/1 to 3	28 October 2012
	PR21/4W	*8	PR21/4W/1; (P21/5W/2 to 3)	15 July 2015
	PR24W	*8	P24W/1 to 3	28 October 2012
	PR27/7W	*8	PR27/7W/1; (P27/7W/2 to 3)	15 July 2015
	PS19W	*8	P19W/1 to 3	1 April 2028
	PS24W	*8	P24W/1 to 3	1 April 2028
	PSR19W	*8	P19W/1 to 3	28 October 2012
	PSR24W	*8	P24W/1 to 3	28 October 2012
	PSX24W	*2	P24W/1 to 3	1 April 2028
	PSX26W	*2	PSX26W/1 to 3	1 April 2028
	PSY19W	*8	P19W/1 to 3	1 April 2028
	PSY24W	*8	P24W/1 to 3	1 April 2028
	PW13W	*8	P13W/1 to 3	1 April 2028
	PW16W	*8	PC16W/1 to 3	1 April 2028
	PW19W	*8	P19W/1 to 3	1 April 2028
	PW24W	*8	P24W/1 to 3	1 April 2028
	PWR16W	*8	PC16W/1 to 3	1 April 2028
	PWR19W	*8	P19W/1 to 3	1 April 2028
	PWR24W	*8	P24W/1 to 3	1 April 2028
	PWY16W	*8	PC16W/1 to 3	1 April 2028
	PWY19W	*8	P19W/1 to 3	1 April 2028
	PWY24W	*8	P24W/1 to 3	1 April 2028
	PX24W	*2	P24W/1 to 3	1 September 2018
	PY19W	*8	P19W/1 to 3	28 October 2016
	PY21/5W	*8	PY21/5W/1 to 3	1 April 2028
	PY24W	*8	P24W/1 to 3	1 April 2028
	R2		R2/1 to 3	11 June 2008
	R5W	*7, *8	R5W/1	26 July 2013
	R10W	*7, *8	R10W/1	26 July 2013

Group 3				
Filament light source categories (or types within these categories) only for use in lamps as replacement parts for lamps on vehicles in use originally equipped with such lamps:				
	Category	*Note(s)*	*Sheet number(s)*	*From date onwards***
	RY10W	*7, *8	R10W/1	26 July 2013
	S1		S1/S2/1 to 2	11 June 2008
	S2	*7	S1/S2/1 to 2	26 July 2013
	S3		S3/1	26 July 2013
	T1.4W	*8	T1.4W/1	15 July 2015
	T4W	*7, *8	T4W/1	26 July 2013
		*6, *8		1 April 2028
	W3W	*7, *8	W3W/1	26 July 2013
	W5W	*7, *8	W5W/1	26 July 2013
	W10W	*7, *8	W10W/1	26 July 2013
	WP21W	*8	WP21W/1 to 2	1 September 2018
	WPY21W	*8	WP21W/1 to 2	1 September 2018
	WY2.3W	*8	WY2.3W/1	15 July 2015
	WY5W	*7, *8	W5W/1	15 July 2014
	WY10W	*7, *8	W10W/1	26 July 2013

"

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	2	LW2/1 to 5	
	LR3A		Lx3/1 to 6	
	LR3B		Lx3/1 to 6	
	LW3A	2	Lx3/1 to 6	
	LW3B	2	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	2	Lx5/1 to 6	
	LW5B	2	Lx5/1 to 6	
	LY5A		Lx5/1 to 6	
	LY5B		Lx5/1 to 6	

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)*	
	LR6A		Lx6/1 to 6	
	LR6B		Lx6/1 to 6	
	LW6A	[2]	Lx6/1 to 6	
	LW6B	[2]	Lx6/1 to 6	
	LY6A		Lx6/1 to 6	
	LY6B		Lx6/1 to 6	
	LW7A	[2]	Lx7/1 to 6	
	LW7B	[2]	Lx7/1 to 6	
	LRR8A		LRR8/1 to 6	
	LRR8B		LRR8/1 to 6	

"

Group 5, amend to read:

“

Group 5	
LED replacement light source categories[3, 4] only for use in lamps approved with filament light source(s) with the same category designation	
Category	***Sheet number(s)***
C5W	C5W_LEDr/1 to 4
H8	H8_LEDr/1 to 7
H11	H11_LEDr/1 to 7
H16	H16_LEDr/1 to 7
HB4	HB4_LEDr/1 to 7

”

Annex 3, sheets for LED light sources, amend the listing to read:

*“*List of sheets for LED light sources and their sequence in this annex:

Sheet number(s)
C5W/LED/1 to 4
C5W_LEDr/1 to 4
H8_LEDr/1 to 7
H11/LED/1 to 7
H11_LEDr/1 to 7
H16_LEDr/1 to 7
HB4_LEDr/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
Lx6/1 to 6
Lx7/1 to 6
LRR8/1 to 6

Sheet number(s)
PY21W/LED/1 to 4
R5W/LED/1 to 4
W5W/LED/1 to 4

”

Annex 3,

After sheet C5W_LEDr/4, insert new sheets H8_LEDr/1 to 7,

After sheet H11_LEDr/7, insert new sheets H16_LEDr/1 to 7 and HB4_LEDr/1 to 7, and

After sheet Lx7/6, insert new sheets LRR8/1 to 6, 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 drawings

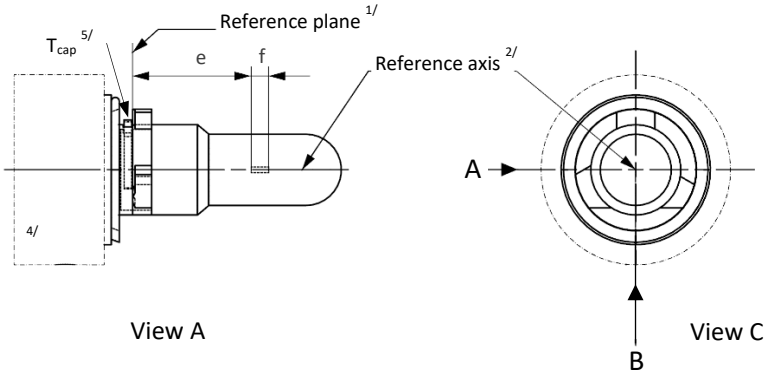
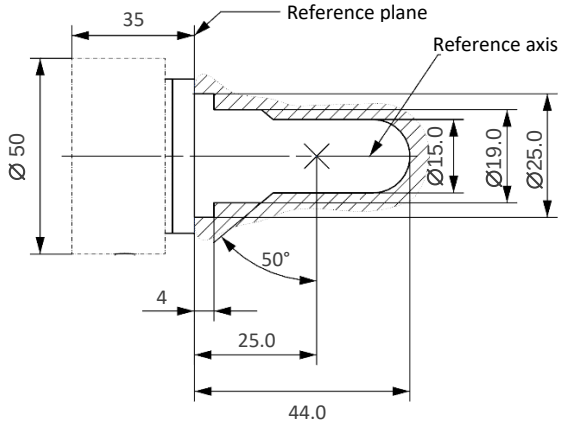


