

BS EN 61167:2016



BSI Standards Publication

Metal halide lamps — Performance specification (IEC 61167:2015, modified)

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National foreword

This British Standard is the UK implementation of EN 61167:2016. It is derived from IEC 61167:2015. It supersedes BS EN 61167:2011 which is withdrawn.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **Ⓒ** **Ⓒ**.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and Related Equipment, to Subcommittee CPL/34/1, Electric lamps.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Amendments/corrigenda issued since publication

Date	Text affected
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English Version

**Metal halide lamps - Performance specification
(IEC 61167:2015 , modified)**

Lampes aux halogénures métalliques - Spécifications de
performance
(IEC 61167:2015 , modifiée)

Halogen-Metall dampflampen - Anforderungen an die
Arbeitsweise
(IEC 61167:2015 , modifiziert)

This European Standard was approved by CENELEC on 2016-03-07. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 34A/1809/FDIS, future edition 3 of IEC 61167, prepared by SC 34A “Lamps” of IEC/TC 34 “Lamps and related equipment” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61167:2016.

A draft amendment, which covers common modifications to IEC 61167 (34A/1809/FDIS), was prepared by CLC/TC 34A “Lamps” and approved by CENELEC.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-12-10
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-06-10

This document supersedes EN 61167:2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 61167:2015 are prefixed “Z”.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For the relationship with EU Directives see informative Annexes ZZA, ZZB and ZZC, which are integral parts of this document.

This standard provides test methods related to parameters as prescribed by EC Regulation 245/2009, EU Regulation 1194/2012 and EU Regulation 874/2012 while conformity assessment (sampling, conformity procedures as well as limits) for market surveillance are specified in the text of the above Regulations.

Endorsement notice

The text of the International Standard IEC 61167:2015 was approved by CENELEC as a European Standard with agreed common modifications.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
		Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 1: Measurement and file format	EN 13032-1 +A1	2004 2012
		Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 4: LED lamps, modules and luminaires	EN 13032-4	2015
IEC 60050-845	1987	International Electrotechnical Vocabulary - Chapter 845: Lighting	-	-
IEC 60061-1	-	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 1: Lamp caps	EN 60061-1	-
IEC 60598-1	-	Luminaires - General requirements and tests	EN 60598-1	-
IEC 60923	-	Auxiliaries for lamps - Ballasts for discharge lamps (excluding tubular fluorescent lamps) - Performance requirements	EN 60923	-
IEC 60927	-	Auxiliaries for lamps - Starting devices (other than glow starters) - Performance requirements	EN 60927	-
IEC/TR 61341	-	Method of measurement of centre beam intensity and beam angle(s) of reflector lamps	EN 61341	-
IEC 62035	-	Discharge lamps (excluding fluorescent lamps) - Safety specifications	EN 62035	-
IEC 62321-4	-	Determination of certain substances in electrotechnical products - Part 4: Mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS	EN 62321-4	-
IEC 62471	-	Photobiological safety of lamp and lamp systems	EN 62471	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CIE 84	-	The measurement of luminous flux	-	-
CIE 13.3		Method of Measuring and Specifying Colour Rendering Properties of Light Sources	-	-

Annex ZZA (informative)

Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EC) No 245/2009 aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/495 to provide one voluntary means of conforming to the ecodesign requirements of Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council [2009 OJ L76].

Once this standard is cited in the Official Journal of the European Union under that Regulation, compliance with the normative clauses of this standard given in Table ZZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding ecodesign requirements of that Regulation and associated EFTA Regulations.

Table ZZA.1 – Correspondence between this European Standard and Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council [2009 OJ L76] and Commission's standardization request M/495

Ecodesign requirements of Regulation No 245/2009 [2009 OJ L76]	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Annex III, Article 2	Annex B or Annex E as appropriate	Lamp power
Annex III, Article 1.3	Annex B or Annex E as appropriate	Luminous flux
Annex III, Article 1.2, Table 14	Subclause 4.Z4	Lamp survival factor
Annex III, Article 1.2, Table 14	Subclause 4.Z3	Lumen maintenance
Annex II, Article 3(b)	Subclause 4.8.4	Chromaticity coordinates
Annex III, Article 1.3 (h)	Subclause 4.8.4	Colour rendering index (CRI)
Annex III, Article 1.3 (g)	Subclause 4.8.4	Correlated colour temperature (CCT)
Annex III, Article 2	Annex B or Annex E as appropriate	Spectral power distribution
Annex I, Article 1(d), (h)	Annex B or Annex E as appropriate	specific effective radiant UV power
Annex I, Article 1 (i)	Subclause 4.4	Caps
Annex III, Article 1.3 (f), Annex V, Article 2	Subclause 4.Z5	Mercury content

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the products falling within the scope of this standard.

Annex ZZB (informative)

Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 1194/2012 aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/495 to provide one voluntary means of conforming to the ecodesign requirements of Commission Regulation (EU) No 1194/2012 of 12 December 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment [2012 OJ L342].

Once this standard is cited in the Official Journal of the European Union under that Regulation, compliance with the normative clauses of this standard given in Table ZZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding ecodesign requirements of that Regulation and associated EFTA Regulations.

Table ZZB.1 – Correspondence between this European Standard and Commission Regulation (EU) No 1194/2012 of 12 December 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment [2012 OJ L342] and Commission's standardization request M/495

Ecodesign requirements of Regulation No 1194/2012 [2012 OJ L342]	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Article 2.4, 3.1, Annex I	Subclause 4.2	Technical description of special purpose lamps for eco-design
Annex III, Article 1 Annex III, Article 3.1	Annex B or Annex E as appropriate	Lamp power
Annex III, Article 3.1.1, 3.1.2 (a), 3.1.3 (c)	Subclause 4.Z1	Useful luminous flux
Annex III, Article 3.1.2 (i), 3.1.3 (k)	Annex B or Annex E as appropriate	Beam angle
Annex III, Table 4, Article 3.1.3	Subclause 4.Z4	Lamp life
Annex III, Table 4, Table 7, Article 3.1.3	Subclause 4.Z3	Lumen maintenance
	Not covered in this standard	Number of switching cycles before failure
Annex III, Table 4	Subclause 4.5, Annex A	Starting time
Annex III, Table 4	Subclause 4.5, Annex A	Warm-up time to 60% ϕ
Annex I	Subclause 4.8.4	Chromaticity coordinates
Annex III, article 3.1.3 (h)	Subclause 4.8.4	Colour rendering index (CRI)
Annex III, article 3.1.1, 3.1.2 (c)	Subclause 4.8.4	Correlated colour temperature (CCT)
	Not covered in this standard	Power factor (only for lamps with integrated control gear)
Annex III, article 3.1.2 (h)	Subclause 4.3 (Data sheets Clause 6)	Lamp dimensions
Annex III, article 3.1.3 (m)	Annex B or Annex E as	Spectral power distribution

Ecodesign requirements of Regulation No 1194/2012 [2012 OJ L342]	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
	appropriate	
Annex III, article 3.1.2 (n), (o)	Subclause 4.Z5	Mercury content
	Not covered in this standard	Dimmability
	Not covered in this standard	Lamp type (MR11 GU4 etc.)
Annex III, article 3.1.3 (j)	Annex B or Annex E as appropriate	Peak intensity in candela

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Annex ZZC (informative)

Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 874/2012 aimed to be covered

This European standard has been prepared under a Commission's standardisation request M/495 to provide one voluntary means of conforming to the energy labelling requirements of Commission Delegated Regulation (EU) No 874/2012 of 12 July 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of electrical lamps and luminaires [2012 OJ L258].

Once this standard is cited in the Official Journal of the European Union under that Regulation, compliance with the normative clauses of this standard given in Table ZZC.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding energy labelling requirements of that Regulation and associated EFTA Regulations.

Table ZZC.1 – Correspondence between this European Standard and Commission Delegated Regulation (EU) No 874/2012 of 12 July 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of electrical lamps and luminaires [2012 OJ L258] and Commission's standardisation request M/495

Energy labelling requirements of Regulation No 874/2012 [2012 OJ L258]	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Article 1	Annex B or Annex E as appropriate	Applicable parameter according to Article 1: luminous flux
Annex VII	Annex B or Annex E as appropriate	Lamp power
Annex VII	Annex B or Annex E as appropriate	Luminous flux (non-directional only)
Annex VII	Subclause 4.Z1	Useful luminous flux (directional only)
Annex VII	Annex B or Annex E as appropriate	Beam angle

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the products falling within the scope of this standard.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

METAL HALIDE LAMPS – PERFORMANCE SPECIFICATION

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.
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- 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.

