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British Standard Specification for



'Single-capped fluorescent lamps - safety and performance requirements'

[IEC title: Single-capped fluorescent lamps. Safety and performance requirements]



'Lampes à fluorescence à culot unique - Prescriptions de sécurité et de performances



Einseitig gesockelte Leuchtstofflampen - Anforderungen an Sicherheit und Arbeitsweise



'This European Standard EN 60901 : 1990 has the status of a British Standard'

British Standards Institution

BS 6982 : 1988

National foreword

This British Standard has been prepared under the direction of the Electrical Illumination Standards Committee. It is identical with IEC Publication 901 : 1987 'Single-capped fluorescent lamps. Safety and performance requirements', published by the International Electrotechnical Commission (IEC).

In 1989 the European Committee for Electrotechnical Standardization (CENELEC) accepted IEC 901 : 1987 as European Standard EN 60901 : 1990.



In 1990 the European Committee for Electrotechnical Standardization (CENELEC) accepted Amendment 1 to IEC 901 : 1987 as Amendment 1 to EN 60901 : 1990.

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

This standard is supplied in the form of separate standard sheets within a loose-leaf folder. Amendments containing new or revised standard sheets will be issued in the future to ensure that this standard may be kept up to date.

Wherever page numbers are quoted, they are IEC page numbers.

Cross-references**International standard**

IEC 61-1 : 1969

IEC 81 : 1974

IEC 82 : 1984

IEC 598-1 : 1986

Corresponding British Standard

BS 5101 Specification for lamp caps and holders together with gauges for the control of interchangeability and safety
Part 1 : 1975 Lamp caps
(Identical)

BS 1853 Tubular fluorescent lamps for general lighting service
Part 1 : 1979 Specification for internationally specified lamps
(Identical)

BS 2818 Ballasts for tubular fluorescent lamps
Part 1 : 1985 Specification for ballasts for use internationally
(Identical)

BS 4533 Luminaires
Part 101 : 1987 Specification for general requirements and tests
(Technically equivalent)



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

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM



EN 60901/A1

September 1990

UDC 621.327 : 614.8

DESCRIPTORS: Lighting equipment, fluorescent lamp, lamp cap, safety, requirement

Amendment 1 to the English version of EN 60901

Single-capped fluorescent lamps — safety and performance requirements

(Amendment 1 to IEC 901 : 1987)

Lampes à fluorescence à culot unique
Prescriptions de sécurité et de performances
(modification 1 à la CEI 901 : 1987)

Einseitig gesockelte Leuchtstofflampen
Anforderungen an Sicherheit und Arbeitsweise
(Änderung 1 zu IEC 901 : 1987)

This Amendment 1 modifies the European Standard EN 60901. It was approved by CENELEC on 11 June 1990. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 Central Secretariat or to any CENELEC member.

This amendment 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 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, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

General Secretariat: rue Bréderode 2, B-1000 Brussels



Foreword

The CENELEC Questionnaire Procedure, performed for finding out whether or not Amendment 1 to IEC 901 : 1987 could be accepted without textual changes, has shown that no CENELEC common modifications were necessary for the acceptance as an amendment to the European Standard. The reference document was submitted to the CENELEC members for formal vote.

The text was approved by CENELEC as Amendment 1 to EN 60901 : 1990 on 11 June 1990.

NOTE: The following subclauses are to be added to the list of subclauses applying to safety requirements given in the European Standard EN 60901:

2.1 Scope

2.2 Definitions

The following dates were fixed:

- latest date of announcement of
the amendment at national level (doa) 1990-12-15
- latest date of publication of an
identical amendment to the
national standard (dop) 1991-06-15
- latest date of withdrawal of
conflicting national standards (dow) 1991-06-15

Endorsement notice

The text of Amendment 1 to the International Standard IEC 901 : 1987 was approved by CENELEC as Amendment 1 to the European Standard EN 60901 : 1990.



EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60901

February 1990

UDC 621.327:614.8

Descriptors: Lighting equipment, fluorescent lamp, lamp cap, safety, requirement

English version

Single-capped fluorescent lamps —
Safety and performance requirements
(IEC 901 : 1987)

Lampes à fluorescence à culot unique —
Prescriptions de sécurité et de performances
(CEI 901 : 1987)

Einseitig gesockelte Leuchtstofflampen —
Anforderungen an Sicherheit und Arbeitsweise
(IEC 901 : 1987)

This European Standard was approved by CENELEC on 12 June 1989.
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 Central Secretariat 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 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, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue Bréderode 2, B-1000 Brussels



Brief history

The CENELEC Questionnaire Procedure, performed for finding out whether or not IEC 901 : 1987 could be accepted without textual changes, has shown that no 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 901 : 1987 was approved by CENELEC on 12 June 1989 as a European Standard with the following information:

At the 60th Technical Board it was confirmed that as far as safety is concerned only the following sub-clauses of this standard apply:

- 1.1 Scope
- 1.2 Definitions
- 1.4 Marking
- 1.7 Cap dimensions
- 2.3 Cap requirements
- 2.7 Thermal conditions

Annexes designated "normative" are part of the body of the EN.

