

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Self-ballasted lamps for general lighting services – Safety requirements

Lampes à ballast intégré pour l'éclairage général – Exigences de sécurité

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SELF-BALLASTED LAMPS FOR
GENERAL LIGHTING SERVICES –****Safety requirements**

FOREWORD

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International Standard IEC 60968 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 1988, Amendment 1:1991 and Amendment 2:1999. This edition constitutes a technical revision.

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

- a) For reasons of photobiological safety, the scope has been extended.
- b) A new definition and clause on UV radiation have been introduced.
- c) Clauses on normative references and an annex on literature were added.
- d) The latest IEC template has been adapted.

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

CDV	Report on voting
34A/1540/CDV	34A/1579/RVC

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.

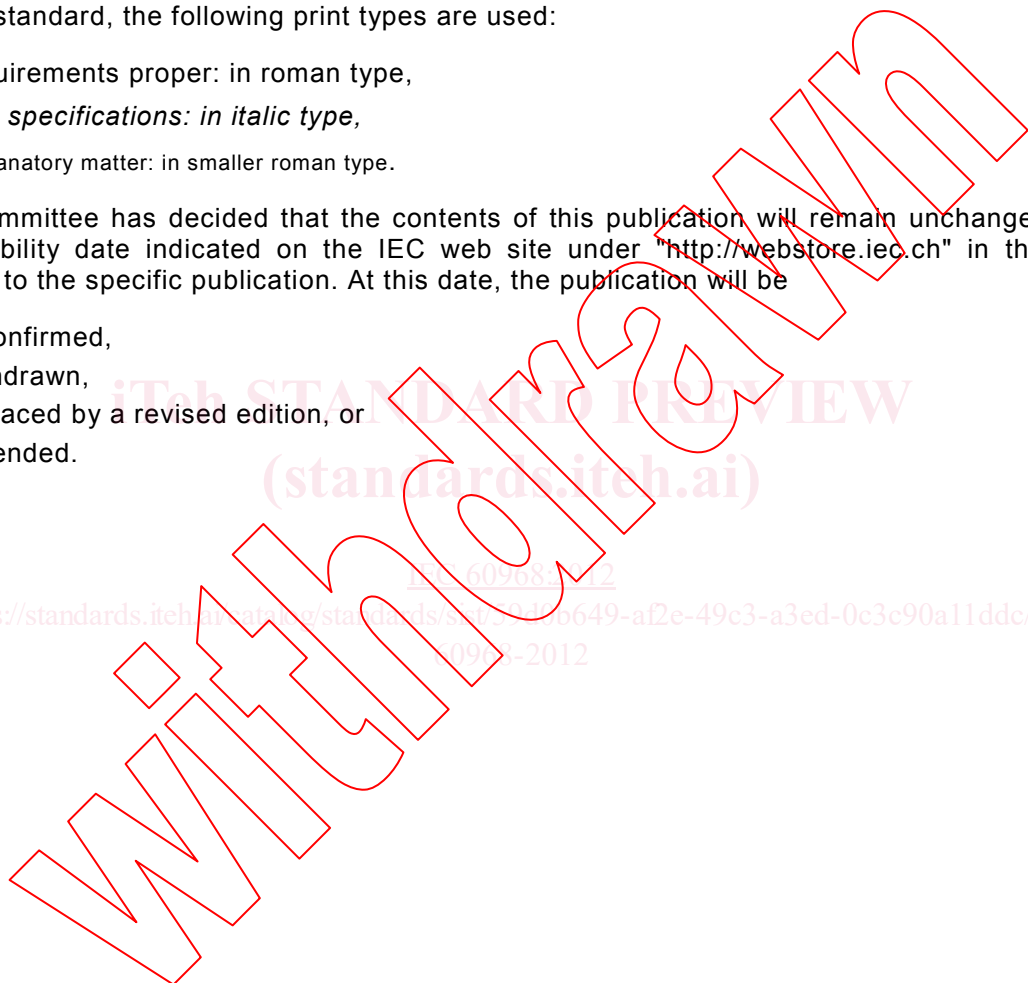
In this standard, the following print types are used:

- requirements proper: in roman type,
- *test specifications: in italic type,*
- explanatory matter: in smaller roman type.