International Standard IEC 61167 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This third edition replaces the second edition published in 2011. This third edition constitutes a technical revision.

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

- a) A set of new lamp data sheets (20 W, 35 W, 50 W, 100 W) is introduced.
- b) Reference to ILCOS (International lamp coding system) is removed from the lamp data sheets and now located in a new annex.
- c) Information on outer bulb temperature (and in some cases also on pin temperature and temperature adjacent to cap) is replaced with an explanation on differences in manufacturers' construction; this explanation is given in detail in a new annex.

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

FDIS	Report on voting
34A/1809/FDIS	34A/1830/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

NOTE In this standard, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

INTRODUCTION

A big step forward when standardising metal halide lamps and their operation was made with the second edition which was published in 2011. Meanwhile, agreements have been reached for introduction of new lamp types and in aspects of operation which led to the third edition.

Major changes of the **second edition** are as follows. Since IEC 62035 *Discharge lamps (excluding fluorescent lamps) – Safety specifications* was published in 1999, the related lamp specific performance standards like IEC 61167 needed to be reviewed in an editorial action, splitting performance and safety requirements, but also to include all items in abeyance, stored for this occasion. The separation has already been carried out with other HID lamps. So, in some instances, the “pilot” text of IEC 60188 has been used. Moreover, the measurement part has been introduced with the assistance of IEC 60188 and IEC 60081.

It may also be noted that the colour coordinates for CCT 3 000 K and 4 200 K were adjusted to a point two units below Planck in order to take account of the life time shift to higher y-values.

Apart from these basic changes which were needed for long time, the new technique of low frequency square wave (LFSW) operation was implemented. This has led to additional pages to the existing lamp data sheets and several annexes describing and specifying the requirements. Further, detailed requirements and measurement methods for the ignition (break down/take-over/run-up) were introduced. Intense discussions took place on measurement and specification of the peak-current ratio during ignition and steady state. Workshops were held in order to come to a broad worldwide acceptance of the concepts. The workshops were open for experts from lamp and control gear side in order to accommodate the interface between control gear and lamp to these requirements.

IEC SC34A MT PRESCO took the opportunity to add further lamp types which were considered of having market relevance and needing normative support.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning the lamp given in standard sheets 1039-1, 1041-1, 1080-1 and 1082-1.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent has assured the IEC that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patents is registered with the IEC. Information may be obtained from:

Panasonic Corporation
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Takatsuki City,
Osaka 569-1193,
Japan

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

Major changes of the **third edition** are as follows. Compared to the 2nd edition, a set of new lamp data sheets (20 W, 35 W, 50 W, 100 W) is introduced. Reference to ILCOS (International lamp coding system) is removed from the lamp data sheets and now located in a new annex. Information on outer bulb temperature (and in some cases also on pin temperature and temperature adjacent to cap) is replaced with an explanation on differences in manufacturers' construction; this explanation is given in detail in a new annex.

METAL HALIDE LAMPS – PERFORMANCE SPECIFICATION

1 Scope

This International Standard specifies the performance requirements for metal halide lamps for general lighting purposes.

For some of the requirements given in this standard, reference is made to “the relevant lamp data sheet”. For some lamps, these data sheets are contained in this standard. For other lamps, falling under the scope of this standard, the relevant data are supplied by the lamp manufacturer or responsible vendor.

The requirements of this standard relate only to type testing.

The requirements and tolerances permitted by this standard correspond to testing of a type test sample submitted by the manufacturer for that purpose. In principle this type test sample should consist of units having characteristics typical of the manufacturer’s production and being as close to the production centre point values as possible.

It may be expected that with the tolerances given in the standard, the product manufactured in accordance with the type test sample will comply with the standard for the majority of production. Due to the production spread however, it is inevitable that there will sometimes be products outside the specified tolerances. For guidance on sampling plans and procedures for inspection by attributes, see IEC 60410.

Z1 Overall statement

Where a Commission Regulation specifies limits for parameters these limits shall be used instead of the limits specified in this standard. 

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-845:1987, *International Electrotechnical Vocabulary – Chapter 845: Lighting*

IEC 60061-1, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps*

IEC 60598-1, *Luminaires – General requirements and tests*

IEC 60923, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

IEC 60927, *Auxiliaries for lamps – Starting devices (other than glow starters) – Performance requirements*

IEC TR 61341, *Method of measurement of centre beam intensity and beam angle(s) of reflector lamps*

IEC 62035, *Discharge lamps (excluding fluorescent lamps) – Safety specifications*

IEC 62471, *Photobiological safety of lamp and lamp systems*

CIE 84, *The measurement of luminous flux*

3 Terms and definitions

For the purposes of this document, the terms and definitions in IEC 60050-845 and the following apply.

3.1

metal halide lamp

high-intensity discharge lamp in which the major portion of the light is produced by the radiation of a mixture of metallic vapour, metal halides and the products issued from the dissociation of metal halides

Note 1 to entry: The definition covers clear and coated lamps.

[SOURCE: IEC 60050-845:1987, 845.07.25, modified]

3.2

nominal value

approximate quantity value used to designate or identify a lamp

[SOURCE: IEC 60081, 1.4.3]

3.3

rated value

quantity value for a characteristic of a lamp for specified operating conditions

The value and the conditions are specified in this standard, or assigned by the manufacturer or responsible vendor.

[SOURCE: IEC 60081, 1.4.4]

3.4

lumen maintenance

ratio of the luminous flux of a lamp at a given time in its life to the initial reading of its luminous flux, the lamp being operated under specific conditions

Note 1 to entry: The ratio is generally expressed as a percentage.

3.5

initial readings

starting characteristics of a lamp, measured before ageing, and the electrical and photometric characteristics, measured at the end of the 100 h ageing period

3.6

reference ballast

special ballast complying with the requirements of IEC 60923, designed for the purpose of providing comparison standards for use in testing ballasts, for the selection of reference lamps and for testing regular production lamps under standardised conditions

Note 1 to entry: It is essentially characterised by the fact that, at its rated frequency, it has a stable voltage/current ratio which is relatively uninfluenced by variations in current, temperature and electromagnetic surroundings, as outlined in the relevant ballast standard.

[SOURCE: IEC 60662:2011, 3.4, modified]

3.7

calibration current

value of the current on which the calibration and control of the reference ballast are based

3.8

type test

test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard

[SOURCE: IEC 60081:1997, 1.4.10]

3.9

specific effective radiant UV power

effective power of the UV radiation of a lamp related to its luminous flux

Note 1 to entry: Specific effective radiant UV power is expressed in mW/klm

Note 2 to entry: The effective power of the UV radiation is obtained by weighting the spectral power distribution of the lamp with the UV hazard function $S_{UV}(\lambda)$. Information about the relevant UV hazard function is given in IEC 62471. It only relates to possible hazards regarding UV exposure of human beings. It does not deal with the possible influence of optical radiation on materials, like mechanical damage or discoloration.

3.10

type test sample

sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test

3.11

inrush current

short term high lamp current, totally or partially rectified, by the asymmetrical electrode heating for some seconds during lamp ignition

3.12

warm-up current

increased lamp current after inrush phase which is due to the low initial lamp voltage

Note 1 to entry: It is in the limits of double rated lamp current down to a value corresponding to highest allowed lamp voltage.

3.13

run-up time

after switching on a 100 h aged lamp at rated supply voltage, maximum time allowed to reach 90 % of the declared luminous flux

3.14

take-over

time between lamp being able to conduct current until electrodes are at thermionic emission

Note 1 to entry: At the end of the take-over phase, the lamp power factor is above 0,9 and the lamp voltage stabilises and ramps up from about 20 V r.m.s.

3.15

peak current ratio

PCR

ratio between the peak currents and the r.m.s. currents

Note 1 to entry: For measurement procedure, see Annex G.

Note 2 to entry: This note applies to the French language only

3.16

typical lamp voltage

steady state lamp voltage expected for a lamp operating on low frequency square wave ballast

Note 1 to entry: Typical lamp current is derived from the lamp rated power and typical lamp voltage. In practice, lamps for use on low frequency square wave ballasts may be targeted to a different voltage within the allowed range for best performance, and the lamp current will be different accordingly. Typical lamp voltages and currents have been used as a basis for assigning currents at take-over and run-up.

3.17

typical lamp current

steady state lamp current expected for a lamp operating on low frequency square wave ballast

Note 1 to entry: Typical lamp current is derived from the lamp rated power and typical lamp voltage. In practice, lamps for use on low frequency square wave ballasts may be targeted to a different voltage within the allowed range for best performance, and the lamp current will be different accordingly. Typical lamp voltages and currents have been used as a basis for assigning currents at take-over and run-up.

