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British Standard Specification for High-pressure sodium vapour lamps

Spécification des lampes à vapeur de sodium à haute pression

Spezifikation für Natriumdampf-Hochdrucklampen

This European Standard EN 60 662 has the status of a British Standard.

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Contents

	Page
National foreword	Inside front cover
Text of EN 60 662	1
Appendix A (Normative)	11
Appendix B (Normative)	12
Annex ZA (Normative)	13
National appendix W	Inside back cover
National appendix X	Inside back cover
Cooperating organizations	Back cover

National foreword

This revised British Standard has been prepared under the direction of the Electrical Illumination Standards Policy Committee and is the English language version of EN 60 662 : March 1989 'High pressure sodium lamps', published by the European Committee for Electrotechnical Standardization (CENELEC). EN 60 662 is identical with IEC Publication 662: 1980, plus Amendment No. 1 (1986) and Amendment No. 2 (1987) (Modified) published by the International Electrotechnical Commission (IEC) and incorporates the corrigendum published in 1980.

For sake of clarity, the CENELEC common modification has been incorporated at the appropriate place in the text of EN 60 662 and is marked by a vertical line at the left hand margin.

This standard supersedes BS 6193 : 1988 which is withdrawn in accordance with CENELEC Internal Regulations.

Attention is drawn to the following points:

- (1) IEC Publication 000, to which informative reference is made in clause 2, is still in preparation by IEC.
- (2) In 7.1.1, the page number quoted in reference to figures 1 and 2 is the IEC page number. This does not correspond to the EN page number as shown in the shoulder heading on each page of EN 60 662; figures 1 and 2 may be found on EN page 11.

Cross-references. Details of other international publications referred to in the standard are given in Annex ZA on EN page 13. Where there are British Standards either identical or technically equivalent to these international publications, the relationship is given in national appendix X on the inside back cover.

Additional information. The list of United Kingdom organizations which participated in the preparation of this standard is given in national appendix W on the inside back cover. Cooperating organizations within CENELEC are listed on the outside back cover.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60 662

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UDC: 621.327.532

Key words: Sodium vapour lamp; characteristic; particular requirements; conception requirement

English version

High-pressure sodium vapour lamps

(IEC 662 (1980) ed 1 + Amdt 1 (1986) + Amdt 2 (1987) modified)

Lampes à vapeur de sodium à haute pression
(CEI 662 (1980) ed 1 + Amdt 1 (1986) +
Amdt 2 (1987) modifiés)

Natriumdampf-Hochdrucklampen
(IEC 662 (1980) 1. Ausg. + Amdt 1 (1986)
+ Amdt 2 (1987) modifiziert)

This European Standard was ratified by CENELEC on 6 December 1988. CENELEC members are bound to comply with the requirements of the 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 CENELEC Central Secretariat or to any CENELEC member.

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

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: Rue Bréderode 2, B-1000 Brussels

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Brief history

The CENELEC Questionnaire Procedure, performed for finding out whether or not IEC 662 (1st edition – 1980) + Amdt 1 (1986) + Amdt 2 (1987) could be accepted without textual changes, has shown that common modifications were necessary for the acceptance as European Standard (EN). The Reference Document was submitted to the CENELEC members for formal vote and acceptance by CENELEC.

Technical text

The text of the International Standard IEC 662 (1st edition – 1980) + Amdt 1 (1986) + Amdt 2 (1987), modified, was approved by CENELEC on 6 December 1988 as a European Standard.

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information.

In this standard, Annex ZA is normative.