Figure 2
Maximum LED light source outline 3/



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.
4/ The light source shall function in either voltage polarity.
5/ Measurement point for cap temperature T_{cap}

Table 1

Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm			*LED light sources of normal production*
e [2/]			25.0 nom.
f [2/]			3.7 nom.
Contrast [4/]			100 min.
Elevated ambient air temperature [3/]			60°C
Cap H8 PGJ19-1 [6/] in accordance with IEC Publication 60061 (sheet 7004-110-3)			
Electrical and photometric characteristics [9/]			
Rated values		Volts	12
		Watts	18 [8/]
Test voltage (DC)		Volts	13.2
Objective values	Power	Watts	18 min. [7/] 43 max. [8/]
	Cap temperature T_{cap}	°C	100 max. [7/]
	Electrical current	mA	1300 min. [7/] (at 12-14 V DC)
	Luminous flux [1/ 3/]	lm	800 ± 15%
	Luminous flux deviation [5/] (voltage range limits)	lm	±10% (at 12V) ±10% (at 14V)

[1/] The light emitted shall be white or selective yellow without a correlated colour temperature restriction.

[2/] To be checked by means of a "box system", sheet H8 LEDr/3

[3/] The luminous flux measured at the elevated ambient air temperature shall be at least 75% of the objective luminous flux (both measured at test voltage)

[4/] The contrast is the proportion of luminous flux originating from two different areas, see details in sheet H8_LEDr/3

[5/] The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the specified voltage range.

[6/] The maximum specifications of parameters G and K are excluded, but the maximum outline dimensions in Figure 2 apply

[7/] Not applicable for high-efficiency type

[8/] For high-efficiency type 12W rated value and 18W max. objective value applies

[9/] In case of LED light source failure (no light emitted) the max. electrical current draw, when operated between 12V and 14V, shall be less than 100 mA (open circuit condition)

Screen projection requirements

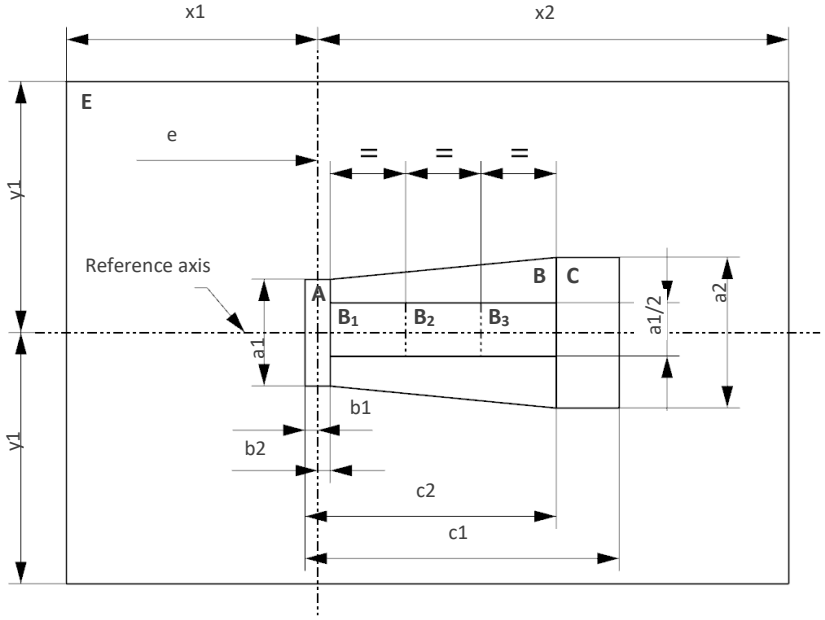
The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by a box system defined in Figure 3 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H8_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5). The distance z between the surfaces of the opposite light emitting areas shall not exceed 2.9 mm.

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in Figure 3:

- Total box area: (A+B+C) / E shall be not less than 90%
- Area A: A / (A+B+C) shall be not more than 14%
- 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 more than 65 %
- Area C: C / (A+B+C) shall be not more than 27%

Figure 3
Box definition of the light emitting area (dimensions given in Table 2)



The contrast is checked by a box system defined in Figure 4 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H8_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5).

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 4 for the definition of the area D).

Figure 4
Box definition of the area D (dimensions given in Table 2)

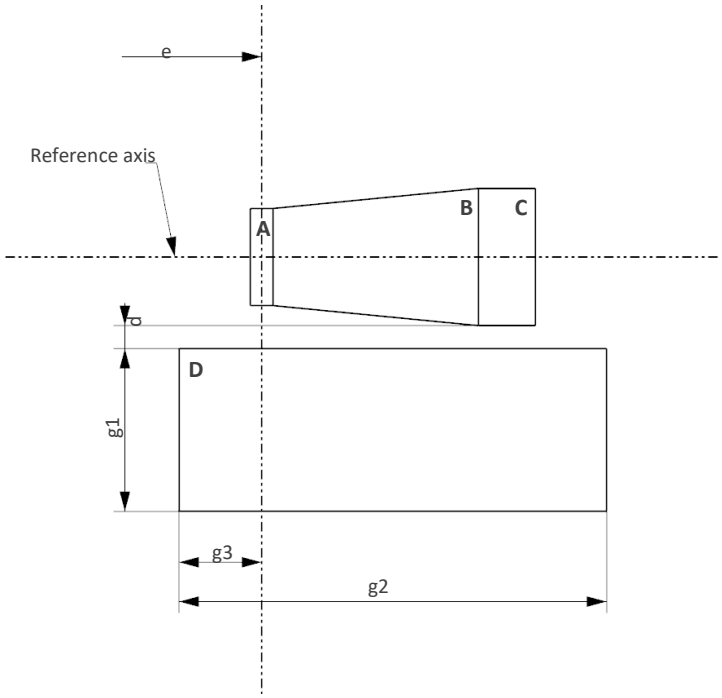


Table 2
Dimensions of the box definitions in Figure 3 and Figure 4

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	0.25	y1	12.5
b2	0.25	g1	2.85
c1	4.6	g2	6.9
c2	3.5	g3	1.4
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 5 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.