3.18

commutation time

fall and rise time

transition time of lamp current at half cycle polarity reversals

Note 1 to entry: It is measured using lamp current waveforms between 90 % of the r.m.s. value of one half cycle to 90 % of the r.m.s. value of the opposite half cycle.

3.21

directional lamp

lamp having at least 80 % light output within a solid angle of π sr (corresponding to a cone with angle of 120°)

[SOURCE: Regulation 1194/2012, Article 2]

3.22

beam angle

the angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the lamp and through points at which the luminous intensity is 50 % of the centre beam intensity

[SOURCE: EN 61341]

3.23

partial luminous flux (of a light source, within a specified cone angle)

luminous flux emitted from a light source within a specified cone angle α determined from the luminous intensity distribution $I(\theta, \varphi)$ of the source:

$$\Phi_\alpha = \int_{\varphi=0}^{2\pi} \int_{\theta=0}^{\alpha/2} I(\theta, \varphi) \sin \theta d\theta d\varphi \quad (2)$$

Note 1 to entry: Partial luminous flux is expressed in lumen (lm).

Note 2 to entry: $(\theta, \varphi) = (0, 0)$ is the direction of the cone axis.

Note 3 to entry: The cone angle α is the full angle (diameter) of the cone.

[SOURCE: EN 13032-4:2015, 3.41, modified, – Notes 4 and 5 removed]

3.24

useful luminous flux, Φ_{use}

partial luminous flux of a lamp falling within the cone used for calculating the lamp's energy efficiency according Annex III, point 1.1 of regulation (EU) No 1194/2012 

Ⓒ Note 1 to entry: Useful luminous flux is expressed in lumen (lm).

Note 2 to entry: The regulation specifies 90° or 120° cones according to the product characteristics.

Note 3 to entry: Useful luminous flux is similar to partial luminous flux. It is determined with the cone axis coincident with the observed optical beam axis of the light source, the axis about which the luminous intensity is substantially symmetrical.

3.25

efficacy

‘luminous efficacy of a source’, ‘light source efficacy’ or ‘lamp efficacy’ (η_{source})

the quotient of the luminous flux emitted (Φ) by the power consumed by the source (P_{source}).
 $\eta_{\text{source}} = \Phi / P_{\text{source}}$. Unit: lm/W.

The power dissipated by auxiliary equipment such as ballasts is not included in the power consumed by the source

[SOURCE: Regulation 245/2009 Annex II, 1.a)]

3.26

Lamp Lumen Maintenance Factor (LLMF)

the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial luminous flux

[SOURCE: Regulation 245/2009 Annex II, 1.b)]

3.27

Lamp Survival Factor (LSF)

the fraction of the total number of lamps which continue to operate at a given time under defined conditions and switching frequency

[SOURCE: Regulation 245/2009 Annex II, 1.c)] Ⓒ

4 Lamp requirements

4.1 General

A lamp, on which compliance with this standard is claimed shall comply with the requirements of IEC 62035.

Some lamps are specified on the data sheet or declared by the manufacturer as suitable for operation on low frequency square wave ballasts only. For these lamps, separate requirements are indicated where appropriate.

A lamp shall be so designed that its performance is reliable in normal and accepted use. In general, this can be achieved by satisfying the requirements of the following subclauses.

The requirements given apply to 95 % of production.

4.2 Marking

A suitable advice on the colour appearance is required. It may preferably take the form of ILCOS (see IEC 61231). Other options are the manufacturer's code or the correlated colour temperature. The information may be given either on the lamp or in the supplier's catalogue.

Ⓒ Where a lamp is to be considered as a special purpose product according to Regulation (EC) No 1194/2012 this shall be declared by the supplier. Ⓒ

4.3 Dimensions

The dimensions of a lamp shall comply with the values specified on the relevant lamp data sheet.

4.4 Caps

The cap on a finished lamp shall comply with IEC 60061-1.

4.5 Starting and warm-up characteristics

4.5.1 Lamps that may operate on electromagnetic ballasts

A lamp shall start fully within the maximum run-up time specified on the relevant lamp data sheet and remain alight. Conditions and method of test are given in Annex A.

The maximum inrush current as given on the lamp data sheet shall not be exceeded. For the test circuit and procedure, see IEC 60923.

The lamp warm-up current shall be between the minimum and maximum values as given on the lamp data sheet. Conditions and method of test are given in Annex A.

NOTE The maximum inrush current (peak) restricts the value of the current during rectification in the starting phase in order to prevent performance damages of ballast and lamp (overheating and melting of the electrodes). The minimum warm-up current is required in order to safeguard the transition from the glow phase to the arc phase.

4.5.2 Lamps suitable for low frequency square wave ballasts only

A lamp shall start and run up fully within the time specified on the lamp data sheet, applying the method of test given in E.3.1.

4.6 Electrical characteristics

The lamp electrical characteristics shall comply with the values given in the relevant lamp data sheet. Conditions and method of test are given in Annex B.

For lamps suitable for operation on low frequency square wave ballasts only, conditions and method of test are given in Annex E. Unless otherwise specified on the lamp data sheet the lamp voltage shall comply with the limits of 75 V to 110 V.

NOTE For these lamps the power control of the ballast provides more freedom in the choice of lamp voltage to optimise the light technical properties of the lamp.

4.7 Photometric characteristics

The photometric requirements are as follows.

- a) The initial reading of the luminous flux shall be not less than 90 % of the rated value.
- b) The initial reading of the centre beam intensity of a reflector lamp shall be not less than 75 % of the rated value.
- c) The initial beam angle of a reflector lamp shall be within ± 25 % of the rated value for all beam angles.
- d) Conditions and method of test are given in Annex B.

For lamps suitable for operation on low frequency square wave ballasts only, conditions and method of test are given in Annex E.

4.21 Useful luminous flux

The useful luminous flux of a directional lamp shall be measured under the conditions of Annex A or Annex E as appropriate, by luminous intensity integration as described in EN 13032-4:2015, 6.3 "Partial luminous flux". 

☐ Alternative measurement methods may be used if they can be shown to give equivalent results for the product being tested, if necessary by applying correction factors. Measurements with lamps operating horizontally are often much easier to carry out. The reference method, however, uses the measurement position according to A.1.

In case of doubt a goniophotometry measurement of EN 13032-4:2015, 6.3 shall be used.

NOTE Below are a few examples of alternative measurement methods. It is not an exhaustive list.

- For small beam angles shine into integrating sphere.
- Mount lamp on internal surface of integrating sphere.
- Mount lamp inside integrating sphere with screening (LM-20 technique).
- Illuminate a surface and measure the illuminance across the surface with a photometer.
- Illuminate a surface and measure the surface luminance with a luminance camera.
- Illuminate a translucent screen and measure the surface luminance of the rear side with a luminance camera. ☐

4.8 Colour characteristics

4.8.1 Lamps with non-standardised chromaticity co-ordinates

The rated values and tolerance areas shall be assigned by the manufacturer or responsible vendor.

4.8.2 Lamps with standardised chromaticity co-ordinates

The correlated colour temperature and chromaticity co-ordinates applicable to a certain lamp are given on the relevant lamp data sheet. A collation is given in Table B.1.

4.8.3 Colour rendering index

The initial reading of the general colour rendering index (Ra) of a lamp shall not be less than the nominal value decreased by 3.

4.8.4 Requirements and test conditions

☐ The chromaticity coordinates and correlated colour temperature of an individual lamp shall be calculated according to CIE 15 from a measurement made under the conditions of Annex B or Annex E as appropriate.

The colour rendering index of an individual lamp shall be calculated according to CIE 13.3 from a measurement made under the conditions of Annex B or Annex E as appropriate. ☐

4.9 Lumen maintenance and life

Lumen maintenance and life shall comply with the data provided by the lamp manufacturer.

For methods of test, see Annex C.

☐ 4.Z2

The efficacy of an individual lamp shall be calculated from a measurement of luminous flux and power according to the conditions of Annex B or Annex E as appropriate.

4.Z3

The lamp lumen maintenance factor of an individual lamp shall be calculated from measurements of its luminous flux made at appropriate times according to the conditions of Annex B or Annex E as appropriate. Lamp operation between these measurements shall be as prescribed in Annex C. ☐

4.24

The survival of an individual lamp shall be determined by operating lamps under the conditions prescribed in Annex C until the lamp fails to remain alight or delivers low light output (in case of doubt, low light output refers to noticeably less than 50 % of rated light output).