The following dates were fixed:

date of announcement	: 1989-07-01
date of latest publication	: 1990-01-01
date of withdrawal of conflicting national standards	: 1990-01-01

CONTENTS

	Page
Brief history	2
Technical text	2
Preface of IEC Publication 662	4

SECTION ONE – GENERAL

Clause	
1. Scope	5
2. General	5
3. Definitions	5
4. Lamp marking	6
5. Lamp dimensions	6
6. Caps	6
7. Test requirements for lamp starting, warm-up and electrical characteristics	6
7.1 Lamp starting test	6
7.2 Lamp warm-up test	7
7.3 Ageing	7
7.4 Lamp electrical characteristics	7
7.5 Extinguishing voltage test	7
8. Information for ballast and ignitor design	7
8.1 Open circuit voltage	7
8.2 European starting pulse characteristics	7
8.3 North American starting pulse characteristics — 250 W and 400 W lamps	8
8.4 Lamp warm-up current	8
8.5 Current crest factor	8
8.6 Lamp operating limits for the information of ballast designers	8
9. Information for luminaire design	9
9.1 Voltage increase at lamp terminals	9
9.2 Lamp envelope temperatures	9
9.3 Permissible cap temperatures	9
10. Maximum lamp outlines	10
11. Numbering system for lamp data sheets	10

APPENDICES

APPENDIX A — Waveshape of voltage pulse for lamp-starting test	11
APPENDIX B — Schematic drawings for location of lamp dimensions	12

SECTION TWO – LAMP DATA SHEETS

SECTION THREE – MAXIMUM LAMP OUTLINES

INFORMATION as to the original IEC text:

The foreword of IEC Publication 662 Amend. 1 (1986) is not part of this European Standard

Appendix ZA (Normative) is not included in IEC 662 Amend. 1 (1986).

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-PRESSURE SODIUM VAPOUR LAMPS

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 34A: Lamps, of IEC Technical Committee No. 34: Lamps and Related Equipment.

Draft proposals for this first edition were considered at the meeting held in The Hague in 1975. As a result of this meeting, a draft, Document 34A(Central Office)109, was submitted to the National Committees for approval under the Six Months' Rule in November 1976.

The National Committees of the following countries voted explicitly in favour of publication:

Australia	Netherlands
Belgium	Norway
Canada	South Africa (Republic of)
Denmark	Sweden
Egypt	Switzerland
Finland	Turkey
France	Union of Soviet
Hungary	Socialist Republics
Israel	United Kingdom
Italy	United States of America

Other IEC publications quoted in this standard:

Publications Nos. 1 61: Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety.

000: Igniters for High Pressure Sodium and Metal Halide Lamps (under consideration).

HIGH-PRESSURE SODIUM VAPOUR LAMPS

SECTION ONE – GENERAL

1. Scope

This standard specifies the characteristics of high-pressure sodium vapour lamps necessary to ensure interchangeability and safety together with test conditions and procedures. The recommendations relate only to type testing.

The standard specifies the lamp dimensions, electrical characteristics for lamp starting and operation together with information for ballast, ignitor and luminaire design purposes.

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.

This standard applies to CENELEC countries only and therefore only 'European practice' applies.

2. General

Lamps which comply with this standard when operated with a ballast and an ignitor complying with IEC Publication 000 (under consideration) will start and operate satisfactorily between 92% and 106% rated supply voltage and at temperatures down to -40°C .

3. Definitions

3.1 *Rated wattage*

The wattage marked on the lamp.

3.2 *Calibration current*

The value of the current on which the calibration of the reference ballast is based.

3.3 *Reference ballast*

A special inductive type ballast designed for use:

- a) in testing lamps;
- b) as a comparison standard for testing ballasts, and
- c) in the selection of reference lamps. It is essentially characterized by a stable voltage/current ratio which is relatively uninfluenced by variations in current, temperature and magnetic surroundings.

3.4 *Type test*

A 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 specification.

3.5 *Type test sample*

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

4. Lamp marking

The following information shall be distinctly and durably marked on the lamp:

- a) *Mark of origin.* This may take the form of a trade mark, the manufacturer's mark or the name of the responsible seller.
- b) *Rated wattage.*

5. Lamp dimensions

The lamp dimensions shall comply with the requirements given on the relevant lamp data sheet.

6. Caps

The caps on the finished lamp shall comply with the requirements of the relevant sheet of IEC Publication 61: Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety.

7. Test requirements for lamp starting, warm-up and electrical characteristics

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 ± 5 °C, on a 50 Hz or 60 Hz sinusoidal power supply using the specified reference ballast at rated voltage.