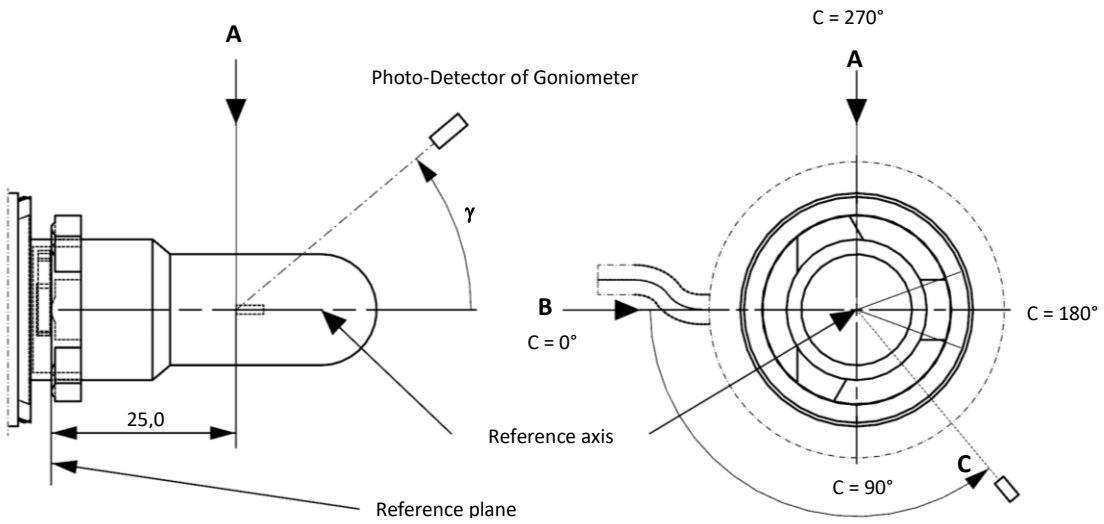
The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in Figure 5.

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 5
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

LED light source of normal production		
	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.

Table 3 – Part 2
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
γ	C_{90}, C_{270}	C_{90}, C_{270}
50°	100	160
60°	115	175
70°	125	185
80°	130	190
90°	130	195
100°	130	190
110°	125	185
120°	115	175
130°	100	160
140°	80	145

The light pattern as described in Table 3 – part 2 (excluding the sections between C_{90} and C_{270} and between C_{270} and C_{90}) 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.

Table 3 – Part 3
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
C-plane	$\gamma = 90°$	$\gamma = 90°$
C_0	n.a.	n.a.
C_{30}	50	130
C_{60}	110	175
C_{90}	130	195
C_{120}	110	175
C_{150}	50	130
C_{180}	n.a.	n.a.
C_{210}	50	130
C_{240}	110	175
C_{270}	130	195
C_{300}	110	175
C_{330}	50	130
C_{360} (= $C_{0)}$	n.a.	n.a.

The light pattern as described in Table 3 – part 3 (excluding the sections between C_{150} and C_{210} and between C_{330} and C_{30}) 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.

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

Figure 1
Main drawings

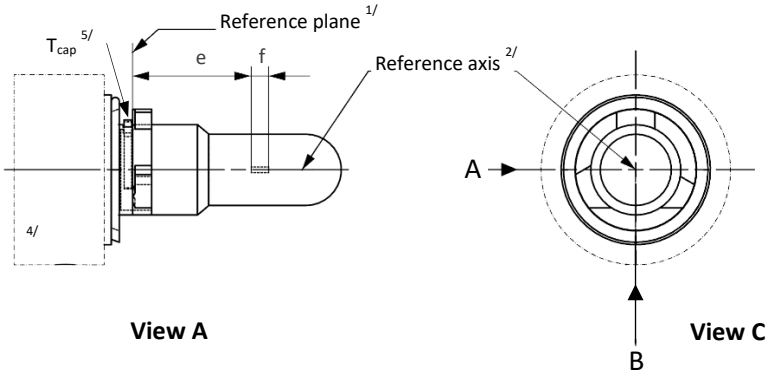
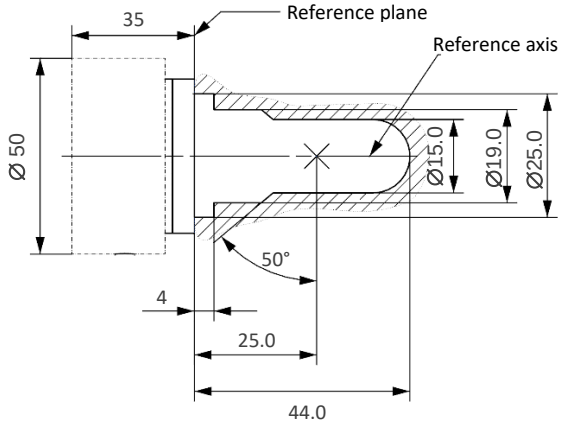


Figure 2
Maximum LED light source outline 3/



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.
4/ The light source shall function in either voltage polarity.
5/ Measurement point for cap temperature T_{cap}

Table 1

Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm			*LED light sources of normal production*
e [2/]			25.0 nom.
f [2/]			3.2 nom.
Contrast [4/]			100 min.
Elevated ambient air temperature [3/]			60°C
Cap H16 PGJ19-3 [6/] in accordance with IEC Publication 60061 (sheet 7004-110-3)			
Electrical and photometric characteristics [9/]			
Rated values		Volts	12
		Watts	10 [8/]
Test voltage (DC)		Volts	13.2
Objective values	Power	Watts	10 min. [7/] 26 max. [8/]
	Cap temperature T_{cap}	°C	100 max. [7/]
	Electrical current	mA	750 min. [7/] (at 12-14 V DC)
	Luminous flux [1/ 3/]	lm	500 + 10% / -15%
	Luminous flux deviation [5/] (voltage range limits)	lm	±10% (at 12V) ±10% (at 14V)

[1/] The light emitted shall be white or selective yellow without a correlated colour temperature restriction.