4.25

The average mercury content shall be measured in accordance with the CV AAS method as described in EN 62321-4. 

5 Information for ballast, ignitor and luminaire design

In order to ensure reliable starting and operating conditions, ballasts, ignitors and luminaires should meet the requirements specified on the relevant lamp data sheet. For additional information for luminaire design, see Annex D.

IEC 60682 provides information for the measurement of the pinch temperature. Advice regarding the measurement of the bulb temperature can be taken from IEC 60357, Annex D.

These measurements should be taken account of, for performance criteria of the lamps.

For lamps with nominal power 35 W/70 W/150 W, rated power for electronic ballast design is 39 W/73 W/147 W respectively.

6 Data sheets

6.1 General principles of numbering sheets

The first number represents the number of this standard: 61167, followed by the letters “IEC”.

The second number represents the data sheet number.

The third number represents the edition of the page of the data sheet. In cases where a data sheet has more than one page, it is possible for the pages to have different edition numbers, with the data sheet number remaining the same.

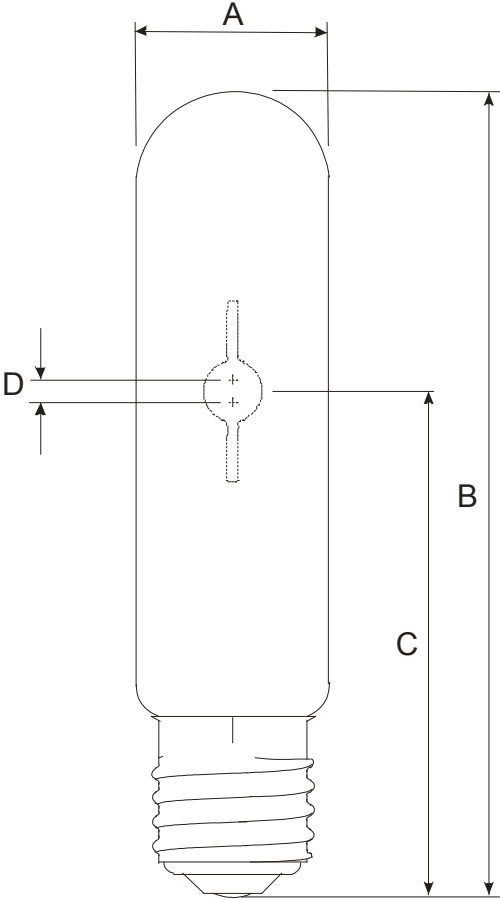
6.2 Lists of data sheets

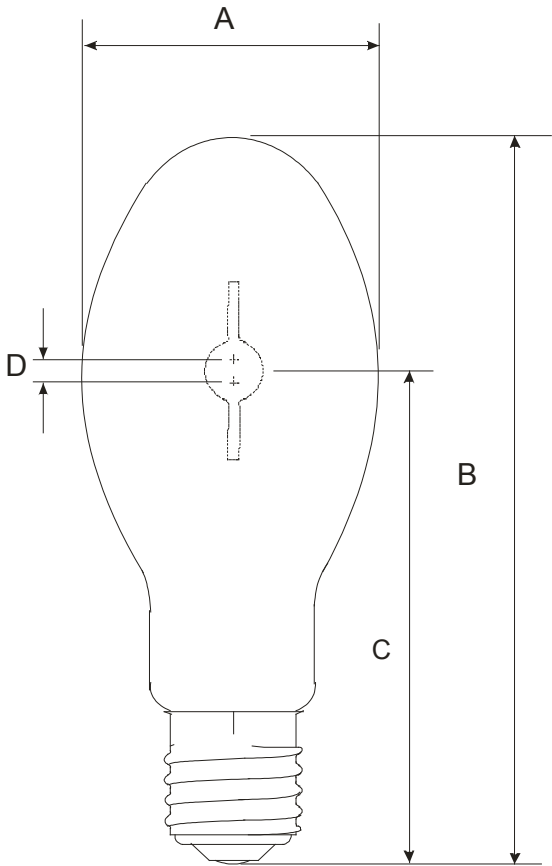
6.2.1 List of diagrammatic lamp data sheets

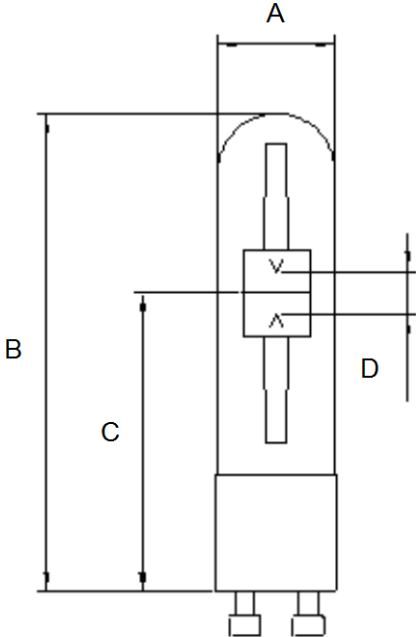
Table 1 represents the listing of diagrammatic data sheets, corresponding to lamp data sheets.

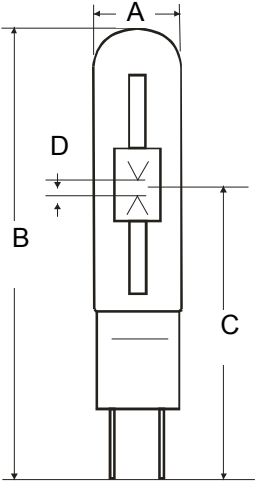
Table 1 – List of diagrammatic lamp data sheets

Sheet number 61167-IEC-	Description	Cap
0010	Single-capped	E27 and E40, tubular
0015	Single-capped	E27 and E40, elliptical
0020	Single-capped	GU6.5
0025	Single-capped	G8.5
0030	Single-capped	GU8.5
0035	Single-capped	G12
0210	Reflector	E27
0215	Reflector	GX8.5
0220	Reflector	GX10
0110	Double-capped	RX7s
0120	Double-capped	Fc2

	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
E27/E40 cap*, tubular bulb <i>Reference plane is the bottom of the lamp.</i>  The diagram shows a side view of a tubular metal halide lamp. It has a rounded top and a threaded base. Four dimensions are indicated: 'A' is the diameter of the bulb; 'B' is the distance from the reference plane (the bottom of the lamp) to the top of the bulb; 'C' is the light centre length, measured from the reference plane to the center of the bulb; and 'D' is the arc length, measured from the reference plane to the center of the bulb. Key - A Diameter - B Distance from reference plane to bulb top = total lamp length - C Light centre length - D Arc length * See sheet 7004-21 (E27) or 7004-24 (E40) of IEC 60061-1		
Texte français au verso French text overleaf	61167-IEC-0010-1	Publication CEI 61167 IEC Publication 61167

	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
E27/E40 cap*, elliptical bulb Reference plane is the bottom of the lamp.  Key A Diameter B Distance from reference plane to bulb top = total lamp length C Light centre length D Arc length * See sheet 7004-21-9 (E27) or 7004-24-6 (E40) of IEC 60061-1		
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	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
GU6.5 cap* <i>Reference plane is the lower cap rim.</i>  Key A Diameter B Distance from reference plane to bulb top C Light centre length D Arc length * See sheet 7004-152 of IEC 60061-1		
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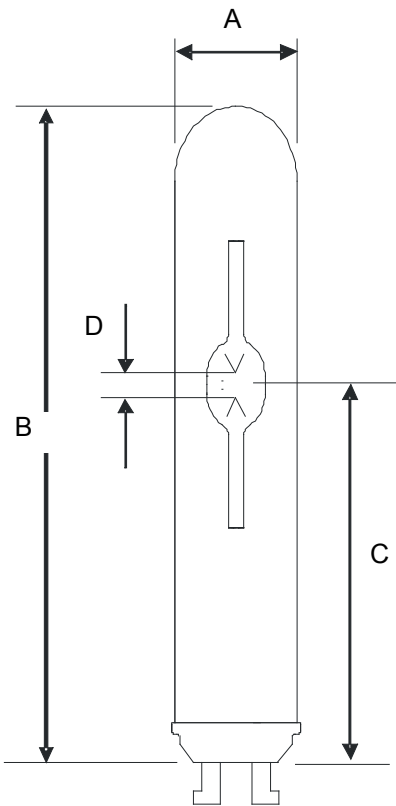
	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
G8.5 cap* <i>Reference plane is defined by the pin ends.</i>  Key A Diameter B Distance from reference plane to bulb top C Light centre length D Arc length * See sheet 7004-122 of IEC 60061-1		
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DIAGRAMMATIC DATA SHEET
FOR LOCATION OF SINGLE-CAPPED
METAL HALIDE LAMP DIMENSIONS

Page 1

GU8.5 cap*

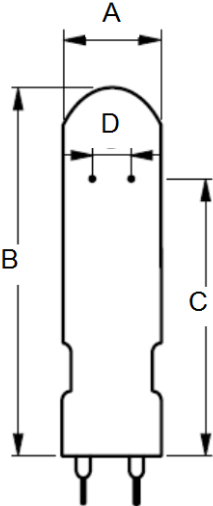
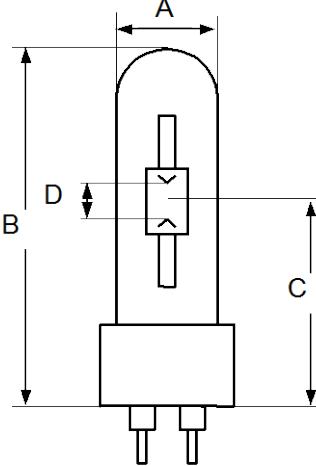
Reference plane is the lower cap rim.