7.1 *Lamp starting test*

7.1.1 *Lamps with external ignitor*

The pulse characteristics specified on the relevant lamp data sheet are measured at the lamp-holder terminals with the normal circuit connected and the lamp removed from the lampholder. The waveshape of the pulse and the interpretation of its principal parameters are illustrated in Figures 1 and 2, page 19.

The peak value of the pulse height is measured from the zero voltage level of the open circuit voltage (see Appendix A). Subsequent peaks of the same pulse shall not exceed 50% of this value.

The circuit connections for lamp starting are to 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.

7.1.2 *Lamps with internal starting device*

The test voltage shall be as indicated in the relevant lamp data sheet. The starting time measured from the instant the internal starting device has opened shall not exceed the maximum value shown in the relevant lamp data sheet.

7.2 *Lamp warm-up test*

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 of 50 V in a time not exceeding that specified on the relevant lamp data sheet.

7.3 *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.

7.4 *Lamp electrical characteristics*

The lamp electrical characteristics shall comply with the requirements given in the relevant lamp data sheet.

7.5 *Extinguishing voltage test*

A 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. **Information for ballast and ignitor design**

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

Except for Sub-clause 8.6, these requirements shall be met over the range of 92% to 106% of the rated voltage of the ballast.

For Sub-clause 8.6, the range is 95% to 105% of the rated voltage of the ballast.

8.1 *Open circuit voltage*

Minimum r.m.s. voltage (50 Hz or 60 Hz) 198 V.

8.2 *European starting pulse characteristics*

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

8.2.2 The pulse height shall comply with the requirements for ballast design information on the relevant lamp data sheet when measured at the lampholder terminals with the normal circuit connected and the lamp removed from the lampholder.

8.2.3 In designing an ignitor, account shall be taken of pulse attenuation due to the cable. The ballast specification shall require the ignitor to be provided with information concerning the maximum value of capacitance consistent with achieving the specified requirements for lamp starting.

8.2.4 General guidance

8.2.4.1 In general, the requirements in Sub-clause 8.2.1 will be met by a positive pulse of 2 800 V peak having a width of 1 μ s at 2 500 V and occurring in either half-cycle of the supply voltage.

8.2.4.2 An ignitor may produce a negative or positive pulse in either half-cycle of the supply voltage. If the pulse is negative, it is probable that the pulse height and/or width may need to be increased.

8.2.4.3 For satisfactory performance the pulse shall occur within the phase range 60-90 or 240-270 electrical degrees of the open-circuit voltage (these values are provisional and under study).

8.2.4.4 Where the pulse repetition rate is less than once per cycle, the pulse width may need to be increased.

8.3 North American starting pulse, characteristics — 250 W and 400 W lamps

The ignitor may be an integral part of the ballast or a separate device. In either case it shall meet the following requirements:

a) Pulse height (measured from zero voltage level of the r.m.s. supply)	2 500 V minimum; 4 500 V maximum.
b) Pulse width (minimum)	1 μ s at 2 250 V.
c) Repetition rate (minimum)	Once per cycle.
d) Pulse position	Between the 90% point of peak open-circuit voltage (leading edge) and 20 electrical degrees beyond centre of the half-cycle.

For this measurement, the starting pulse shall be applied to the centre contact of the lampholder. A capacitive load of 20 pF shall be connected across the lampholder terminals in place of the lamp (additional capacitive loading may be necessary to simulate remote mounting of ballasts and ignitors, and further recommendations on this aspect are under consideration).

8.4 Lamp warm-up current

The lamp warm-up current shall be measured within the range of 5 s to 15 s after the ignition of the lamp arc, and shall comply with the values specified on the relevant lamp data sheet.

8.5 Current crest factor

The current crest factor shall not exceed 1.8 during lamp warm-up and operation.

The crest factor shall be measured on a specially selected lamp having a voltage within ± 5 V of the specified nominal lamp voltage.

8.6 Lamp operating limits for the information of ballast designers

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;
- c) maximum voltage rise due to enclosure in a luminaire.

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.