[2/] To be checked by means of a "box system", sheet H16_LEDr/3

[3/] The luminous flux measured at the elevated ambient air temperature shall be at least 75% of the objective luminous flux (both measured at test voltage)

[4/] The contrast is the proportion of luminous flux originating from two different areas, see details in sheet H16_LEDr/3

[5/] The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the specified voltage range.

[6/] The maximum specifications of parameters G and K are excluded, but the maximum outline dimensions in Figure 2 apply

[7/] Not applicable for high-efficiency type

[8/] For high-efficiency type 8W rated value and 10W max. objective value applies

[9/] In case of LED light source failure (no light emitted) the max. electrical current draw, when operated between 12V and 14V, shall be less than 100 mA (open circuit condition)

Screen projection requirements

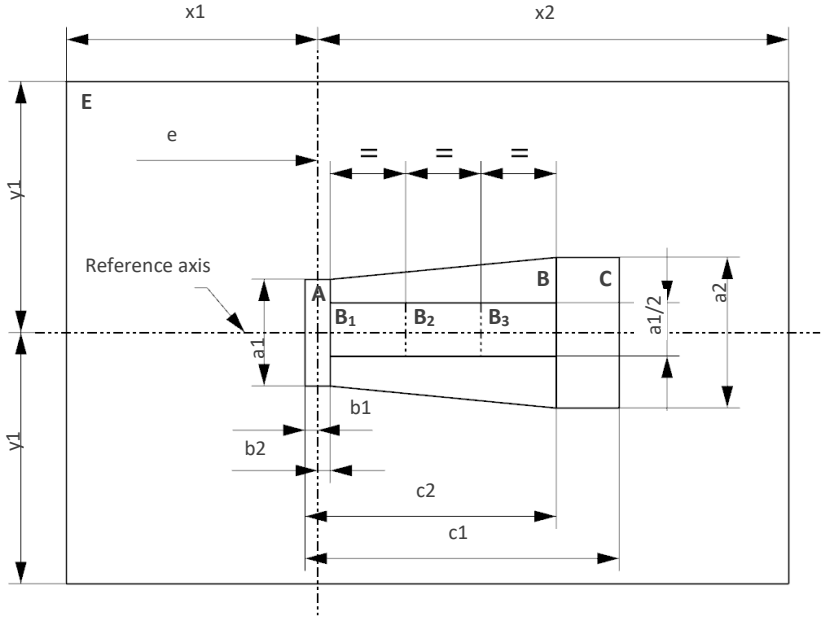
The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by a box system defined in Figure 3 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H16_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5). The distance z between the surfaces of the opposite light emitting areas shall not exceed 2.9 mm.

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in Figure 3:

- Total box area: (A+B+C) / E shall be not less than 90%
- Area A: A / (A+B+C) shall be not more than 19%
- 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 more than 58 %
- Area C: C / (A+B+C) shall be not more than 32%

Figure 3
Box definition of the light emitting area (dimensions given in Table 2)



The contrast is checked by a box system defined in Figure 4 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H16_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5).

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 4 for the definition of the area D).

Figure 4
Box definition of the area D (dimensions given in Table 2)

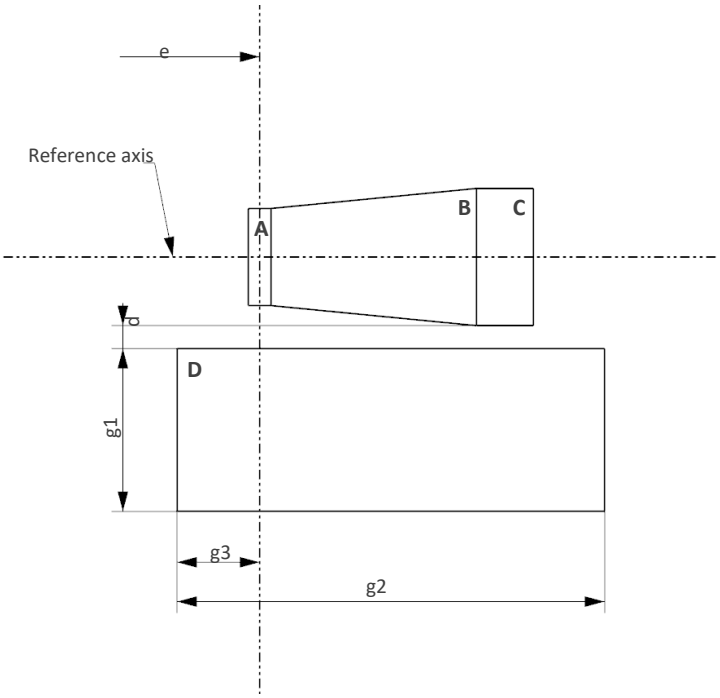


Table 2
Dimensions of the box definitions in Figure 3 and Figure 4

All views (as specified above)	*Dimensions in mm*	*All views (as specified above)*	*Dimensions in mm*
a1	1.6	x1	25
a2	1.8	x2	19
b1	0.25	y1	12.5
b2	0.25	g1	2.7
c1	3.6	g2	5.4
c2	2.6	g3	1.15
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 5 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.

