IEC 60809

Edition 4.0 2023-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

Lamps and light sources for road vehicles – Dimensional, electrical and luminous requirements

Lampes et sources lumineuses pour véhicules routiers – Exigences dimensionnelles, électriques et lumineuses

IEC 60809:2021-04/AMD1:2023-11(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 60809

Edition 4.0 2023-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1

AMENDEMENT 1

Lamps and light sources for road vehicles – Dimensional, electrical and luminous requirements

Lampes et sources lumineuses pour véhicules routiers – Exigences dimensionnelles, électriques et lumineuses

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.140.20, 43.040.20

ISBN 978-2-8322-7760-7

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

LAMPS AND LIGHT SOURCES FOR ROAD VEHICLES – DIMENSIONAL, ELECTRICAL AND LUMINOUS REQUIREMENTS

AMENDMENT 1

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to IEC 60809:2021 has been prepared by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting.

The text of this Amendment is based on the following documents:

Draft	Report on voting
34A/2370/FDIS	34A/2378/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications/.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

---

2 Normative references

Replace the existing reference to IEC 60810 with the following:

IEC 60810:2017, *Lamps, light sources and LED packages for road vehicles – Performance requirements*
IEC 60810:2017/AMD1:2019
IEC 60810:2017/AMD2:2022

Add the following new reference:

IEC 62707-1:2013, *LED-binning – Part 1: General requirements and white colour grid intended for automotive applications*
IEC 62707-1:2013/AMD1:2018

3 Terms and definitions

Add, at the end of Clause 3, the following new terminological entries 3.19, 3.20 and 3.21:

3.19
matrix light source
MLS
LED light source consisting of a grid of individually operated pixels in two perpendicular directions

Note 1 to entry: The grid consists of m pixels in direction x (row) and n pixels in direction y (column).

3.20
pitch p_x and pitch p_y
nominal distance (centre-to-centre) in direction x respectively in direction y between adjacent pixels in an MLS having a rectilinear grid pattern

3.21
pixel
smallest element of a matrix light source that is capable of being operated individually

6.5 Lamp dimensions

Replace, in the second paragraph, "Lx5B[5]", *with* "Lx5B, Lx6A, Lx6B[5],".

8.2 List of specific lamp types

Table 3

Replace the last four rows (Sheet no. in R.E.5: L3, LR4, L5 and L1/6) of the existing Table 3, before footnotes "a" and "b", with the following new rows:

Table 3 – List of specific lamp types

IEC sheet no. [a]	Sheet no. [b] in R.E.5	Category	Voltage V	Wattage W	Cap
-	Lx3	LR3A / LR3B	12	3	PGJ18,5d-1
		LW3A / LW3B	12	4	PGJ18,5d-24
		LY3A / LY3B	12	4	PGJ18,5d-15
-	LR4	LR4A / LR4B	12	3 / 075	PGJ18,5t-5
-	Lx5	LR5A / LR5B	12	3	PGJ18,5d-10
		LW5A / LW5B	12	6	PGJ18,5d-28
		LY5A / LY5B	12	6	PGJ18,5d-19
-	Lx6	LR6A / LR6B	12	7	PGJ18,5d-33
		LW6A / LW6B	12	7	PGJ18,5d-12
		LY6A / LY6B	12	7	PGJ18,5d-7
-	L1	L1A/6 / L1B/6	12	6	PGJ18,5d-29
-	C5W/LED	C5W/LEDK	12	2	SVX8.5
-	PY21W/LED	PY21W/LED	12	7	BAU15s-3(110°)
			24	7	BAU15s-3(110°)
-	R5W/LED	R5W/LED	12	2	BA15s-3(110°)
			24	2	BA15s-3(110°)
-	W5W/LED	W5W/LEDK	12	2	WX2.1x9.5d
			24	2	WX2.1x9.5d
		WY5W/LED	12	2	WX2.1x9.5d
			24	2	WX2.1x9.5d
-	H11/LED	H11/LED/6	12	18	PGJX19-2
			24	18	PGJX19-2
-	C5W_LEDr	C5W (LEDr)	12	3	SV8.5
-	H11_LEDr	H11 (LEDr)	12	27	PGJ19-2
			24	27	PGJ19-2

Add, at the end of the existing Clause 8, the following new Clause 9:

9 Requirements and test conditions for matrix light sources (MLSs)

9.1 General requirements

Matrix light sources shall be so designed as to be and to remain in good working order when in normal use. They shall, moreover, exhibit no fault in design or manufacture.