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INTRODUCTION

With IEC 62471 and IEC/TR 62471-2, there are horizontal requirements available that need to be introduced into product standards, e.g. to IEC 60968. The horizontal requirement is transformed into a requirement for self-ballasted lamps.

The lamps within the scope of this standard are general lighting service (GLS) lamps according to the definition 3.11 in IEC 62471:2006. "...lamps intended for lighting spaces that are typically occupied or viewed by people...".

According to Clause 6 of IEC 62471:2006, radiation of GLS lamps is measured at a distance equivalent to 500 lx.

Measured at the 500 lx distance, GLS lamps will not exceed risk group 1 for blue light hazard and risk group 0 for IR radiation. This combination of risk group and hazard does not require marking (Table 1 of IEC/TR 62471-2:2009).

Hazards from UV radiation of GLS lamps will be covered by Clause 14 of IEC 60968.

Hence, IEC 62471 does not require any additional marking for GLS lamps.

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Withstand

SELF-BALLASTED LAMPS FOR GENERAL LIGHTING SERVICES –

Safety requirements

1 Scope

This International Standard specifies the safety and interchangeability requirements, together with the test methods and conditions, required to show compliance of tubular fluorescent and other gas-discharge lamps with integrated means for controlling starting and stable operation (self-ballasted lamps), intended for domestic and similar general lighting purposes, having:

- a rated wattage up to 60 W;
- a rated voltage of 100 V to 250 V;
- Edison screw or bayonet caps.

The requirements of this standard relate only to type testing.

Recommendations for whole product testing or batch testing are under consideration.

This part of the standard covers photobiological safety according to IEC 62471 and IEC/TR 62471-2.

Blue light and infrared hazards are below the level which requires marking.

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 60061, *Lamp caps and holders together with gauges for the control of interchangeability and safety*

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 60238, *Edison screw lampholders*

IEC 60360, *Standard method of measurement of lamp cap temperature rise*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products*

IEC 60695-2-12:2010, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability test method for materials*

IEC 60695-2-13:2010, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignitability test method for materials*

IEC 60901, *Single-capped fluorescent lamps – Performance specifications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1

self-ballasted lamp

unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a light source and any additional elements necessary for starting and stable operation of the light source

3.2

type

lamps that, independent of the type of cap, are identical in photometric and electrical rating

3.3

rated voltage

voltage or voltage range marked on the lamp

3.4

rated wattage

wattage marked on the lamp

3.5

rated frequency

frequency marked on the lamp

3.6

cap temperature rise

Δt_s

surface temperature rise (above ambient) of a standard test lampholder fitted to the lamp, when measured in accordance with the standard method described in IEC 60360

3.7

live part

conductive part which may cause an electric shock in normal use

3.8

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

3.9

type test sample

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

3.10

specific effective radiant UV power

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

Note 1 to entry: The 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.

4 General requirement and general test requirements

4.1 Self-ballasted lamps shall be so designed and constructed that in normal use they function reliably and cause no danger to the user or surroundings.

In general, compliance is checked by carrying out all the tests specified.

4.2 All measurements unless otherwise specified, are carried out at rated voltage and frequency and in a draught-proof room at $(25 \pm 1) ^\circ\text{C}$.

If lamps are marked with a voltage range, rated voltage is taken as the mean of the voltage range marked.

4.3 Self-ballasted lamps are non-repairable, factory sealed units. They shall not be opened for any tests. In the case of doubt based on the inspection of the lamp and the examination of the circuit diagram, and in agreement with the manufacturer or responsible vendor, lamps specially prepared so that a fault condition can be simulated shall be submitted for testing (see Clause 13).

5 Marking

5.1 Lamps shall be clearly and durably marked with the following mandatory markings:

- a) mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor);
- b) rated voltage or voltage range (marked "V" or "volts");
- c) rated wattage (marked "W" or "watts");
- d) rated frequency (marked in "Hz").

5.2 In addition the following information shall be given by the lamp manufacturer either on the lamp or packing or in the installation instructions:

- a) lamp current;
- b) burning position if restricted;
- c) for lamps with a weight significantly higher than that of the lamps for which they are a replacement, attention should be drawn to the fact that the increased weight may reduce the mechanical stability of certain luminaires;
- d) special conditions or restrictions which shall be observed for lamp operation, for example, operation in dimming circuits. Where lamps are not suitable for dimming, the symbol in Figure 1 may be used:



IEC 928/99

Figure 1 – Dimming not allowed

5.3 Compliance is checked by the following:

- a) presence and legibility of the marking required in 5.1 – by visual inspection;
- b) the durability of the marking is checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked with water and, after drying, for a further 15 s with a piece of cloth soaked with hexane. The marking shall be legible after the test;
- c) availability of information required in 5.2 – by visual inspection.