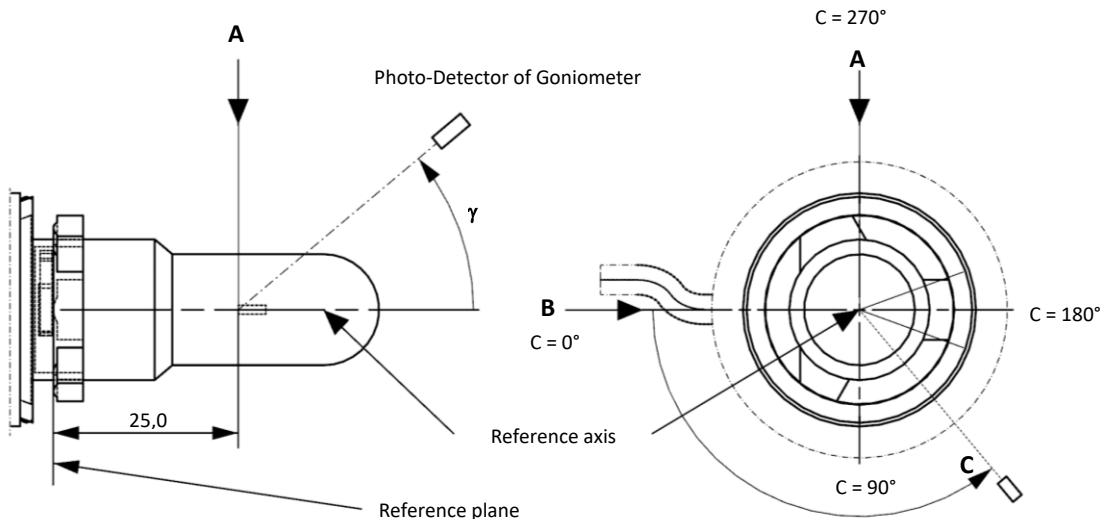
The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in Figure 5.

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 5
Setup to measure the luminous intensity distribution and the definition of C-Planes and angle γ



View B ***View C***

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

Table 3 – Part 1
Test point values of normalized intensity

LED light source of normal production		
	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.

Table 3 – Part 2
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
γ	C_{90}, C_{270}	C_{90}, C_{270}
50°	100	160
60°	115	175
70°	125	185
80°	130	190
90°	130	195
100°	130	190
110°	125	185
120°	115	175
130°	100	160
140°	80	145

The light pattern as described in Table 3 – part 2 (excluding the sections between C_{90} and C_{270} and between C_{270} and C_{90}) 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.

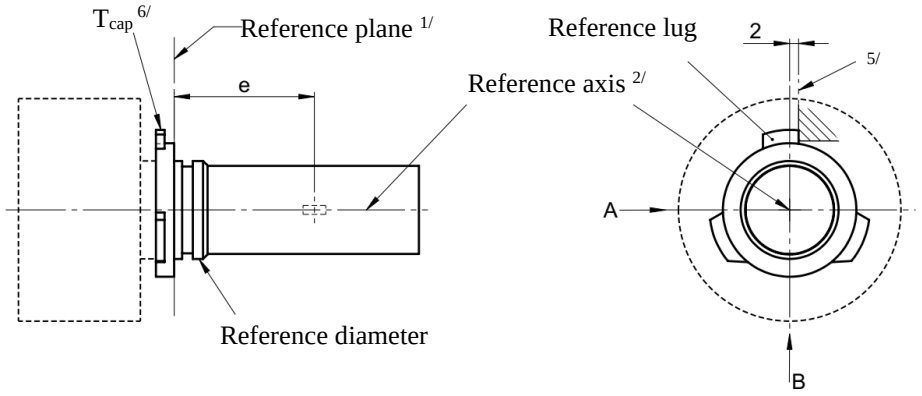
Table 3 – Part 3
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
C-plane	$\gamma = 90°$	$\gamma = 90°$
C_0	n.a.	n.a.
C_{30}	50	130
C_{60}	110	175
C_{90}	130	195
C_{120}	110	175
C_{150}	50	130
C_{180}	n.a.	n.a.
C_{210}	50	130
C_{240}	110	175
C_{270}	130	195
C_{300}	110	175
C_{330}	50	130
C_{360} (= $C_{0)}$	n.a.	n.a.

The light pattern as described in Table 3 – part 3 (excluding the sections between C_{150} and C_{210} and between C_{330} and C_{30}) 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.

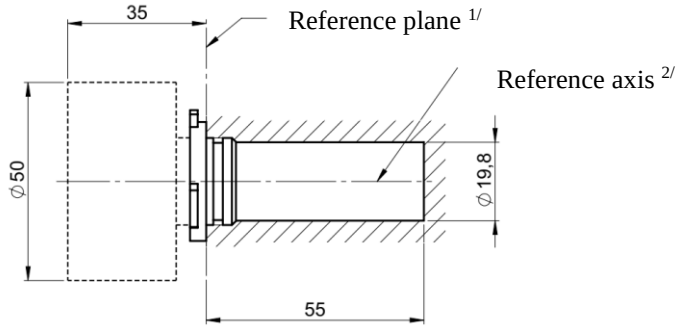
The drawings are intended only to illustrate the essential dimensions (in mm) of the LED light source.

Figure 1
Main drawings



View A **View C**

Figure 2
Maximum LED light source outline 3/



1/ The reference plane is the plane defined by the meeting points of cap-holder fit.
2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.
3/ The LED light source shall not exceed the envelope as indicated in Figure 2.
4/ The light source shall function in either voltage polarity.
5/ The LED light source shall be rotated in the measuring holder until the reference lug contacts the plane of the holder
6/ Measurement point for cap temperature T_{cap}

Table 1

Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm [9/]			*LED light sources of normal production*
e [2/]			31.5 nom.
f [2/]			5.1 nom.
Contrast [4/]			100 min.
Elevated ambient air temperature [3/]			60°C
Cap HB4 P22d [6/] in accordance with IEC Publication 60061 (sheet 7004-32-2)			
Electrical and photometric characteristics [10/]			
Rated values		Volts	12
		Watts	25 [8/]
Test voltage (DC)		Volts	13.2
Objective values	Power	Watts	25 min. [7/] 62 max. [8/]
	Cap temperature T_{cap}	°C	100 max. [7/]
	Electrical current	mA	1900 min. [7/] (at 12-14 V DC)
	Luminous flux [1/ 3/]	lm	1095 ± 15%
	Luminous flux deviation [5/] (voltage range limits)	lm	±10% (at 12V) ±10% (at 14V)

[1/] The light emitted shall be white or selective yellow without a correlated colour temperature restriction.

[2/] To be checked by means of a "box system", sheet HB4_LEDr/3

[3/] The luminous flux measured at the elevated ambient air temperature shall be at least 75% of the objective luminous flux (both measured at test voltage)

[4/] The contrast is the proportion of luminous flux originating from two different areas, see details in sheet HB4_LEDr/3

[5/] The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the specified voltage range.

