

# INTERNATIONAL STANDARD



---

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



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2021 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

**IEC online collection - [oc.iec.ch](http://oc.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](http://www.electropedia.org)**

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



IEC 60809

Edition 4.0 2021-04

# INTERNATIONAL STANDARD



---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.140.20; 43.040.20

ISBN 978-2-8322-9634-9

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	8
1 Scope.....	10
2 Normative references .....	10
3 Terms and definitions .....	12
4 Requirements and test conditions for filament lamps .....	15
4.1 General requirements .....	15
4.2 Lamp marking .....	15
4.3 Bulbs .....	15
4.4 Colour.....	15
4.4.1 Colour of light.....	15
4.4.2 Colour endurance .....	17
4.4.3 Coated bulb .....	17
4.5 Lamp dimensions .....	17
4.6 Caps and bases .....	18
4.7 Initial electrical and luminous requirements.....	18
4.8 Check on optical quality .....	18
4.8.1 General .....	18
4.8.2 12 V lamps emitting white light .....	18
4.8.3 6 V and 24 V lamps emitting white light .....	18
4.8.4 Lamps emitting selective-yellow light .....	19
4.9 UV radiation.....	19
4.10 Standard (étalon) filament lamps .....	19
4.11 Non-replaceable filament lamps .....	20
4.11.1 General .....	20
4.11.2 Fixation .....	21
4.11.3 Lifetime .....	21
4.11.4 Colour endurance .....	22
4.11.5 Luminous flux and colour maintenance .....	22
4.11.6 Vibration and shock resistance .....	22
5 Requirements and test conditions for discharge lamps .....	22
5.1 General requirements .....	22
5.2 Lamp marking .....	22
5.3 Bulbs .....	23
5.4 Caps.....	23
5.5 Position and dimensions of electrodes, arc and black stripes .....	23
5.5.1 Measurements.....	23
5.5.2 Electrodes .....	23
5.5.3 Arc .....	23
5.5.4 Black stripes.....	23
5.6 Starting, run-up and hot-restrike characteristics .....	24
5.6.1 Starting.....	24
5.6.2 Run-up .....	24
5.6.3 Hot-restrike.....	24
5.6.4 Compliance .....	24
5.7 Electrical and photometric characteristics .....	25
5.7.1 Voltage and wattage .....	25
5.7.2 Luminous flux .....	25

5.7.3	Compliance .....	25
5.8	Colour.....	25
5.9	UV radiation.....	26
5.10	Standard (étalon) discharge lamps.....	27
6	Requirements and test conditions for LED light sources .....	27
6.1	General requirements .....	27
6.2	Light source marking.....	27
6.3	Optical surfaces .....	27
6.4	Colour of light .....	27
6.5	Lamp dimensions .....	27
6.6	Caps and bases .....	28
6.7	Initial electrical and photometrical requirements.....	28
6.8	Red content .....	28
6.9	UV radiation.....	29
6.10	Standard (étalon) light sources .....	29
7	Sampling and conditions of compliance .....	29
8	Lamp data sheets .....	29
8.1	General.....	29
8.2	List of specific lamp types .....	30
8.3	Data sheets not transferred to UN R.E.5 .....	34
Annex A	(normative) Filament shape, length and position .....	54
A.1	General.....	54
A.2	Filaments shown as points .....	54
A.3	Line filaments .....	54
A.4	Coiled-coil filaments.....	54
A.5	Extreme filament turns .....	54
A.6	Filament extremities.....	54
A.6.1	General .....	54
A.6.2	Axial filaments .....	54
A.6.3	Transverse filaments .....	54
A.7	Determination of filament length.....	55
A.8	Filament offsets .....	55
A.9	Lateral deviation .....	55
A.10	Filament location check system (box system).....	55
Annex B	(normative) Measurement method of the colour of filament lamps .....	58
B.1	General.....	58
B.2	Colour.....	58
B.3	Measuring directions.....	58
B.3.1	General .....	58
B.3.2	Filament lamps used in headlamps .....	58
B.3.3	Filament lamps used in light signalling devices .....	59
Annex C	(normative) Test conditions for electrical and luminous characteristics .....	60
C.1	Filament lamps .....	60
C.1.1	Ageing .....	60
C.1.2	Test conditions .....	60
C.1.3	Electrical instrumentation .....	60
C.1.4	Photometry .....	60
C.2	LED light sources.....	60