For a ballast to meet the lamp operating requirements, its characteristic curve, at any supply voltage between 95% and 105% of rated voltage, shall intersect each of the lamp voltage limit lines at points between the wattage limit lines and shall remain between the wattage limit lines throughout the full range of lamp voltage. A ballast characteristic is preferred such that the lamp wattage attains a maximum below the maximum lamp voltage limit and then decreases as the lamp voltage increases beyond this point.

The lamp wattage obtained with a lamp of nominal voltage, when measured on a ballast at rated voltage, shall not vary by more than $\pm 7.5\%$ from that measured on the specified reference ballast.

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

9. Information for luminaire design

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.

9.1 *Voltage increase at lamp terminals*

With a lamp operated on a reference ballast at its rated voltage, the voltage at lamp terminals shall not increase by more than the value specified on the relevant lamp data sheet when the lamp is transferred from stabilized operation in free air to stabilized operation in the luminaire.

9.2 *Lamp envelope temperatures*

The lamp envelope temperatures, when measured at any point, shall not exceed 400 °C.

9.3 *Permissible cap temperatures*

The temperature of the lamp cap shall not exceed the following:

- Cemented lamp cap 210 °C maximum.
- Mechanically-fixed lamp cap 250 °C maximum.

Note. — The limitations in Sub-clauses 9.2 and 9.3 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 Sub-clause 9.1 will be exceeded.

10. 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 Section Three.

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

Mechanical acceptance of the lamp cap and the 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 Publication 61-3: Part 3: Gauges.

11. Numbering system for lamp data sheets

The first number represents the number of this Publication (662) followed by the letters "IEC".

The second number represents the lamp data sheet number.

The third number on the sheet indicates the edition of the sheet. Only those pages of the lamp data sheet which have been modified have a new edition number. For example, the first page of the lamp data sheet 662-IEC-1010-1 has been modified so this first page is now numbered 662-IEC-1010-2. The two following pages of the data sheet have not been modified and therefore retain the number 662-IEC-1010-1.

APPENDIX A

WAVESHAPE OF VOLTAGE PULSE FOR LAMP-STARTING TEST

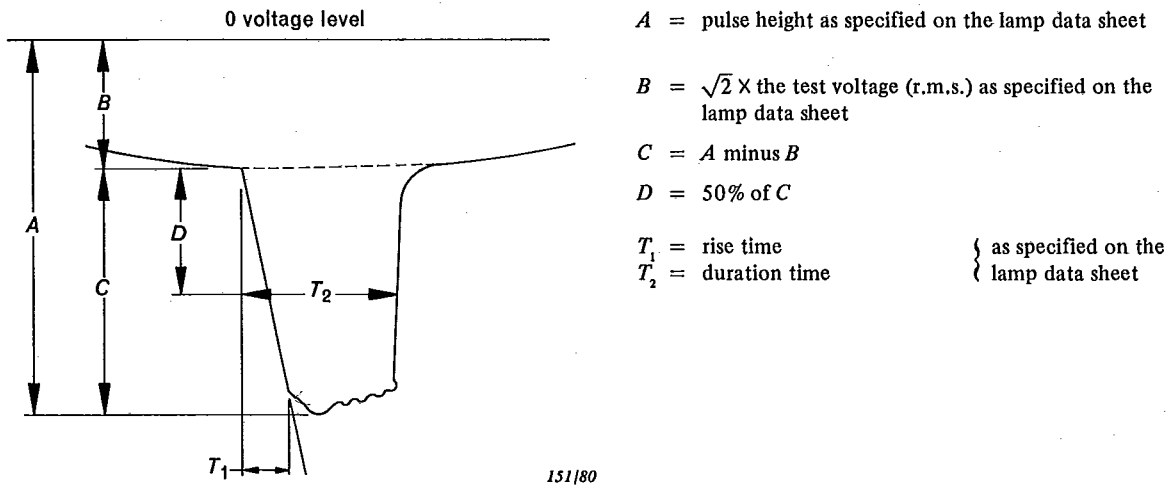


FIG. 1. — American practice.