In this standard, Annex ZA is normative

The following dates are applicable:

- latest date of announcement
of the EN at national level (doa) : 1989-12-01
- date of latest publication of
a new harmonized standard (dop) : 1990-06-01
- date of withdrawal of conflicting
national standards (dow) : 1990-06-01

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British Standard Specification for
Single-capped fluorescent lamps - safety and performance
requirements'



SECTION ONE - GENERAL

1.1 Scope

This standard specifies the safety and performance requirements of a range of single-capped fluorescent lamps which are operated on a.c. supplies. The following types are included:—

- lamps with pre-heated cathodes operated with an integral means of starting;
- lamps with pre-heated cathodes operated with an external means of starting;
- lamps with pre-heated cathodes operated without the use of any starter.

The specific lamp types and requirements are listed in separate sections.

The safety and performance requirements of this standard relate only to type testing. Requirements for whole product testing or batch testing are under consideration.

Note. — Lamps which comply with this standard, when operated with a ballast complying with IEC Publication 82 and in a luminaire complying with IEC Publication 598-1, start and operate satisfactorily between 92% and 106% rated supply voltage and at an ambient air temperature of between 10 °C and 50 °C.

1.2 Definitions

1.2.1 Single-capped fluorescent lamp

Low-pressure mercury discharge lamp having a single cap in which most of the light from the lamp is emitted by a layer of fluorescent material excited by the ultra-violet radiation from the discharge.

1.2.2 Rated wattage

The wattage marked on the lamp. It is expressed in watts.

1.2.3 Colour

The colour characteristics of a lamp are defined by the colour appearance and the colour rendering.

- a) The actual colour of the lamp is called colour appearance and is defined in terms of the specific chromaticity co-ordinates according to the recommendations of the International Commission on Illumination (CIE).
- b) The effect which the spectral characteristics of the light emitted by the lamp have on the appearance of the objects illuminated by it is called colour rendering.

1.2.4 Rated colour

The colour appearance defined by the markings on the lamp.

Note. — For standard colours see Appendix D of IEC Publication 81.

Other colours declared by manufacturers are called special colours.

1.2.5 Rated luminous flux

The luminous flux marked on the lamp or declared as such by the supplier. It is expressed in lumens.

1.2.6 Lumen maintenance

The luminous flux at a given time in the life of a lamp divided by the initial value of the luminous flux of that lamp and expressed as a percentage of the initial luminous flux.

1.2.7 Burn-in period

The time required after switching on to reach stabilization of the vapour pressure within the discharge tube.

1.2.8 Initial readings

The measurement of the photometric and electrical characteristics made at the end of the 100 h ageing period and the checking of the starting voltages made before ageing.

1.2.9 Type test

A 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 standard.

1.2.10 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.

1.2.11 Group

Lamps as represented by a single data sheet having the same rated electrical characteristics, the same physical dimensions and the same method of starting.

1.2.12 Type

Lamps of the same group having the same photometric ratings and colour characteristics.

1.2.13 Batch

All the lamps of one type put forward at one time for acceptance tests.

1.2.14 Whole production

The entire range of types manufactured over a period of 12 months for which a manufacturer requires certified approval, this list being incorporated in the certificate.

1.2.15 Comparability test

A test to check the consistency between the market sample and the manufacturer's own test data.

1.2.16 Market sample

A specified number of lamps selected by the test authority for the comparability test.

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1.3 General principles of layout of data sheets

1.3.1 *Numbering system for lamp data sheets*

The first number represents the number of this standard "901" followed by the letters "IEC".

The second number is the lamp data sheet number.

The first figure of this number represents the section of this standard.

The second figure represents the range of the data sheets.

The third and fourth figures identify the individual data sheets.

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.

1.4 Marking

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

- mark of origin. This may take the form of a trade mark, the manufacturer's mark or the name of the responsible vendor;
- rated wattage.

1.5 Glass tubing

The visible glass tubing of the lamp shall be free from defects detrimental to service.

1.6 Lamp dimensions

The lamp dimensions shall be those given on the relevant lamp data sheet.

1.7 Lamp caps

The requirements for lamp caps are given in IEC Publication 61-1.