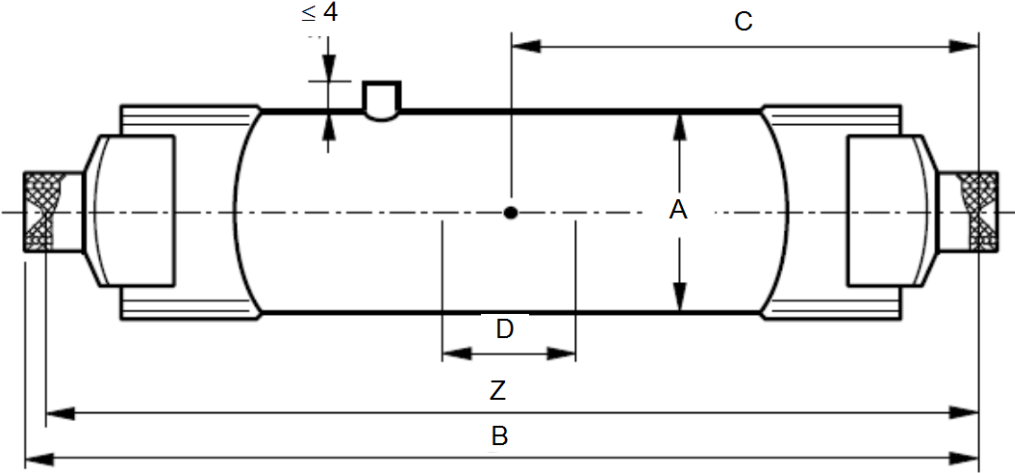


Key

- A Diameter
- B Distance from reference plane to bulb top
- C Light centre length
- D Arc length

* See sheet 7004-166 of IEC 60061-1

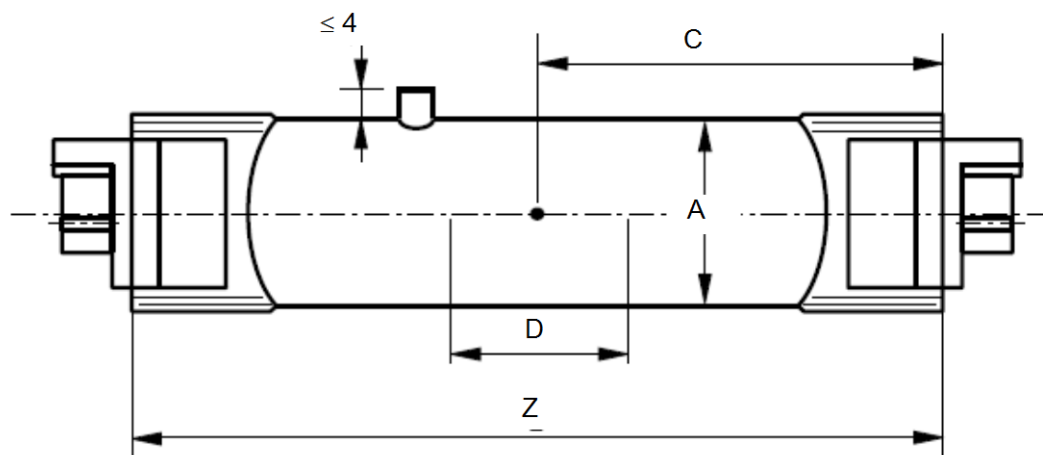
	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
G12 cap*		
<i>Reference plane is the lower cap rim.</i>		
 a) Quartz arc tube, transversal arc  b) Ceramic arc tube, axial arc		
Key A Diameter B Distance from reference plane to bulb top C Light centre length D Arc length** * See sheet 7004-63 of IEC 60061-1 ** The arc is transversal (left hand drawing), except for the lamps referred to in a footnote in the data sheets where it is axial (right hand drawing).		
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	DIAGRAMMATIC DATA SHEET FOR LOCATION OF DOUBLE-CAPPED METAL HALIDE LAMP DIMENSIONS	Page 1
RX7s and RX7s-24 cap*  Key A Diameter B Insertion length C Light centre length D Arc length Z Contact-to-contact length NOTE For the place of the exhaust tip, see Clause B.2. * See sheet 7004-92A of IEC 60061-1		
Texte français au verso French text overleaf	61167-IEC-0110-1	Publication CEI 61167 IEC Publication 61167 Documents Document Sharing Hub

DIAGRAMMATIC DATA SHEET FOR LOCATION OF DOUBLE-CAPPED METAL HALIDE LAMP DIMENSIONS

Page 1

Fc2 cap*



Key

- A Diameter
- C Light centre length
- D Arc length
- Z Distance between the two cap reference planes of the lamp

NOTE For the place of the exhaust tip see Clause B.2.

* See sheet 7004-114 of IEC 60061-1

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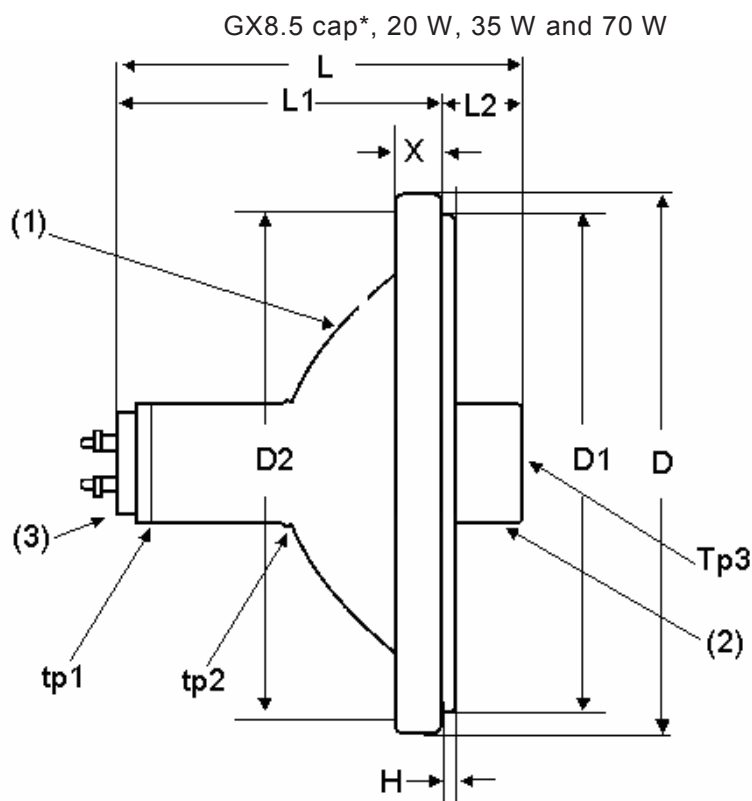
Documents

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	DIAGRAMMATIC DATA SHEET FOR LOCATION OF REFLECTOR METAL HALIDE LAMP DIMENSIONS	Page 1
E27 cap* The dot (arrow) marks the measuring point for cap contact temperature. Key D Diameter L Overall length * See sheet 7004-21 of IEC 60061-1		
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DIAGRAMMATIC DATA SHEET FOR LOCATION OF REFLECTOR METAL HALIDE LAMP DIMENSIONS

Page 1



Key

- (1) Metal reflector
- (2) Anti-glare screen
- (3) Cap GX8.5
- D Lamp diameter
- D1 Reflector outer rim
- D2 Open diameter behind reflector rim
- H Height of the reflector outer rim above X
- L Overall length without pins
- L1 Length from the upper corner of the reflector stop rim to cap bottom (without pins)
- L2 Height of antiglare shield above the reflector outer rim
- X Thickness of the reflector stop rim
- Tp1, Tp2 and Tp3: temperature measurement points refer to the information for luminaire design on the relevant lamp data sheet