This Clause 9 applies to matrix light sources with a Lambertian-like intensity distribution, i.e. $I(\theta) \approx I_0 \cdot \cos(\theta)$ (see 9.2.5.4).

Matrix light sources may consist of areas with different pitch p_x and pitch p_y, for example a central area with a smaller pitch p_x and outer areas with a larger pitch p_x.

NOTE In the case of an MLS with areas of different pitch p_x and pitch p_y, it can be necessary to evaluate each area separately, and some deviations from the specified procedures can be necessary.

This Clause 9 is intended to be applied to matrix light sources with a number of pixels in the order of one hundred or less.

9.2 Photometrical requirements and test conditions

9.2.1 Measurement methods

Appropriate measurement methods capable of dealing with the requirements of 9.2.4.2, 9.2.4.3, 9.2.5.2, 9.2.5.3, 9.2.5.4, 9.2.5.5, 9.2.5.6, 9.2.5.7 and 9.2.6.1 shall apply.

9.2.2 Reference system

The reference system for the (x, y) reference plane shall be specified in the manufacturer's data sheet. The (z) reference axis shall be normal to the (x, y) reference plane and intersect the centre point of the grid.

9.2.3 Operating conditions

For testing purposes, one of the following operating conditions shall apply:

– pulsed operation, defined by
  - pulse definition and measurement intervals according to IEC 62707-1:2013, and IEC 62707-1:2013/AMD1:2018, 5.3;
  - drive current I_f, according to the manufacturer's data sheet;
  - ambient temperature 23 °C ± 5 °C (see IEC 62707-1:2013, and IEC 62707-1:2013/AMD1:2018, 5.2);
– steady state operation, defined by
  - drive current I_f, according to the manufacturer's data sheet;
  - PWM duty cycle, according to the manufacturer's data sheet;
  - position of T_b-point, according to the manufacturer's data sheet;
  - stabilization temperature T_b (within ±3 °C) at the T_b-point, according to the manufacturer's data sheet.

All measurements shall be performed under pulsed operation, unless otherwise specified in the manufacturer's data sheet.

9.2.4 Parameters determined by all pixels

9.2.4.1 General

Subclause 9.2.4 covers parameters which are determined by the entirety of all pixels.

9.2.4.2 Partial luminous flux

The partial luminous flux Φ_{cone} of an MLS is the luminous flux emitted into a cone of θ = 45° around the z axis according to:

$$\Phi_{\text{cone}} = \int\limits_{\theta=0°}^{\theta=45°}\int\limits_{\varphi=0}^{\varphi=2\pi} I \sin\theta \, d\theta \, d\varphi$$

The partial luminous flux Φ_{cone} shall comply with the limiting values given in the manufacturer's data sheet.

9.2.4.3 Colour

The colour of an MLS is the colour of the light emitted into a cone of θ = 45° around the z axis. The chromaticity coordinates shall comply with the limiting values given in the manufacturer's data sheet.

9.2.5 Parameters determined per pixel

9.2.5.1 General

Subclause 9.2.5 covers parameters which are determined for each pixel individually.

Measurements of pixel parameters are made along the z-axis of the MLS.

The minimum distance between the grid and the aperture of the measurement equipment shall be 10-times the diameter of the smallest circle containing all pixels of the MLS.

9.2.5.2 Partial luminous flux

The partial luminous flux $\Phi_{\text{cone},i}$ of a single-pixel "i" is the luminous flux emitted by this single pixel into a cone of θ = 45° around the z axis according to:

$$\Phi_{\text{cone},i} = \int\limits_{\theta=0°}^{\theta=45°}\int\limits_{\varphi=0}^{\varphi=2\pi} I_i \sin\theta \, d\theta \, d\varphi$$

for all pixels $i = 1, \ldots, (m \cdot n)$.

The arithmetic average $\Phi_{\text{cone,ave}}$ of the partial luminous flux of all pixels is:

$$\Phi_{\text{cone,ave}} = \sum_{i=1}^{m \cdot n} \Phi_{\text{cone},i} \, / \left(m \cdot n \right)$$

The relative deviation $\Delta\Phi_{\text{cone},i} = | \Phi_{\text{cone},i} - \Phi_{\text{cone,ave}} |$ of each pixel shall comply with the limiting value given in the manufacturer's data sheet.

9.2.5.3 Colour

The colour of each pixel is the colour of the light emitted by this single pixel into a cone of θ = 45° around the z axis. The chromaticity coordinates shall comply with the limiting values given in the manufacturer's data sheet.