C.2.1	Test conditions .....	60
C.2.2	Luminous flux .....	60
C.2.3	Normalized luminous intensity .....	61
C.2.4	Colour .....	61
C.2.5	Power consumption .....	61
C.2.6	Luminous flux and colour at elevated temperature .....	62
Annex D (normative) Measurement method of internal elements of R2 lamps .....		65
D.1	General test conditions .....	65
D.1.1	Measurement position.....	65
D.1.2	Ageing .....	65
D.1.3	Test conditions .....	65
D.2	Reference axis, reference plane and planes for measurements.....	65
D.2.1	Reference axis .....	65
D.2.2	Reference plane .....	65
D.2.3	Plane V-V .....	65
D.2.4	Plane H-H.....	65
D.2.5	Plane X-X .....	65
D.2.6	Plane Y1-Y1 .....	65
D.2.7	Plane Y2-Y2 .....	65
D.3	Viewing directions (see Figure D.1).....	66
D.3.1	Viewing direction ① .....	66
D.3.2	Viewing direction ② .....	66
D.3.3	Viewing direction ③ .....	66
D.4	Measuring points (MP) .....	66
D.5	Dimensions to be measured.....	67
Annex E (normative) Measurement method of internal elements of H4 and HS1 lamps .....		70
E.1	General test conditions .....	70
E.1.1	Measurement position.....	70
E.1.2	Ageing .....	70
E.1.3	Test conditions .....	70
E.2	Reference axis, reference plane and planes for measurement .....	70
E.2.1	Reference axis .....	70
E.2.2	Reference plane .....	70
E.2.3	Plane V-V .....	70
E.2.4	Plane H-H.....	70
E.2.5	Plane X-X .....	70
E.2.6	Plane Y1-Y1 .....	70
E.2.7	Plane Y2-Y2 .....	71
E.2.8	Plane Y3-Y3 .....	71
E.2.9	Plane Y4-Y4 .....	71
E.2.10	Plane Y5-Y5 .....	71
E.3	Viewing directions (see Figure E.1).....	71
E.3.1	Viewing direction ① .....	71
E.3.2	Viewing direction ② .....	71
E.3.3	Viewing direction ③ .....	71
E.3.4	Viewing direction ④ .....	71
E.4	Measuring points (MP) .....	71
E.4.1	General .....	71

E.4.2	Shield and filaments (see Figure E.2) .....	72
E.4.3	Top obscuration (see Figure E.3).....	72
E.5	Dimensions to be measured .....	72
Annex F (normative)	Measurement method of internal elements of HB1 lamps .....	77
F.1	General test conditions .....	77
F.1.1	Measurement position.....	77
F.1.2	Ageing .....	77
F.1.3	Test conditions .....	77
F.2	Dipped-beam filament location .....	77
F.2.1	Horizontal location .....	77
F.2.2	Vertical location .....	77
F.2.3	Axial location .....	77
F.3	Main-beam filament location .....	77
F.3.1	Horizontal location .....	77
F.3.2	Vertical location .....	77
F.3.3	Axial location .....	78
Annex G (informative)	Optical set-up for the measurement of the position and form of the arc and of the position of the electrodes of discharge lamps .....	79
Annex H (normative)	Measurement method of electrical and photometric characteristics of discharge lamps .....	80
H.1	General.....	80
H.2	Ballast .....	80
H.3	Burning position .....	80
H.4	Ageing .....	80
H.5	Supply voltage .....	80
H.6	Starting test .....	80
H.7	Run-up test .....	80
H.8	Hot restrike test .....	80
H.9	Electrical and photometric test .....	81
H.10	Colour.....	81
Annex I (informative)	Overview of lamp types and their applications .....	82
Annex J (normative)	Test conditions for colour endurance measurements .....	85
J.1	General.....	85
J.2	Calibration and ageing .....	85
J.3	Test voltage .....	86
J.4	Operating position.....	86
J.5	Test rack.....	86
J.6	Operating cycles .....	86
J.7	Closure .....	89
Annex K (informative)	Method(s) to determine the value of the light centre length for Lx3A, Lx3B, Lx4A, Lx4B, Lx5A, Lx5B, L1A/6 and L1B/6 .....	90
K.1	Measurement and calculation method based on ray tracing .....	90
K.2	Alternative method.....	91
Annex L (informative)	Method to determine the maximum luminance gradient of LED light sources .....	92
L.1	Measuring the luminance .....	92
L.2	Calculating the maximum luminance gradient.....	92
Bibliography	.....	94