* See sheet 7004-143 of IEC 60061-1

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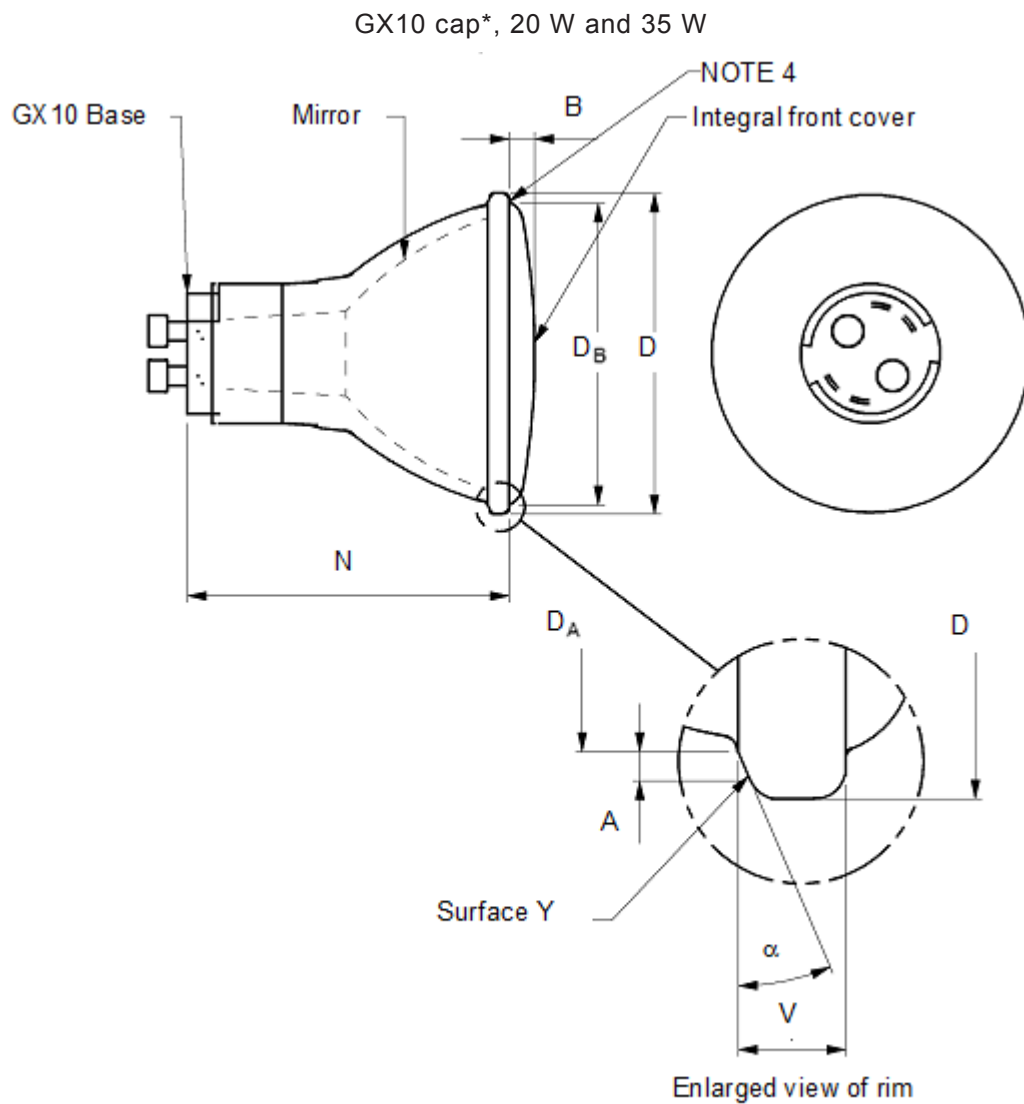
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DIAGRAMMATIC DATA SHEET FOR LOCATION OF REFLECTOR METAL HALIDE LAMP DIMENSIONS

Page 1



Key

D Lamp diameter

N Length from cap reference plane (cap without pins) to reflector rim

V is measured at D_A

^a This surface is to be defined by the annulus formed by the difference between diameters D and D_B . It can be used to position the lamp and when so used should mate firmly with any rim-centring device to obtain proper optical alignment.

* See sheet 7004-144 of IEC 60061-1

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IEC Publication 61167

6.2.2 List of lamp data sheets

Table 2 represents the listing of lamp data sheets in the order of:

- type (single-capped, reflector, double-capped);
- lamp power;
- details of cap.

Table 2 – List of lamp data sheets

Sheet number 61167-IEC-	Description	Nominal power W	Cap	Correlated colour temperature K	Operation
1020	Single-capped	20	GU6.5	3 000	LFSW
1025	Single-capped	20	G8.5	3 000	LFSW
1027	Single-capped	20	G12	3 000	LFSW
1030	Single-capped	35	GU6.5	3 000	LFSW
1035	Single-capped	35	G8.5	3 000	50/60 Hz/LFSW
1037	Single-capped	35	G8.5	4 200	50/60 Hz/LFSW
1039	Single-capped	35	GU8.5 (protected)	3 000	LFSW
1041	Single-capped	35	GU8.5 (protected)	4 200	LFSW
1043	Single-capped	35	G12	3 000	50/60 Hz/LFSW
1045	Single-capped	35	G12	4 200	50/60 Hz/LFSW
1050	Single-capped	50	GU6.5	3 000	LFSW
1052	Single-capped	50	G8.5	3 000	50/60 Hz/LFSW
1054	Single-capped	50	G12	3 000	50/60 Hz/LFSW
1070	Single-capped, tubular	70	E27	3 000	50/60 Hz/LFSW
1072	Single-capped, elliptical	70	E27	3 000	50/60 Hz/LFSW
1074	Single-capped, elliptical	70	E27	4 200	50/60 Hz/LFSW
1076	Single-capped	70	G8.5	3 000	50/60 Hz/LFSW
1078	Single-capped	70	G8.5	4 200	50/60 Hz/LFSW
1080	Single-capped	70	GU8.5 (protected)	3 000	LFSW
1082	Single-capped	70	GU8.5 (protected)	4 200	LFSW
1084	Single-capped	70	G12	3 000	50/60 Hz/LFSW
1086	Single-capped	70	G12	4 200	50/60 Hz/LFSW
1100	Single-capped, elliptical	100	E27 (protected)	3 000	50/60 Hz/LFSW
1105	Single-capped, elliptical	100	E27 (protected)	4 200	50/60 Hz/LFSW
1110	Single-capped	100	G12	3 000	50/60 Hz/LFSW
1115	Single-capped	100	G12	4 200	50/60 Hz/LFSW
1150	Single-capped, elliptical	150	E27	3 000	50/60 Hz/LFSW
1152	Single-capped, elliptical	150	E27	4 200	50/60 Hz/LFSW

Sheet number 61167-IEC-	Description	Nominal power W	Cap	Correlated colour temperature K	Operation
1154	Single-capped, tubular	150	E40	3 000	50/60 Hz/LFSW
1156	Single-capped	150	G12	3 000	50/60 Hz/LFSW
1158	Single-capped	150	G12	4 200	50/60 Hz/LFSW
2015	Reflector PAR20	20	E27	3 000	LFSW
2020	Reflector PAR30	20	E27	3 000	LFSW
2022	Reflector R111	20	GX8.5	3 000	LFSW
2024	Reflector MR16	20	GX10	3 000	LFSW
2035	Reflector PAR20	35	E27	3 000	50/60 Hz/LFSW
2037	Reflector PAR30	35	E27	3 000	50/60 Hz/LFSW
2039	Reflector PAR20	35	E27	4 200	50/60 Hz/LFSW
2041	Reflector R111	35	GX8.5	3 000	50/60 Hz/LFSW
2043	Reflector R111	35	GX8.5	4 200	50/60 Hz/LFSW
2045	Reflector MR16	35	GX10	3 000	LFSW
2050	Reflector PAR20	50	E27	3 000	50/60 Hz/LFSW
2052	Reflector PAR30	50	E27	3 000	50/60 Hz/LFSW
2054	Reflector R111	50	GX8.5	3 000	50/60 Hz/LFSW
2056	Reflector MR16	50	GX10	3 000	LFSW
2070	Reflector PAR30	70	E27	3 000	50/60 Hz/LFSW
2072	Reflector PAR30	70	E27	4 200	50/60 Hz/LFSW
2074	Reflector R111	70	GX8.5	3 000	50/60 Hz/LFSW
2076	Reflector R111	70	GX8.5	4 200	50/60 Hz/LFSW
3070	Double-capped	70	RX7s	3 000	50/60 Hz/LFSW
3075	Double-capped	70	RX7s	4 200	50/60 Hz/LFSW
3150	Double-capped	150	RX7s-24	3 000	50/60 Hz/LFSW
3155	Double-capped	150	RX7s-24	4 200	50/60 Hz/LFSW
3250	Double-capped	250	Fc2	4 200	50/60 Hz

METAL HALIDE LAMP DATA SHEET

Page 1

Nominal power	Correlated colour temperature (nominal)	Version	Cap
20 W	3 000 K	Single-capped	GU6.5

Dimensions (mm)			
A (max.)	B (max.)	C	D (nominal)
13,3	52	30±2	3,5

See sheet 61167-IEC-0020.