[6/] The maximum specifications of parameter AC, AE and AO are excluded, but the maximum outline dimensions in Figure 2 apply

[7/] Not applicable for high-efficiency type

[8/] For high-efficiency type 16W rated value and 25W max. objective value applies

[9/] Dimensions shall be checked with O-ring removed

[10/] In case of LED light source failure (no light emitted) the max. electrical current draw, when operated between 12V and 14V, shall be less than 100 mA (open circuit condition)

Screen projection requirements

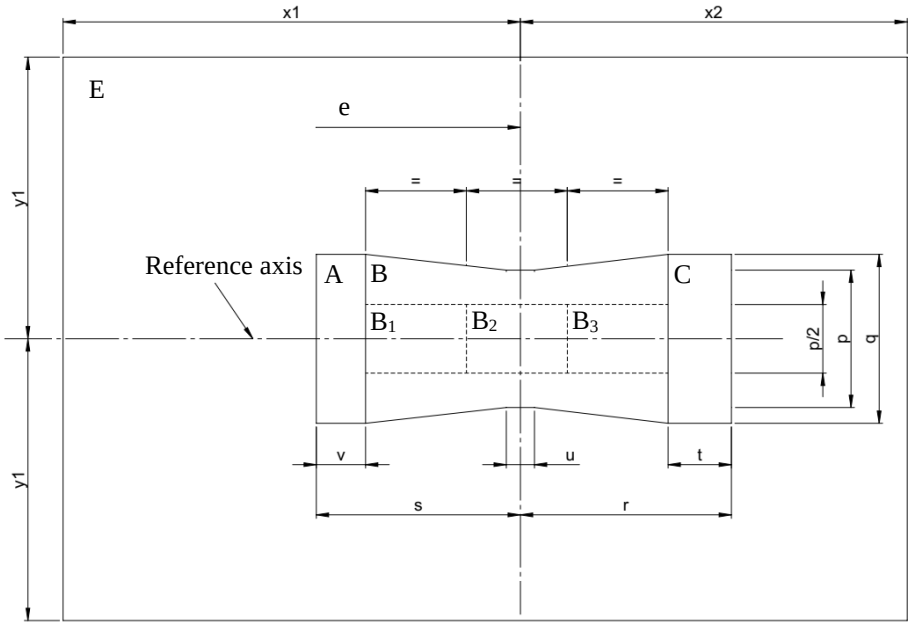
The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by a box system defined in Figure 3 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet HB4_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5). The distance z between the surfaces of the opposite light emitting areas shall not exceed 2.9 mm.

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in Figure 3:

- Total box area: (A+B+C) / E shall be not less than 90%
- Area B: B / (A+B+C) shall be not less than 73%
- 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 A: A / (A+B+C) shall be not more than 14 %
- Area C: C / (A+B+C) shall be not more than 17%

Figure 3
Box definition of the light emitting area (dimensions given in Table 2)



The contrast is checked by a box system defined in Figure 4 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet HB4_LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 5).

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 4 for the definition of the area D).

Figure 4
Box definition of the area D (dimensions given in Table 2)

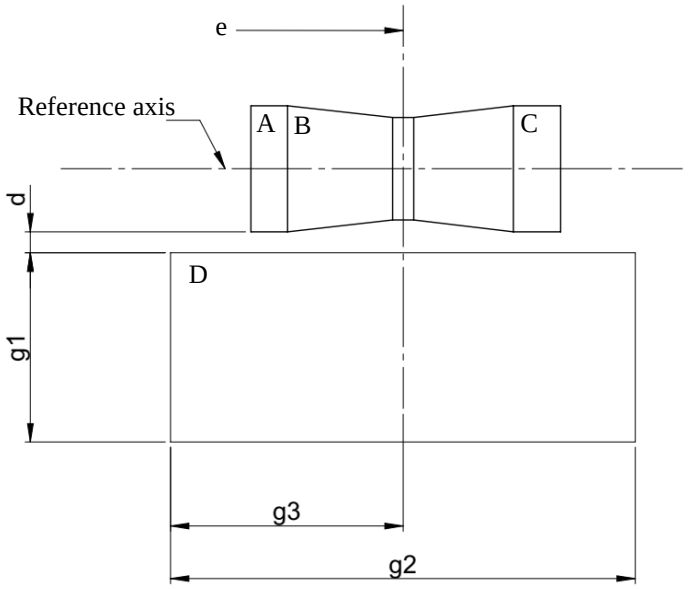


Table 2
Dimensions of the box definitions in Figure 3 and Figure 4

All views (as specified above)	*Dimensions in mm*	*All views (as specified above)*	*Dimensions in mm*
p	1.95	x1	31.5
q	2.4	x2	23.5
u	0.4	y1	9.9
v	0.7	g1	3.6
t	0.9	g2	8.85
r	3.0	g3	4.43
s	2.9	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 5 when operated at test voltage. The intersection of the reference axis and the plane parallel to the reference plane at distance e = 31.5 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 5.

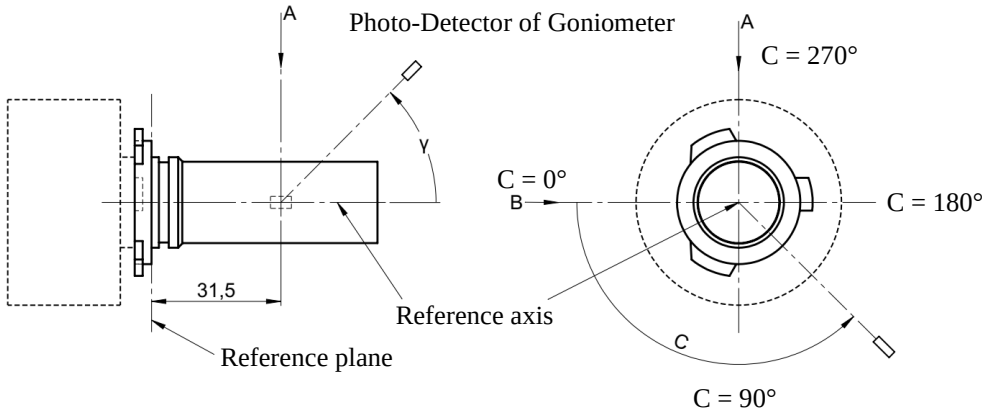
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

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 5

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



View B **View C**

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

Table 3 – Part 1
Test point values of normalized intensity

LED light source of normal production		
	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.

