

INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-pressure sodium vapour lamps – Performance specifications

Lampes à vapeur de sodium à haute pression – Spécifications de performance

IEC 60662:2011

<https://standards.iteh.ai/catalog/standards/sist/04b893a0-0bf2-43f4-91d4-5f437e20acb7/iec-60662-2011>



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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HIGH-PRESSURE SODIUM VAPOUR LAMPS – PERFORMANCE SPECIFICATIONS

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International Standard IEC 60662 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 1980 and its amendments. It constitutes a technical revision.

Main items that required development of the 2nd edition of IEC 60662 are:

- restriction to performance requirements. Safety requirements are given in IEC 62035: *Discharge lamps (excluding fluorescent lamps) – Safety specifications*;
- introduction of a test device for ignition;
- split of the lamp data sheets which make use of the test device and those which do not;
- provisions for measurement during starting, measurement of electrical and photometrical characteristics and tests for lumen maintenance and life;
- general review e.g. of maximum lamp outlines and alignment of data;
- new order of data sheets by wattage.

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

FDIS	Report on voting
34A/1432/FDIS	34A/1452/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.

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- withdrawn,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.

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INTRODUCTION

The relation between data sheet numbers of the first and the second edition is given below.

Lamp data sheets							
1 st edition	2 nd edition		1 st edition	2 nd edition		1 st edition	2 nd edition
1010	3250		1090	1105		2120	3300
1010	3255		1100	9000		2120	3305
1010	3260		1110	0770		2130	3310
1020	3265		1120	0775		2130	3315
1020	3270		1130	0780		2140	4500
1030	4400		1140	0785		2140	4505
1030	4405		1150	9005		2150	4510
1030	4410		1160	9010		2150	4515
1040	4415		1170	0550		3010	2300
1040	4420		1180	0555		3020	3400
1050	2150		1190	0560		3030	4600
1050	2155		-	6000		4010	3500
1060	2160		2100	2200		4020	3505
1060	2165		2110	2210		4030	4700
1070	1119		2110	2215		4040	4705
1080	1100						

Lamp outline sheets			
1 st edition	2 nd edition	1 st edition	2 nd edition
-	150 01	9030 mod.	400 01
9010	250 01	9031	400 02
9011	250 02	9032	400 03
9012 mod.	250 03	9040 mod.	400 04
9020	250 04		

HIGH-PRESSURE SODIUM VAPOUR LAMPS – PERFORMANCE SPECIFICATIONS

1 Scope

This International Standard specifies performance requirements for high-pressure sodium vapour lamps for general lighting purposes which comply with the safety requirements of IEC 62035.

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 dealing with the lamp starting test and associated information for ballast/ignitor design are different depending on the practice of the country in which the lamp type was originally developed.

NOTE 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 with the tolerances given in the standard that 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 referenced documents are indispensable for the application 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 60050-845:1987, *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 60061-3, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 3: Gauges*

IEC 60923:2005, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*¹
Amendment 1 (2006)

IEC 61347-2-1, *Lamp controlgear – Part 2-1: Particular requirements for starting devices (other than glow starters)*

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

3 Terms and definitions

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

¹⁾ There exists a consolidated edition 3.1 that comprises edition 3 and its Amendment 1.

3.1

high-pressure sodium vapour lamp

high-intensity discharge lamp in which the light is produced mainly by radiation from sodium vapour operating at a partial pressure of the order of 10 kilopascals

NOTE The term covers lamps with clear or diffusing bulb.

[IEC 60050-845 :1987, 845-07-23]

3.2

nominal value

approximate quantity value used to designate or identify a lamp

[IEC 60081:1997, definition 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.

[IEC 60081:1997, definition 1.4.4]

3.4

reference ballast

special inductive type ballast, 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

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 magnetic surroundings, as outlined in the relevant ballast standard.

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3.5

calibration current

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

3.6

type test

test or 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

[IEC 60081:1997, definition 1.4.10]

3.7

type test sample

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

[IEC 60081:1997, definition 1.4.11]

4 General lamp requirements

4.1 Conditions on safety

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

4.2 Expectations on performance

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 clauses.

The requirements and information given apply to 95 % of production.

4.3 Classification

For the purpose of this standard, the following designations are used as a classification according to the rated voltage at lamp terminals:

Lamp voltage designation	Abbreviation	Lamp voltage range V
Low lamp voltage	LV	< 70
High lamp voltage	HV	70 to 180
Extra high lamp voltage	EHV	> 180

5 Marking

In addition to lamp marking requirements prescribed in IEC 62035, the following symbols, indicating the starting method shall be marked on the lamp:

- for lamps without an internal starting device and requiring an external ignitor
- for lamps having an internal starting device



NOTE In the U.S.A., lamps are marked with an electrical code that is used to identify the proper ballast. See local standards. The symbols are not required or used in U.S.A.