Run-up characteristics at rated supply voltage ¹⁾		
Max. time to 90 % lumens	min	3

Electrical characteristics under square wave conditions in steady state operation ¹⁾		
Rated power for ballast design	Typical lamp voltage	Typical lamp current
W	V	A
20	95	0,211
For lamps declared by manufacturers as suitable for use on LFSW ballasts only, initial lamp voltages shall be in the range of 75 V to 110 V. Manufacturers may have different target values for lamp voltage and the current will vary accordingly.		

Colour characteristics (nominal) ¹⁾	
Correlated colour temperature	K
Chromaticity co-ordinate x	
Chromaticity co-ordinate y	
Colour rendering index Ra	
	3 000
	0,434
	0,398
	80

Information for reference ballast (see Annex E)		
Series resistor of the low frequency square wave reference ballast	Ω	680

¹⁾ Values after 100 h ageing. Test position: vertical cap-up ±5°.

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Information for square wave ballast design (see Annex G)				
Superimposed ignition				
			Min.	Max.
Pulse height		kV _{peak}	3,0	5 ¹⁾
Pulse width at 90 % peak, option (1)		µS/S	100	
Pulse width at 90 % peak, option (2) with 3 s@a, combined with	a =	µS/S	250	
pulse width at 90 % peak, option (2) with 30 s@b	b =		2)	
Resistance at take-over		Ω	8 200 typical	
Resistance at run-up		Ω	62 typical	
The resistors for take-over and run-up are part of the set-up in order to measure the current.				
Run-up current: I _{run-up}		A	0,30	0,50
Steady state operation				
High frequency ripple limitation range		kHz	10	1 000
Performance limits of rated power for extended operation				
120 V to 150 V lamp voltage		%	80	110
Because of a possible risk that abnormal operating conditions may occur at the end of lamp life which can lead to ballast overheating, suitably protected circuits shall be used for the operation of this lamp.				
Information for luminaire design				
Maximum permissible lamp temperature adjacent to cap for normal lamp operation		°C	*3)	
Maximum permissible bulb temperature for normal lamp operation		°C	3)	
Maximum permissible pin temperature for normal lamp operation		°C	3)	
Operating position			any	
The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1.				
Maximum specific effective radiant UV power of the lamp		mW/klm	2	

1)

This limit is for safety reasons.

2)

50 to 100, exact value under consideration.

3)

Lamp operating temperatures and burning position can affect performance. Due to different designs from different manufacturers, temperature limits will differ. Limits from the relevant manufacturer's data sheets apply.

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Nominal power	Correlated colour temperature (nominal)	Version	Cap
20 W	3 000 K	Single-capped	G8.5

Dimensions (mm)			
A (max.)	B (max.)	C	D (nom.)
17	85	52±1	3,5

See sheet 61167-IEC-0025.

Run-up characteristics at rated supply voltage ¹⁾		
Max. time to 90 % lumens	min	3

Electrical characteristics under square wave conditions in steady state operation ^{1) 2)}		
Rated wattage for ballast design	Typical lamp voltage	Typical lamp current
W	V	A
20	95	0,211

For lamps declared by manufacturers as suitable for use on LFSW ballasts only, initial lamp voltages shall be in the range of 75 V to 110 V. Manufacturers may have different target values for lamp voltage and the current will vary accordingly.

Colour characteristics (nominal) ¹⁾	
Correlated colour temperature	K
Chromaticity co-ordinate x	0,434
Chromaticity co-ordinate y	0,398
Colour rendering index Ra	80

Information for reference ballast (see Annex E)	
Series resistor of the low frequency square wave reference ballast	Ω
	680

¹⁾ Values after 100 h ageing. Test position: vertical cap-up ±5°.

²⁾ This lamp is suitable for operation on low frequency square wave ballasts only.

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Information for square wave ballast design (see Annex G)

Superimposed ignition

			Min.	Max.
Pulse height		kV _{peak}	3	5 ²⁾
Pulse width at 90 % peak, option (1)		µs/s	100	
Pulse width at 90 % peak, option (2) with 3 s@a, combined with pulse width at 90 % peak, option (2) with 30 s@b	a =	µs/s	250	
	b =		1)	
Resistance at take-over		Ω	8 200 typical	
Resistance at run-up		Ω	62 typical	
The resistors for take-over and run-up are part of the set-up in order to measure the current.				
Run-up current: I_{run-up}		A	0,30	0,50

Steady state operation

High frequency ripple limitation range	kHz	10	1 000
Performance limits of rated power for extended operation			
120 V to 150 V lamp voltage	%	80	110

Because of a possible risk that abnormal operating conditions may occur at the end of lamp life which can lead to ballast overheating, suitably protected circuits shall be used for the operation of this lamp.

Information for luminaire design

Maximum permissible pinch temperature	°C	280 *
Maximum permissible outer bulb temperature	°C	3)
Operating position		any
Maximum specific effective radiant UV power of the lamp	mW/klm	2
The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1.		

¹⁾ 50 to 100, exact value under consideration

²⁾ This limit is for safety reasons.

³⁾ Lamp operating temperatures and burning position can affect performance. Due to different designs from different manufacturers, temperature limits will differ. Limits from the relevant manufacturer's data sheets apply.

* Under consideration.

METAL HALIDE LAMP DATA SHEET

Page 1

Nominal power	Correlated colour temperature (nominal)	Version	Cap
20 W	3 000 K	Single-capped	G12

Dimensions (mm)			
A (max.)	B (max.)	C	D (nom.)
20	90	56±1	3,5

See sheet 61167-IEC-0035b

Run-up characteristics at rated supply voltage ¹⁾		
Max. time to 90% lumens	min	3

Electrical characteristics under square wave conditions in steady state operation ¹⁾		
Rated power for ballast design	Typical lamp voltage	Typical lamp current
W	V	A
20	95	0,211
This lamp is suitable for operation on low frequency square wave ballasts only. Initial lamp voltages shall be in the range of 75 V to 110 V. Manufacturers may have different target values for lamp voltage and the current will vary accordingly.		

Colour characteristics (nominal) ¹⁾	
Correlated colour temperature	K
	3 000
Chromaticity co-ordinate x	0,434
Chromaticity co-ordinate y	0,398
Colour rendering index Ra	80

Information for reference ballast (see Annex E)		
Series resistor of the low frequency square wave reference ballast	Ω	680

¹⁾ Values after 100 h ageing. Test position: vertical cap-up ±5°.

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Information for square wave ballast design (see Annex G)				
Superimposed ignition				
		Min.	Max.	
Pulse height		kV _{peak}	3	5 ²⁾
Pulse width at 90% peak, option (1)		µs/s	100	
Pulse width at 90% peak, option (2) with 3 s@a, combined with pulse width at 90% peak, option (2) with 30 s@b	a =	µs/s	250	
	b =		³⁾	
Resistance at take-over		Ω	8 200 typical	
Resistance at run-up		Ω	62 typical	
The resistors for take-over and run-up are part of the set-up in order to measure the current.				
Run-up current: <i>I</i> _{run-up}		A	0,30	0,50
Steady state operation				
High frequency ripple limitation range		kHz	10	1 000
Performance limits of rated power for extended operation				
120 V to 150 V lamp voltage		%	80	110
Because of a possible risk that abnormal operating conditions may occur at the end of lamp life which can lead to ballast overheating, suitably protected circuits shall be used for the operation of this lamp.				

Information for luminaire design	
Maximum permissible pinch temperature	°C
Maximum permissible bulb temperature	°C
Operating position	any
Maximum specific effective radiant UV power of the lamp	mW/klm
The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1.	

2) This limit is for safety reasons.