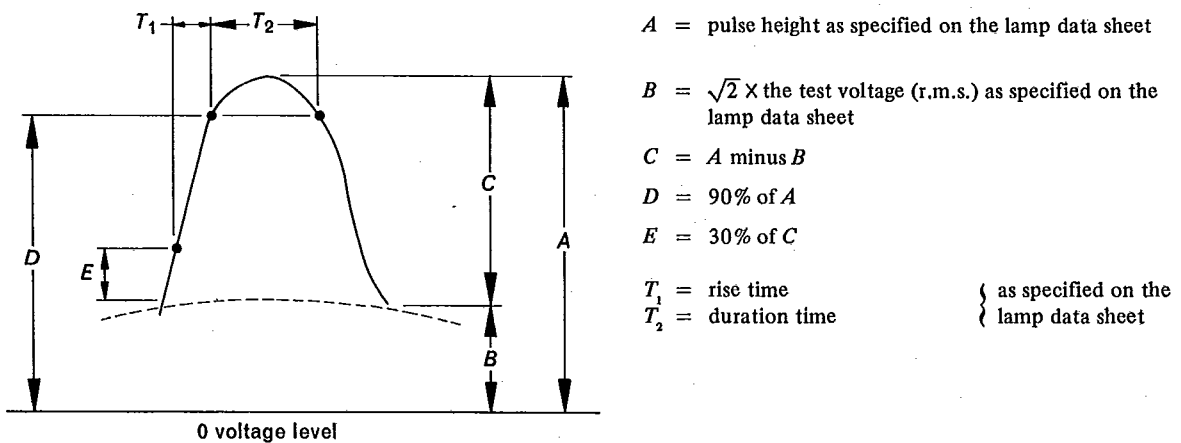


FIG. 2. — European practice.

APPENDIX B

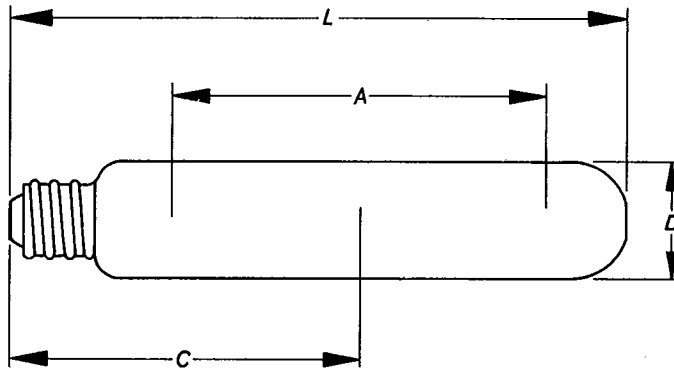
SCHEMATIC DRAWINGS FOR LOCATION
OF LAMP DIMENSIONS

FIG. 3. — Tubular bulb lamp.

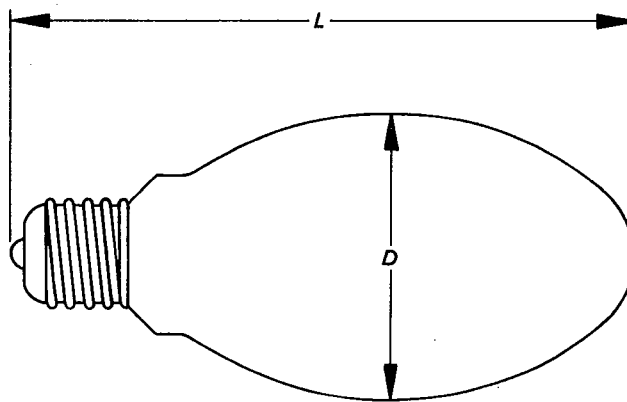


FIG. 4. — Elliptical bulb lamp.

ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD

IEC Publications		EN/HD Reference
61-1	Lamp Caps and holders together with gauges for the control of inter-changeability and safety	
	Part 1: Lamp caps	HD 65.1
61-2	Part 2: Lampholders	HD 65.2
61-3	Part 3: Gauges	HD 65.3
000	Ignitors for high pressure sodium and Metal halide lamps (under consideration)	