Table 3 – Part 2
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
γ	C_{90}, C_{270}	C_{90}, C_{270}
50°	100	160
60°	115	175
70°	125	185
80°	130	190
90°	130	195
100°	130	190
110°	125	185
120°	115	175
130°	100	160
140°	80	145

The light pattern as described in Table 3 – part 2 (excluding the sections between C_{90} and C_{270} and between C_{270} and C_{90}) 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.

Table 3 – Part 3
Test point values of normalized intensity

	LED light source of normal production	
	Minimum intensity (cd/klm)	*Maximum intensity (cd/klm)*
C-plane	$\gamma = 90°$	$\gamma = 90°$
C_0	n.a.	n.a.
C_{30}	50	130
C_{60}	110	175
C_{90}	130	195
C_{120}	110	175
C_{150}	50	130
C_{180}	n.a.	n.a.
C_{210}	50	130
C_{240}	110	175
C_{270}	130	195
C_{300}	110	175
C_{330}	50	130
C_{360} (= $C_{0)}$	n.a.	n.a.

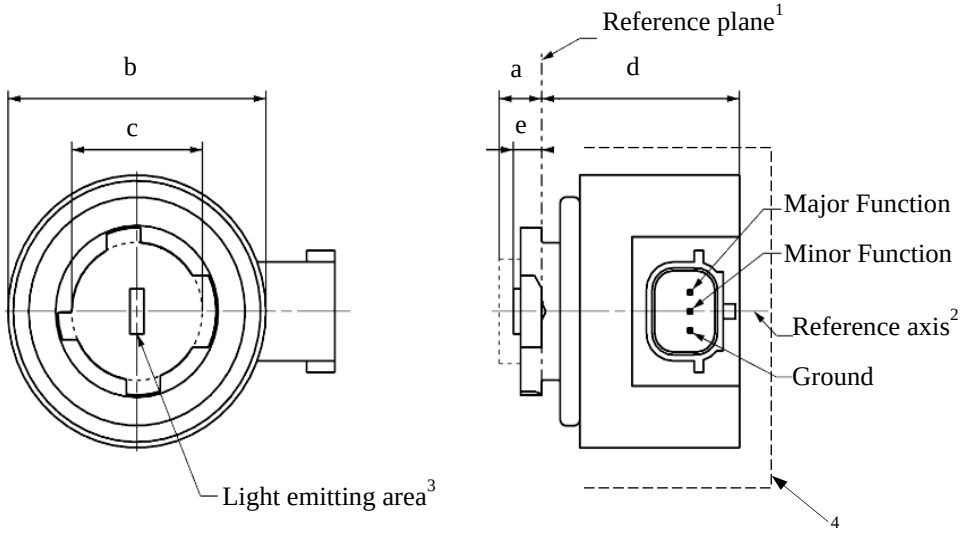
The light pattern as described in Table 3 – part 3 (excluding the sections between C_{150} and C_{210} and between C_{330} and C_{30}) shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two 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.

Categories LRR8A, LRR8B **Sheet LRR8/1**

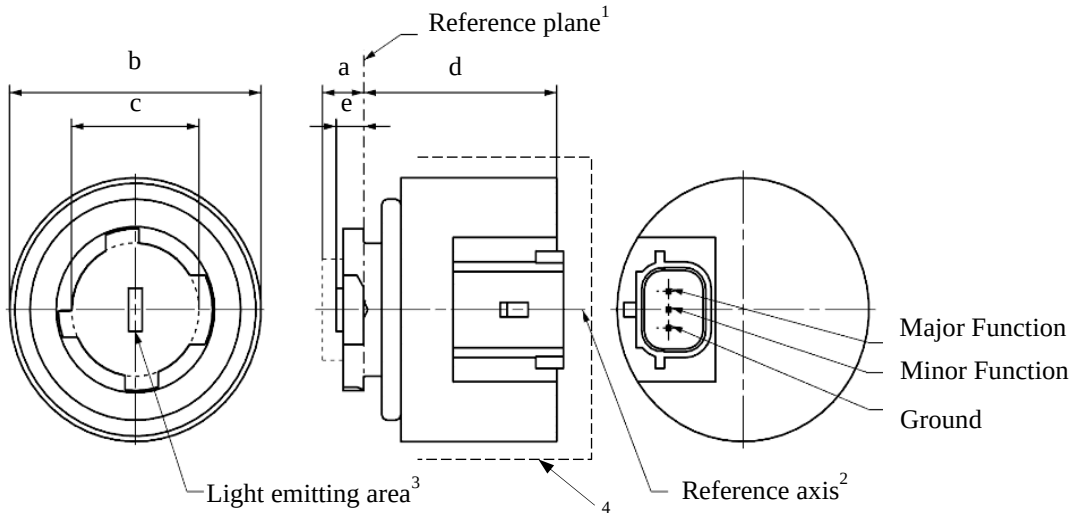
The drawings are intended only to illustrate the essential dimensions of the LED light source.

Figure 1*
Main Drawing

LRR8A



LRR8B



* Projection method:

For the notes see sheet LRR8/2

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 [8/]		mm	3.0 ± 0.30		3.0 ± 0.15	
Cap LRR8A, LRR8B PGJ18.5t-1 in accordance with IEC Publication 60061 (sheet 7004-185-3)						
Electrical and photometric characteristics						
			Minor function	*Major function*	*Minor function*	*Major function*
Rated values	Volts		12		12	
	Watts		1.0	4.0	1.0	4.0
Test voltage	Volts (DC)		13.5		13.5	
Objective Values [6]	Watts (at test voltage)		1.0 max.	4.5 max.	1.0 max	4.5 max
	Luminous flux (in lm at test voltage) [5, 10, 11]		10 ± 30%	120 ± 20 % [7]	10 ± 20% [9]	120 ± 10 % [7]
	Luminous flux (in lm at 9 V DC) [5]		2 min	28 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 5 mm around the light source shall be respected for convection; the connector interface can be neglected.
[5/] The emitted light shall be red.
[6/] After continuous operation for 30 minutes at 23 ± 2.5° C.
[7/] The measured value shall be in between 100 per cent and 70 per cent of the value measured after 1 minute.
[8/] Light centre length; the major function is operated during the measurement; for the method of measurement, see Annex K of IEC 60809, Edition 4.
[9/] The measured value shall be in between 110 per cent and 90 per cent of the value measured after 1 minute.
[10/] When minor and major functions are powered at the same time, the luminous flux shall not be less than the minimum objective value of the major function (96 lm) and shall not be more than the maximum objective value given by the sum of both functions (157 lm).
[11/] No light shall be emitted in the case the light source LRR8A is powered with a connector counterpart having the pin assignment of the light source LRR8B, and vice versa

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 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 C_{90} and C_{180} and shows the projection when viewing along direction $\gamma = 0^{o}$ at e = 3.0 mm (C, γ as defined in Figure 3).