SECTION TWO – LAMPS WITH PRE-HEATED CATHODES AND WITH AN INTEGRAL MEANS OF STARTING

2.1 Scope

This section specifies the safety and performance requirements which are in addition to those in Section One, for a range of single-capped fluorescent lamps with pre-heated cathodes and with integral means of starting.

The list of specified lamp types and lamp data sheets is given in Clause 2.11.

2.2 Definitions

2.2.1 *Single-capped fluorescent lamp with an integral means of starting*

A low-pressure mercury discharge lamp having a single cap and an integral means of starting.

2.3 Caps

2.3.1 *For G23 caps the following applies:*

- a) For new lamps neither lamp bulb nor lamp cap shall be loosened by an axial pull of 40 N or a bending moment of 3 Nm. The pivot point lies in the cap reference plane (mating plane with the holder).
- b) Caps shall withstand, after the simulated endurance test, bending and pulling forces (requirements and test conditions are under consideration).
- c) At the end of life, the lamp cap shall show no damage impairing safety.

2.3.2 *For GR8 caps the following applies:*

Mechanical requirements are under consideration.

2.4 Starting characteristics

2.4.1 *Test conditions*

Tests shall be made in still air at an ambient temperature between 20 °C and 27 °C in a relative humidity of 65% maximum.

Metallic parts and wires in the vicinity of the lamp shall be avoided as far as possible.

The lamps shall be kept inoperative and in an ambient temperature of between 20 °C and 27 °C and a relative humidity of 65% maximum, for a period of at least 24 h immediately prior to the starting test.

Lamps shall be tested with a 50 Hz or 60 Hz supply, in the circuit shown in Figure 1, page F-2.

The ballast shall comply with the requirements of IEC Publication 82.

When, at its rated voltage, the ballast is associated with a lamp whose voltage at lamp terminals does not deviate by more than $\pm 2\%$ from the objective value specified on the relevant lamp data sheet, the lamp shall absorb a power which does not differ from its objective value by more than $\pm 4\%$.

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The voltage applied to the circuit shall be as specified on the relevant lamp data sheet.

2.4.2 *Starting time*

Lamps shall start fully within the time specified on the relevant lamp data sheet and remain alight.

2.5 *Electrical and photometric characteristics*

Before the lamps are measured for the first time, they shall be aged in the circuit shown in Figure 2, page F-2, for a period of 100 h.

2.5.1 *Test conditions*

Tests shall be made in a draught-free atmosphere at the ambient temperature specified on the relevant lamp data sheet.

Lamps shall be tested in the position specified on the relevant data sheet.

Lamps shall be tested in the circuit shown in Figure 3, page F-2.

Ballasts used for these tests shall be reference ballasts as specified in IEC Publication 82.

2.5.2 *Supply voltage*

a) *Frequency*

The frequency shall be that for which the ballast is designed, with a tolerance of $\pm 0.5\%$.

b) *Stabilization*

During periods of stabilization, the supply voltage shall be stable within $\pm 0.5\%$, this tolerance being reduced to $\pm 0.2\%$ at the moment of measurement. The appropriate stabilization time is 15 min after the burn-in period as declared by the manufacturer or responsible vendor.

Note. — During the shipping and normal handling of the lamps any excess amount of mercury may be distributed in small droplets within the discharge tube. Stabilization is reached when all the excess mercury has been collected at the coldest spot in the tube.

Experience shows that this process of collecting may take up to 15 h. When a lamp, once having passed the burn-in period, is re-lit within 24 h it will only need about 15 min for stabilizing, provided that the lamp has been kept in the same position and not subjected to vibration and shock.

c) *Harmonic content*

The total harmonic content of the supply voltage shall not exceed 3%. The harmonic content is defined as the root-mean-square (r.m.s.) summation of the individual harmonic components, using the fundamental as 100%.

Note. — This implies that the source of supply should have sufficient power and that the supply circuit should have a sufficiently low impedance compared with the ballast impedance. Care should be taken that this applies under all conditions that occur during the measurement.

2.5.3 *Instruments*

Instruments shall be essentially free from waveform errors. When measuring the voltage or power of the lamp, the potential circuit of the instruments shall be not less than 100 000 Ω and when not in

use shall be disconnected. During the measuring of the lamp wattage, no correction shall be made for the wattmeter consumption (the circuit connection being made on the lamp side of the current coil).

When measuring the luminous flux, the potential circuits of the voltmeter and of the wattmeter shall be open.

2.5.4 *Lamp wattage and voltage*

The initial readings for the power dissipated by the lamp shall not differ from the objective wattage indicated on the relevant lamp data sheet by more than 5% + 0.5 W.

The initial readings of the voltage at the lamp terminals shall comply with the value specified on the relevant lamp data sheet.