3) 50 to 100, exact value under consideration.

4) Lamp operating temperatures and burning position can affect performance. Due to different designs from different manufacturers, temperature limits will differ. Limits from the relevant manufacturer's data sheets apply.

* Under consideration

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Nominal power	Correlated colour temperature (nominal)	Version	Cap
35 W	3 000 K	Single-capped	GU6.5

Dimensions (mm)			
A (max.)	B (max.)	C	D (nom.)
13,3	52	30±2	5

See sheet 61167-IEC-0020

Run-up characteristics at rated supply voltage ¹⁾		
Max. time to 90% lumens	min	3

Electrical characteristics under square wave conditions in steady state operation ¹⁾		
Rated power for ballast design W	Typical lamp voltage V	Typical lamp current A
39	85	0,46
This lamp is suitable for operation on low frequency square wave ballasts only. Initial lamp voltages shall be in the range of 75 V to 110 V. Manufacturers may have different target values for lamp voltage and the current will vary accordingly.		

Colour characteristics (nominal) ¹⁾	
Correlated colour temperature	K
Chromaticity co-ordinate x	0,434
Chromaticity co-ordinate y	0,398
Colour rendering index Ra	85

Information for reference ballast (see Annex E)		
Series resistor of the low frequency square wave reference ballast	Ω	340

¹⁾ Values after 100 h ageing. Test position: vertical cap-up ±5°.

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Information for square wave ballast design (see Annex G)

Superimposed ignition

		Min.	Max.
Pulse height	kV _{peak}	3	5 ²⁾
Pulse width at 90 % peak, option (1)	µs/s	100	
Pulse width at 90 % peak, option (2) with 3 s@a, combined with	a =	250	
pulse width at 90 % peak, option (2) with 30 s@b	b =	³⁾	
Resistance at take-over	Ω	4 300 typical	
Resistance at run-up	Ω	30 typical	
The resistors for take-over and run-up are part of the set-up in order to measure the current.			
Run-up current: I_{run-up}	A	0,46	0,92

Steady state operation

High frequency ripple limitation range	kHz	10	1 000
Performance limits of rated power for extended operation			
120 V to 135 V lamp voltage	%	80	110
>135 V to 150 V lamp voltage	%	0	110

Because of a possible risk that abnormal operating conditions may occur at the end of lamp life which can lead to ballast overheating, suitably protected circuits shall be used for the operation of this lamp.

Information for luminaire design

Maximum permissible lamp temperature adjacent to cap for normal lamp operation	°C	4)
Maximum permissible bulb temperature for normal lamp operation	°C	4)
Maximum permissible pin temperature for normal lamp operation	°C	4)
Operating position		any
Maximum specific effective radiant UV power of the lamp	mW/klm	2

The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1

²⁾ This limit is for safety reasons.

³⁾ 50 to 100, exact value under consideration.

⁴⁾ Lamp operating temperatures and burning position can affect performance. Due to different designs from different manufacturers, temperature limits will differ. Limits from the relevant manufacturer's data sheets apply.

METAL HALIDE LAMP DATA SHEET

Page 1

Nominal power	Correlated colour temperature (nominal)	Version	Cap
35 W	3 000 K	Single-capped	G8.5

Dimensions (mm)			
A (max.)	B (max.)	C	D (nom.)
17	85	52±1	5

See sheet 61167-IEC-0025.

Run-up characteristics at rated supply voltage ¹⁾		
Max. time to 90 % lumens	min	3

Electrical characteristics at 50 Hz and 60 Hz ¹⁾				
		Rated	Minimum	Maximum
Power	W	39		
Voltage	V	90	80	105
Current	A	0,53		

Colour characteristics (nominal) ¹⁾	
Correlated colour temperature	K
Chromaticity co-ordinate x	
Chromaticity co-ordinate y	
Colour rendering index Ra	

Reference ballast characteristics	
Rated frequency	Hz
Rated voltage	V
Calibration current	A
Voltage/current ratio	Ω
Power factor	

¹⁾ Values after 100 h ageing. Test position: vertical cap-up ±5°.

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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="5" style="text-align: center;">Information for electromagnetic ballast design</th> </tr> <tr> <th colspan="3"></th> <th style="text-align: center;">Min.</th> <th style="text-align: center;">Max.</th> </tr> <tr> <td>Open circuit voltage for starting</td> <td style="text-align: center;">V</td> <td style="text-align: center;">r.m.s.</td> <td style="text-align: center;">198</td> <td></td> </tr> <tr> <td>Sustaining voltage for stable operation</td> <td style="text-align: center;">V</td> <td style="text-align: center;">r.m.s.</td> <td style="text-align: center;">198*</td> <td style="text-align: center;">305</td> </tr> <tr> <td>Inrush current</td> <td style="text-align: center;">A</td> <td style="text-align: center;">peak</td> <td></td> <td style="text-align: center;">10,6</td> </tr> <tr> <td>Warm-up current</td> <td style="text-align: center;">A</td> <td style="text-align: center;">r.m.s.</td> <td style="text-align: center;">0,53</td> <td style="text-align: center;">1,06</td> </tr> <tr> <td colspan="5"> Because of a possible risk that abnormal operating conditions may occur at the end of lamp life, which can lead to ballast overloading, suitably protected circuits shall be used for operation of this lamp. </td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: center;">Information for ignitor design*</th> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="text-align: center;">Information for luminaire design</th> </tr> <tr> <td>Maximum permissible pinch temperature</td> <td style="text-align: center;">°C</td> <td style="text-align: center;">250*</td> </tr> <tr> <td>Maximum permissible outer bulb temperature</td> <td style="text-align: center;">°C</td> <td style="text-align: center;">2)</td> </tr> <tr> <td>Operating position</td> <td></td> <td style="text-align: center;">any</td> </tr> <tr> <td>Maximum specific effective radiant UV power of the lamp</td> <td style="text-align: center;">mW/klm</td> <td style="text-align: center;">2</td> </tr> <tr> <td colspan="3"> The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1. </td> </tr> </table> 2) Lamp operating temperatures and burning position can affect performance. Due to different designs from different manufacturers, temperature limits will differ. Limits from the relevant manufacturer's data sheets apply. * Under consideration.			Information for electromagnetic ballast design								Min.	Max.	Open circuit voltage for starting	V	r.m.s.	198		Sustaining voltage for stable operation	V	r.m.s.	198*	305	Inrush current	A	peak		10,6	Warm-up current	A	r.m.s.	0,53	1,06	Because of a possible risk that abnormal operating conditions may occur at the end of lamp life, which can lead to ballast overloading, suitably protected circuits shall be used for operation of this lamp.					Information for ignitor design*	Information for luminaire design			Maximum permissible pinch temperature	°C	250*	Maximum permissible outer bulb temperature	°C	2)	Operating position		any	Maximum specific effective radiant UV power of the lamp	mW/klm	2	The luminaire shall be provided with a protective shield. For requirements, see IEC 60598-1.		
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Electrical characteristics under square wave conditions in steady state operation ¹⁾

Rated power for ballast design W	Typical lamp voltage V	Typical lamp current A
39	85	0,46

For lamps declared by manufacturers as suitable for use on LFSW ballasts only, initial lamp voltages shall be in the range of 75 V to 110 V. Manufacturers may have different target values for lamp voltage and the current will vary accordingly.

Information for reference ballast (see Annex E)

Series resistor of the low frequency square wave reference ballast	Ω	340
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Information for square wave ballast design (see Annex G)

Superimposed ignition

			Min.	Max.
Pulse height		kV _{peak}	3	5 ³⁾
Pulse width at 90 % peak, option (1)		μs/s	100	
Pulse width at 90 % peak, option (2) with 3 s@a, combined with pulse width at 90 % peak, option (2) with 30 s@b	a =	μs/s	250	
	b =		²⁾	
Resistance at take-over		Ω	4 300 typical	
Resistance at run-up		Ω	30 typical	
The resistors for take-over and run-up are part of the set-up in order to measure the current.				
Run-up current: <i>I</i> _{run-up}		A	0,46	0,92

Steady state operation

High frequency ripple limitation range	kHz	10	1 000
Performance limits of rated power extended operation			
120 V to 135 V lamp voltage	%	80	110
>135 V to 150 V lamp voltage	%	0	110

Because of a possible risk that abnormal operating conditions may occur at the end of lamp life which can lead to ballast overheating, suitably protected circuits shall be used for the operation of this lamp.

¹⁾ Values after 100 h ageing. Test position: vertical cap-up $\pm 5^\circ$.

²⁾ 50 to 100, exact value under consideration

³⁾ This limit is for safety reasons.