9.2.5.4 Luminous intensity distribution

The deviation of the luminous intensity distribution $I(\theta)$ from a Lambertian distribution is tested in the following directions:

- 0° (corresponding to the z-axis);
- ±22,5° and ±45° (in the x-z plane);
- ±22,5° and ±45° (in the y-z plane).

In each of these directions, the relative deviation characterized by the coefficient k

$$k = | I(\theta) / (I(0°) \cdot \cos\theta) - 1 |$$

shall comply with the upper limit k_{max} given in the manufacturer's data sheet, whereby k_{max} shall be 0,3 or less.

9.2.5.5 Luminance uniformity

The light emitting area (LEA) of a pixel is determined from the luminance measurements of an area with dimensions pitch p_x and pitch p_y which contains the whole pixel. The value L_{98} is the 98th percentile of all values of these luminance measurements.

The LEA of a pixel is the smallest circumferential rectangle having the same orientation as the grid and containing all luminance measurements with a value of 20 % or more of the value L_{98}.

In case the luminance does not drop below 20 % of the value L_{98} in this area, the nominal size of the pitch (p_x, p_y) shall determine the LEA of a pixel.

The value L_{ave} is the arithmetic average of the values of all luminance measurements within the LEA.

The LEA is subdivided into nine subsections (three by three rectangles of equal size), see Figure 1.

For each of the subsection (i = 1, …, 9) the value L_i is the arithmetic average of the values of all luminance measurements in the corresponding subsection.

The value ΔL is the maximum relative deviation of all luminance values L_i from the luminance value L_{ave}.

$$\Delta L = \text{Max} \{ |(L_i - L_{ave})/L_{ave}|; i = 1, …, 9\}$$

The maximum relative deviation ΔL shall comply with the limiting values given in the manufacturer's data sheet.

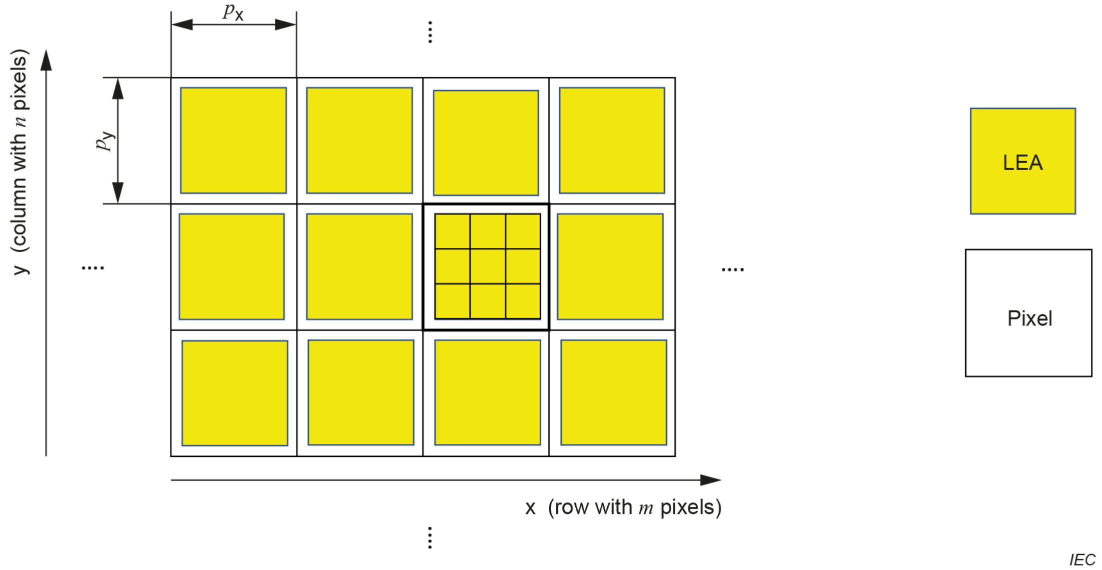

Figure 1 – Illustration of a grid of pixels with corresponding LEAs and subsections of pixels under test

It is recommended to use a luminance camera with minimum 30 camera pixels for the smaller value of the pitch p_x and pitch p_y.

9.2.5.6 Spatial colour uniformity

The LEA of a pixel and the subsections of the LEA shall be determined according to 9.2.5.5.

For each of the subsections (i = 1, ..., 9) the chromaticity coordinates x_i and y_i shall be determined.

The spatial colour uniformity described by the values Δx and Δy according to

$$\Delta x = \text{Max}\ \{x_i\} - \text{Min}\ \{x_i\};\ i = 1, \ldots, 9$$

$$\Delta \text{y} = \text{Max}\ \{\text{y}_i\} - \text{Min}\ \{\text{y}_i\};\ i = 1, \ldots, 9$$

shall comply with the limiting values given in the manufacturer's data sheet.