2.5.5 *Photometric characteristics*

- a) The initial readings for the luminous flux of the lamp shall be not less than 90% of the rated value, which shall be not less than the value specified in the relevant lamp data sheet.
- b) The initial readings for the chromaticity colour co-ordinates of an individual lamp shall be within 5 SDCM (Standard Deviation of Colour Matching) of the rated values.

Note. — See also Appendix D of IEC Publication 81.

2.6 **Lumen maintenance**

2.6.1 *Test conditions*

Tests shall be made at an ambient temperature of between 20 °C and 30 °C. Excessive draughts shall be avoided and the lamps shall not be subjected to extreme vibration and shock.

Lamps shall be tested in the position specified on the relevant data sheet.

Lamps shall be tested in the circuit shown in Figure 2, page F-2.

Ballasts used for these tests shall comply with the requirements of IEC Publication 82 and moreover with the following:

- a) When, at its rated voltage, the ballast is associated with a lamp whose voltage at lamp terminals does not deviate by more than $\pm 2\%$ from the objective value specified on the relevant lamp data sheet, the lamp shall absorb a power which does not differ from its objective value by more than $\pm 4\%$.
- b) The pre-heating current, at rated voltage, shall not differ by more than $\pm 10\%$ from the nominal value specified on the relevant lamp data sheet.

The test voltage shall be equal to the rated voltage of the ballast and the frequency shall be according to the rated frequency of the ballast.

Lamps on these tests shall be switched off for 15 min after each 2 h 45 min burning.

2.6.2 *Requirements*

Under consideration.



2.7 Thermal conditions

2.7.1 Maximum temperature rise of lamp cap

For lamps with G23 and GX23 caps:

The temperature rise, being the highest temperature of the insulating material on the outside of the lamp cap 8 mm from the reference plane of the cap in the direction of the tube, shall not exceed the value given on the relevant lamp data sheet under the following conditions:

- a) using a specially prepared de-activated lamp (end of life condition, de-activated cathode, starter contacts operating),
- b) in a draught-free atmosphere at the ambient temperature specified on the relevant lamp data sheet,
- c) in the position specified on the relevant lamp data sheet,
- d) on a 50 Hz reference ballast at 110% rated supply voltage.

For lamps with GR8 caps:

Details are under consideration.

2.7.2 Power dissipation

Lamps with G23 and GX23 caps:

The power dissipation shall be not greater than the wattage given on the relevant lamp data sheet under the conditions specified in Sub-clause 2.7.1.

Lamps with GR8 caps:

The test is not applicable.

2.8 Conditions of compliance

The conditions of compliance are under consideration.

2.9 Information for luminaire design

This information refers to 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.

2.9.1 Lamps with G23 and GX23 caps

a) Normal operation — Cap temperature.

Under normal operation test conditions according to Sub-clause 12.4.1 of IEC Publication 598-1 the temperature of the lamp cap measured at the bottom of the guide post shall not exceed the value indicated in Table I.

TABLE I

Lamp cap	Maximum temperature °C
G 23	90
GX23	90

Notes 1. — Explanation of the test conditions:

- Test lamps are production lamps with the lamp voltage, current and power within 2.5% of the standardized objective values.
- The test voltage for the luminaire is 1.06 times rated voltage.
- The ambient temperature in the test room is $(25 \pm 1) ^\circ\text{C}$.

2. — The temperature limitation under normal operation test conditions is necessary because of the presence of a radio interference capacitor built into the lamp cap.



b) Abnormal operation — Heat test source temperature

Under abnormal operation test conditions, according to Sub-clause 12.5.1 of IEC Publication 598-1, luminaires for single-capped fluorescent lamps with G23 and GX23 caps shall be tested with the heat test source described in Figure 4, page F-4.

The heat test simulates the end of life condition for a deactivated lamp with continuously switching starter and with cathodes passing nearly short-circuit current where maximum energy is dissipated through the central post and other parts of the lamp cap.

After the heat test source has thermally stabilized, the temperature on the measuring point of the heat test source shall not exceed the temperature marked on the heat test source.

Note. — Explanation of the test conditions:

- Testing is carried out with a specially-made heat test source.
- The test voltage for the luminaire is 1.10 times rated supply voltage.
- The ambient temperature in the test room is $(25 \pm 1) ^\circ\text{C}$.
- The temperature limitation under abnormal operation test conditions is imposed by the lamp materials in order to guarantee safe removal of a defective lamp.

2.9.2 Information on luminaire design for lamps with GR8 caps is under consideration.

2.10 Diagrammatic data sheets

2.10.1 List of diagrammatic data sheets

901-IEC-2001 Diagrammatic drawing for location of lamp dimensions—linear-shaped.

901-IEC-2002 Diagrammatic drawing for location of lamp dimensions—square-shaped.