6 Dimensions

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

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7 Caps

<https://standards.iteh.ai/catalog/standards/sist/04b893a0-0b12-43f4-91d4-5f437e20acb7/iec-60662-2011>

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

8 Test requirements for lamp starting, warm-up, electrical and photometric characteristics

8.1 General

For the tests for lamp starting, lamp warm-up and lamp electrical characteristics the lamps shall be operated in a horizontal position in free air and at an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$, on a 50 Hz or 60 Hz sinusoidal power supply using the specified reference ballast at voltage specified on the lamp data sheet. Lamps shall not be operated during 5 h immediately prior to making the starting test.

8.2 Lamp starting test

8.2.1 Lamps with external ignitor

In view of various types of ignitors in the market using essentially different methods for ignition, a well-defined reference device² allows to determine whether a lamp is ignitable in the sense of the standard or not. Since the device also is the basis for comparable measurements, essential component changes are not permitted unless the responsible IEC maintenance team has agreed the changes.

All variable starting parameters are given on the lamp data sheet and refer to either adjustments of the device or to an implicit property thereof (e.g. waveshape), see Figure A.1 for pulse features. If the lamp data sheet requires a second pulse, during the negative half

² The device can be obtained for example from Spitzenberger + Spies, D-94234 Viechtach, Germany. Brand name is LST15. This information is given for the convenience of users of this document and does not constitute an endorsement by the IEC of the product named.

cycle, the shape of this second pulse is according to Figure A.2. The fixed settings of the reference device are given in Annex F.

The pulse characteristics specified on the relevant lamp data sheet are measured at the device output terminals in open circuit condition.

NOTE In U.S.A., the reference device is not used. A description of the pulse is given in Figure A.3. The starting pulse is measured with a simulated lamp-load of 20 pF across the lampholder terminals.

The circuit connections for lamp starting shall be such that the pulse is applied to the lamp through the eyelet terminal of the cap and with the shell substantially at earth potential.

8.2.2 Lamps with internal starting device

The test voltage shall be as indicated in the relevant lamp data sheet. The starting time measured from applying the test voltage shall not exceed the maximum value shown on the lamp data sheets.

8.3 Lamp warm-up test

Prior to the warm-up test, the lamps shall have been aged for a minimum of 10 h using a suitable production ballast and cooled for a minimum of 1 h prior to the test.

The voltage at lamp terminals shall reach a minimum value within the time specified on the relevant lamp data sheet.

8.4 Ageing

Before the initial readings are taken the lamp shall be subjected to ageing for 100 h. This operation may be carried out on a production ballast.

8.5 Lamp electrical characteristics

The lamp electrical characteristics shall comply with the values given in the relevant lamp data sheet, using the measuring method given in Annex G. During measurement of the electrical characteristics, the external ignitor shall be disconnected from the lamp circuit.

8.6 Extinguishing voltage test

This test shall only be carried out on lamps where an extinguishing voltage is shown on the lamp data sheet.

The lamp shall be operated on a reference ballast at rated supply voltage and at the extinguishing voltage shown on the lamp data sheet, achieved, if necessary, by artificial means. This lamp shall not extinguish when the supply voltage falls from 100 % to 90 % of the rated value in less than 0,5 s and remains at that value for at least 5 s.

8.7 Photometric characteristics

Requirements are under consideration. For methods of measuring, see Annex G.

8.7 Colour characteristics

Requirements are under consideration. For methods of measuring, see Annex G.

8.9 Lumen maintenance and life

Requirements are under consideration. For methods of measuring, see Annex H.

9 Information for ballast and ignitor design

9.1 General

Ballasts and ignitors should meet the following requirements to ensure reliable starting and operating conditions. These checks do not constitute lamp requirements.

Except where noted otherwise, these requirements should be met over the range of 92 % to 106 % of the rated voltage of the ballast.

9.2 Information for ignitor design (external type)

An ignitor should start lamps which comply with the specified lamp starting test.

The ignition reference device settings on the data sheets are only for lamp start testing and are not intended to predetermine any practical ignitor properties.

In designing an ignitor, account should be taken of pulse attenuation due to cable capacitive loading.

9.3 Information for ballast design

9.3.1 General

The ballast specification should require the ignitor to be provided with information concerning the maximum value of capacitance consistent with achieving the specified requirements for lamp starting.

9.3.2 Current crest factor

The current crest factor should comply with the requirements of 9.1 of IEC 60923.

9.3.3 Lamp operating limits for the information of ballast designers (see Annex C)

Each of the lamp operating sheets shows a diagram of the lamp voltage and lamp wattage limits within which the lamp should be operated. The minimum voltage limit (left-hand side of the diagram) is the characteristic curve of a lamp whose voltage at rated wattage is the minimum considered acceptable.