9.2.5.7 Gap width

The gap width shall be determined for all direct neighbour pixels in the x and y directions, while (at least) the two neighbour pixels are switched on, see Figure 2.

The gap width in the x-direction is determined from the luminance profile L(x), averaging along the y axis over a width of LEA/3, starting from the centre of the LEA of the "pixel under test" with the nominal value of the pitch p_x.

The gap width in the y-direction is determined from the luminance profile L(y), averaging along the x axis over a width of LEA/3, starting from the centre of the LEA of the "pixel under test" with the nominal value of the pitch p_y.

The gap width is characterized by the parameters $g50$ and $g90$, which are determined at a luminance level of 50 %, respectively 90 %, of the average luminance of the corresponding luminance profiles (L(x) and L(y) respectively), see Figure 3. In case the luminance profile does not drop below 50 % of the average, the $g50$ value is zero.

The gap widths $g50$ and $g90$ for all pairs of neighbour pixels shall comply with the limiting values given in the manufacturer's data sheet.

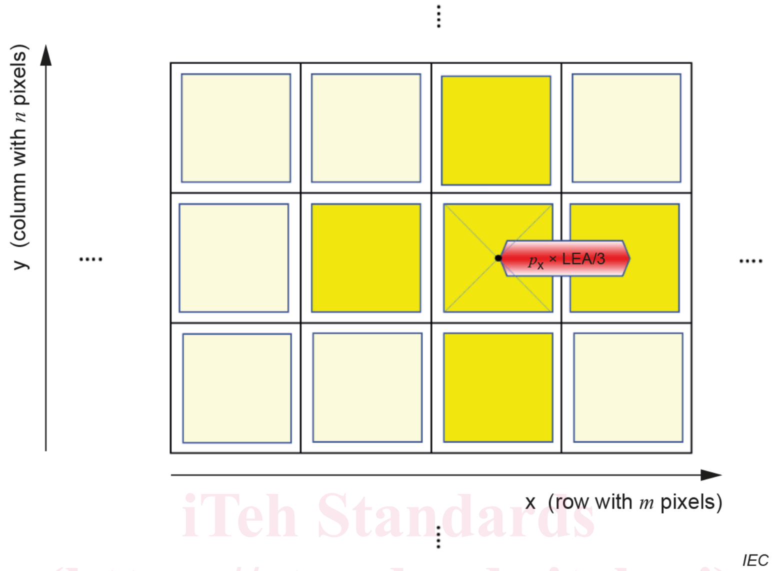

Figure 2 – Illustration of method to determine the gap width

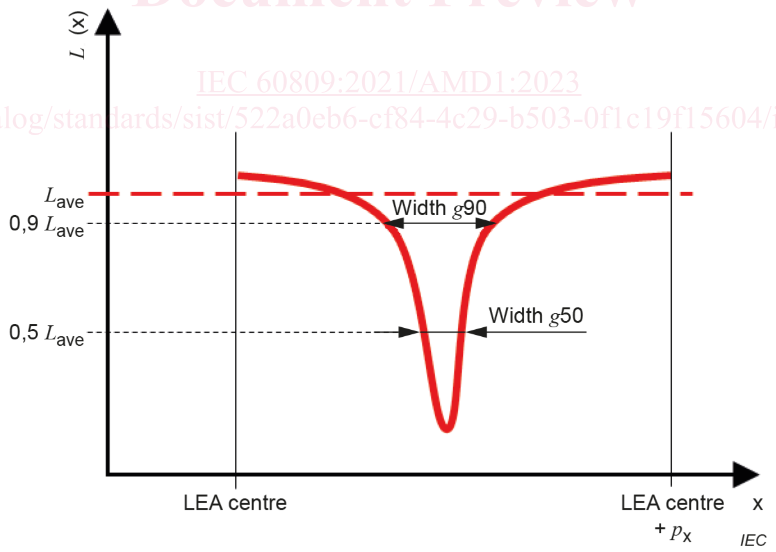

Figure 3 – Example of gap width characterization (luminance profile)

It is recommended to use a luminance camera with minimum 30 camera pixels for the smaller value of the pitch p_x and pitch p_y which is able to detect a luminance contrast ratio of at least 200.

9.2.6 Characteristic parameters for luminance contrast behaviour

The luminance contrast shall be determined for each row and column separately, while the row, respectively column under test is switched on and the neighbour row(s), respectively column(s) are switched off.