

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Metal halide lamps – Performance specification

Lampes aux halogénures métalliques – Spécifications de performance

IEC 61167-1:2015

<https://standards.iteh.ai/en/standards/iec/61167-1/iec-61167-1-2015>



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INTERNATIONAL STANDARD

NORME INTERNATIONALE



Metal halide lamps – Performance specification

Lampes aux halogénures métalliques – Spécifications de performance

INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**METAL HALIDE LAMPS –
PERFORMANCE SPECIFICATION**

FOREWORD

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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.

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- reconfirmed,
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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
1-1 Saiwai-cho,
Takatsuki City,
Osaka 569-1193,
Japan

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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.

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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.

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.

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.

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.

4.8 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.