The maximum voltage limit (right-hand side of the diagram) is the characteristic curve having a voltage high enough to allow for a lamp with:

- a) maximum zero-hour voltage;
- b) voltage rise during life; [IEC 60662:2011](https://standards.iteh.ai/catalog/standards/sist/04b893a0-0b12-43f4-91d4-5457226a07ac/iec-60662-2011)
- c) maximum voltage rise due to enclosure in a luminaire. <https://standards.iteh.ai/catalog/standards/sist/04b893a0-0b12-43f4-91d4-5457226a07ac/iec-60662-2011>

The wattage limit lines (top and bottom of the diagram) are chosen with regard to the effect of lamp wattage on performance factors such as initial light output, lumen maintenance, lamp life, lamp warm-up etc.

The supply voltage limits for lamp operation on reactor (choke) ballasts should be as shown below. The upper supply voltage limit should not be exceeded continuously in lamp use, otherwise special precautions are necessary. Short-term excursions above this limit can be tolerated.

The voltage limits are:

- a) for rated supply voltages between 100 V and 150 V:
 - between 95 % and 105 % of rated voltage of the ballast;
- b) for rated supply voltages between 220 V and 240 V:
 - the lower supply voltages limit is 95 % of rated voltage of the ballast;
 - the upper supply voltage limits are:
 - for lamp ratings below 150 W: rated voltage of the ballast + 7 V
 - for lamp ratings 150 W and above: rated voltage of the ballast + 10 V.

The lamp wattage obtained with a reference lamp when measured on a ballast at rated voltage, should comply with the requirements of Clause 15 of IEC 60923.

Lamp operating limits and a typical ballast characteristic are given as part of each lamp data sheet.

9.4 North American starting pulse characteristics

The ignitor may be an integral part of the ballast or a separate device. In either case it should meet the following general requirements along with those given on the lamp data sheet.

The starting pulse application should be to the eyelet or centre lampholder terminal with the wiring between ballast and lampholder (or its equivalent capacitance) connected.

The starting pulse measurement should be at the lampholder terminals with a simulated lamp-load of 20 pF across the terminals. The pulse height should be measured from zero voltage level of the supply voltage. The minimum pulse repetition rate should be once per cycle for lag circuit ballasts and once per half cycle for lead circuit ballasts.

The pulse position for lag circuit ballasts should be (1) during the time that the open-circuit voltage exceeds 90 % of its peak and (2) no later than 20 electrical degrees beyond the centre of the half cycle (that is, 110 degrees or 290 degrees, or both).

The pulse position for lead circuit ballasts should be (1) during the time that the open-circuit voltage exceeds 90 % of its peak and (2) no later than 15 electrical degrees beyond the centre of the half cycle (that is, 105 degrees and 285 degrees).

Low current off time is given on the relevant lamp data sheet.

NOTE The low current off time is defined by the time that the instantaneous current at the end of each half cycle is below 1,0 A. This specification is needed for CWA (= constant wattage autotransformer) ballasts.

10 Information for luminaire design

NOTE This information refers to the luminaire design checks necessary to ensure that conditions in the luminaire do not cause premature failure of lamps complying with this standard. These checks do not constitute lamp requirements.

10.1 Voltage increase at lamp terminals

The lamp voltage increase as determined in accordance with the relevant procedure given in Annex D should not exceed the value specified on the relevant lamp data sheet.

Tests should be carried out in accordance with the relevant requirements of Annex D.

10.2 Lamp envelope temperatures

The lamp envelope temperature, when measured at any point, should not exceed the following.

- European practice

150 W or lower	310 °C
above 150 W (except 600 W)	400 °C
600 W	480 °C (under consideration)
- North American practice

bulb type RL38	385 °C
else	400 °C
- Japanese practice

70 W and lower	385 °C
above 70 W	400 °C

During the measurement, the lamp should be operated at its rated wattage.

NOTE 1 These values do not apply to lamps with quartz outer bulbs.

NOTE 2 The limitations in 10.2 should be regarded with caution. These are limitations imposed by the lamp materials, but it should be understood that, in general, if the luminaire causes a lamp to reach these temperatures, it is probable that the voltage rise limitation in 10.1 will be exceeded.

11 Maximum lamp outlines

Maximum lamp outline requirements are provided for the guidance of designers of luminaires and are based on a maximum-sized lamp inclusive of bulb to cap eccentricity, see Annex I.

Observance of these requirements in luminaire design will ensure mechanical acceptance of lamps complying with this standard.

Mechanical acceptance of the lamp cap and adjoining part of the lamp neck in the holder is ensured by compliance of the lamp with the gauges for testing contact-making as given in IEC 60061-3.

12 Numbering system for lamp data sheets

The first number represents the number of this publication (IEC 60662) followed by the letters “IEC”.

The second number represents the lamp 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.

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