The luminous flux Φ emitted into the viewing direction shall be calculated as given below:

$$\Phi = L \cdot S \cdot \Omega$$

with

S = area to be considered

L = luminance average of area S

Ω = solid angle defined by the entrance aperture of the measurement system

The distribution of luminous flux originating from the LEA as shown in Figure 2 shall fulfil the requirements given in Table 3. All numbers shall be given in % of the total luminous flux emitted into the viewing direction from the bayonet core area, i.e. a circular area with diameter c = 18.5 mm (see Figure 1).

Note: When evaluating the luminous flux distribution emitted from the LEA, reflections and stray light within the measurement equipment shall be reduced as much as possible and if necessary, corrected. More details regarding measurement of light-emitting areas can be found in the publication describing general photometry accuracy guidelines currently prepared by CIE TC2-67

C_{90}

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

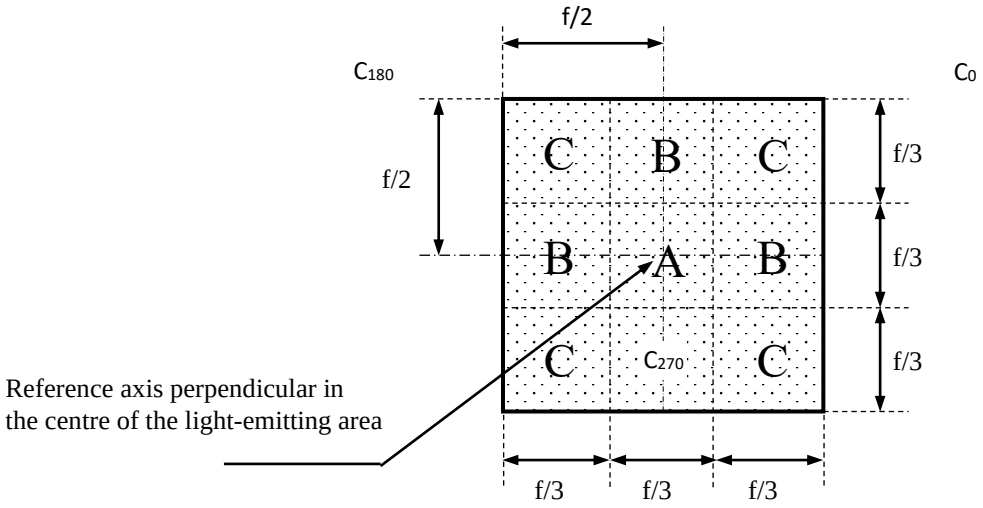


Table 2
Dimensions of the box system in Figure 2

Dimensions in mm	*f*
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

Area(s)	*LED light sources of normal production for minor function and major function*	*Standard LED light sources for minor function and major function*
Each B individually	≥10%	≥15%
Each A, B individually	< 40%	< 30%
All B together	≥ 60%	≥ 65%
Each C individually	-	< 10%
All A, B and C together	≥ 90%	≥ 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 = 3.0 mm 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 axes of the goniometer. The corresponding measurement set-up is described in Figure 3.

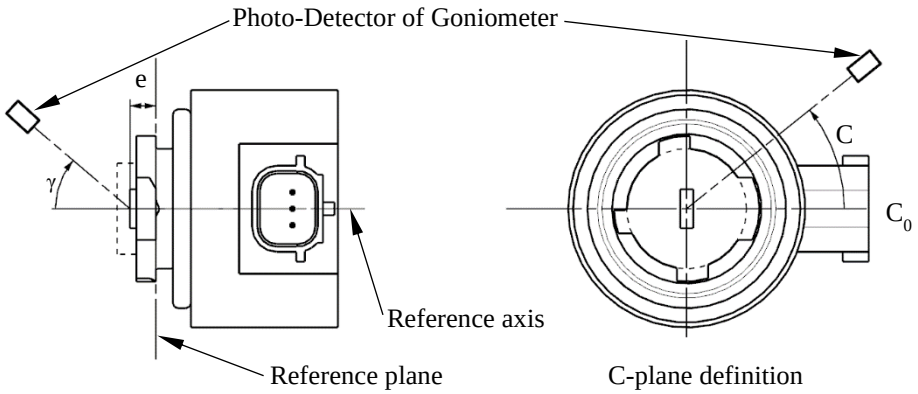
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately, to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes C_0, C_{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 4.

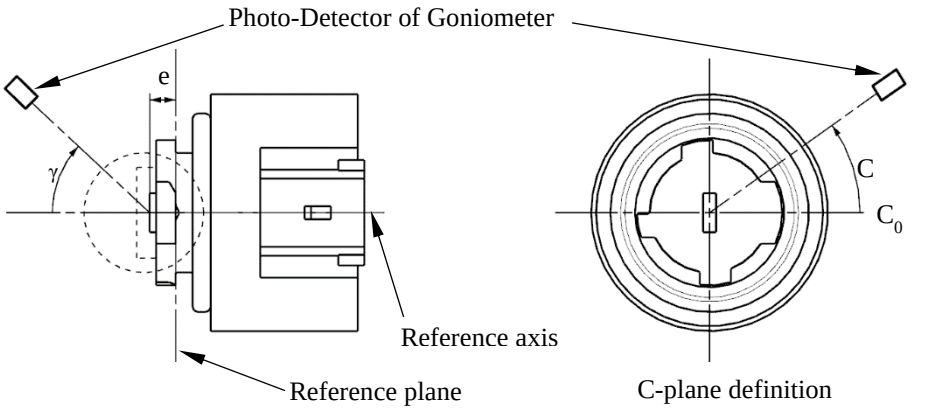
The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1,000 lm light source. The data shall comply with the tolerance band as defined in Table 4.

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



LRR8A



LRR8B

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

	LED light sources of normal production for minor function and major function		*Standard LED light sources for minor function and major function*	
Angle 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*
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

"