Figure A.1 – Determination of apexes, filament length and filament offsets (A and B).....	56
Figure A.2 – Determination of filament centre.....	56
Figure A.3 – Determination of lateral deviations (A and B) and tolerance on the light centre length (C) .....	57
Figure B.1 – Positions of the colorimetric receiver when measuring lamps used in headlamps .....	59
Figure B.2 – Positions of the colorimetric receiver when measuring lamps used in light signalling devices .....	59
Figure C.1 – Schematic representation of the set-up to measure the luminous flux and colour at elevated temperature .....	63
Figure C.2 – Schematic representation of the set-up to measure the luminous flux and colour at elevated temperature .....	64
Figure D.1 – Viewing directions, seen from the top of the lamp .....	68
Figure D.2 – Position of measuring points of R2 lamps .....	69
Figure E.1 – Viewing directions, seen from the top of the lamp .....	74
Figure E.2 – Position of measuring points of H4, H17, H19 and HS1 lamps .....	75
Figure E.3 – Top obscuration .....	76
Figure F.1 – Side view, view from ③ <sup>ab</sup> .....	78
Figure F.2 – Plan view, view from ④ <sup>a</sup> .....	78
Figure G.1 – Optical system.....	79
Figure J.1 – Side view of box .....	86
Figure J.2 – Front view of box.....	86
Figure J.3 – Temperature in the climate chamber during one operating cycle.....	87
Figure J.4 – Relative humidity in the climate chamber during one operating cycle.....	87
Figure J.5 – Switching modes of filament lamps for intermittent operation during one operating cycle .....	88
Figure J.6 – Switching modes of filament lamps for intermittent and continuous operation during one operating cycle .....	88
Figure J.7 – Switching modes of filament lamps for continuous operation during one operating cycle .....	89
Figure J.8 – Switching modes of filament lamps for intermittent and continuous operation during one operating cycle .....	89
Figure K.1 – Set-up to measure the luminance distribution of the A versions of the LED light sources .....	90
Figure K.2 – Set-up to measure the luminance distribution of the B versions of the LED light sources .....	91
Figure L.1 – Example of a luminance image and the calculated average luminance values $I(x)$ .....	93
Figure L.2 – Example for 1 $\mu\text{m}$ -interpolation and position of maximum luminance gradient .....	93
Table 1 – Lifetime of non-replaceable light sources used in devices (luminaires) .....	21
Table 2 – Spectral weighting function.....	26
Table 3 – List of specific lamp types .....	30
Table C.1 – Luminous flux tolerance limits.....	61
Table D.1 – Dimensions to be measured for R2 lamps .....	67
Table E.1 – Dimensions to be measured for H4, H17, H19 and HS1 lamps .....	73

Table I.1 – Overview of lamp types and their applications ..... 82

Table J.1 – Applicable switching modes ..... 85

Table J.2 – Applicable boxes of the test racks ..... 85

Table J.3 – Dimensions of the applicable boxes and the relative position of the centre  
of the filament..... 86

Table J.4 – Timing during one operating cycle ..... 87

Table J.5 – Switching modes of the filament lamps ..... 88

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

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

#### 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60809 has been prepared by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2014, Amendment 1:2017, Amendment 2:2017 and Amendment 3:2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Introduction of a light technical measurement on LED light sources intended for use in front-lighting applications.
- b) As the original data sheets and some figures from previous editions were not available in an editable format, they have been reproduced from their old format, following the current drafting rules and are now in single language format. Some reproductions constitute minor (obvious) editorial changes of the original text sections and original figures; no technical changes were introduced.

The text of this International Standard is based on the following documents:

Draft	Report on voting
34A/2232/FDIS	34A/2235/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 International Standard 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**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.**

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

## 1 Scope

This document is applicable to electric light sources (see Note 1) for use in automotive applications, for example in road illumination devices and/or light signalling devices for road vehicles.

It is especially applicable to light sources listed in UN Resolution R.E.5 and light sources subject to other legislations.

This document specifies the technical requirements for interchangeability for example dimensional, electrical and photometrical characteristics, and includes test methods.

For the light sources listed in this document, the data sheets are contained either in this document or are included by reference to UN Resolution R.E.5.

Performance requirements are specified in IEC 60810, for example life, torsion strength, resistance to vibration and shock.

The requirements for miniature light sources for supplementary purposes, not subject to legislation, are specified in IEC 60983.

NOTE 1 The terms "lamp" and "light source" are both used in this document to mean the same product, so the two terms are interchangeable throughout this document.

NOTE 2 In various vocabularies and standards, different terms are used for "incandescent lamp" (IEC 60050-845:1987, 845-07-04), "discharge lamp" (IEC 60050-845:1987, 845-07-17) and "LED lamp". In this document "filament lamp", "discharge lamp" and "LED light source" are used, however, where only "lamp" or "light source" is written, all light sources, independent of the technology used, are meant, unless the context clearly shows that it applies to one kind of technology only. In the UN Regulations, the word "light source" is used for the products specified in this document.

NOTE 3 Wherever the term "device" is used, it is meant to designate equipment which is used as a luminaire. It can for instance take the form and purpose of a headlight or signal light.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-845, *International Electrotechnical Vocabulary – Part 845: Lighting* (available at <http://www.electropedia.org/>)

IEC 60051-1, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 1: Definitions and general requirements common to all parts*

IEC 60061-1, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps* (available at <http://std.iec.ch/iec60061>)

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