6 Interchangeability

6.1 Interchangeability shall be ensured by the use of caps in accordance with IEC 60061-1.

6.2 Compliance of the combination of cap and bulb is checked by the use of gauges for checking the dimensions controlling interchangeability in accordance with Table 1.

The gauges are those shown in the standard sheet included in IEC 60061-3.

6.3 Self-ballasted lamps, when capped either B22d or E27 shall have a mass not exceeding 1 kg and shall not impart a bending moment, at the lampholder, of more than 2 Nm.

Compliance shall be checked by measurement.

Table 1 – Interchangeability gauges and lamp cap dimensions

Lamp cap	Cap dimensions to be checked by the gauge	Gauge sheet no. from IEC 60061-3
B22d or B15d	A max. and A min. D1 max. N min. Diametrical position of the pins Insertion in lampholder Retention in lampholder	} 7006-10 and 7006-11 7006-4A 7006-4B
E27	Max. dimensions of the screw thread Min. major diameter of the screw thread Contact making	7006-27B 7006-28A 7006-50
E26 E14	Max. dimensions of the screw thread Max. dimensions of the screw thread Min. major diameter of the screw thread Contact making	7006-27D 7006-27F 7006-28B 7006-54

7 Protection against electric shock

Self-ballasted lamps shall be so constructed that, without any additional enclosure in the form of a luminaire, no internal metal parts or live metal parts of the lamp cap are accessible when the lamp is installed in a lampholder according to IEC 60238.

Compliance is checked by means of the test finger specified in Figure 2, if necessary, with a force of 10 N.

Lamps with Edison screw caps shall be so designed that they comply with the requirements for inaccessibility for general lighting service (GLS) lamps.

Compliance is checked with the aid of a gauge in accordance with the current edition of IEC 60061-3, sheet 7006-51A for E27 caps and sheet 7006-55 for E14 caps.

NOTE Requirements for E26 caps are under consideration.

Lamps with B22 or B15 caps are subject to the same requirements as normal incandescent lamps with this cap.

External metal parts other than current-carrying metal parts of the cap shall not be or become live. For testing, any movable conductive material shall be placed in the most onerous position without using a tool.

Compliance is checked by means of the insulation resistance and electric strength test (see Clause 8).

8 Insulation resistance and electric strength after humidity treatment

8.1 General

Insulation resistance and electric strength shall be adequate between current-carrying metal parts of the lamp and accessible parts of the lamp.

8.2 Insulation resistance

The lamp shall be conditioned for 48 h in a cabinet containing air with a relative humidity between 91 % and 95 %. The temperature of the air is maintained within 1 °C of any convenient value between 20 °C and 30 °C.

Insulation resistance shall be measured in the humidity cabinet with a d.c. voltage of approximately 500 V, 1 min after application of the voltage. The insulation resistance between current-carrying metal parts of the cap and accessible parts of the lamp (accessible parts of insulating material are covered with metal foil) shall be not less than 4 M Ω .

NOTE The insulation resistance of bayonet caps between shell and contacts is under consideration.

8.3 Electric strength

Immediately after the insulation resistance test, the same parts as specified above shall withstand a voltage test for 1 min with an a.c. voltage as follows:

- ES caps: between accessible parts and parts of screw caps (accessible parts of insulating material are covered with metal foil):
 - type HV (220 V to 250 V): 4 000 V r.m.s.

- type BV (100 V to 120 V): $2U + 1\,000\text{ V}$

Value U = rated voltage.

During the test, the eyelet and the shell of the cap are short-circuited.

Initially, no more than half the prescribed voltage is applied. It is then gradually raised to the full value.

No flash-over or breakdown shall occur during the test. Measurements shall be carried out in the humidity cabinet.

NOTE The distance between the foil and the current-carrying parts is under consideration.

- Bayonet caps: between shell and contacts (under consideration).

9 Mechanical strength

Torsion resistance: The cap shall remain firmly attached to the bulb or that part of the lamp which is used for screwing the lamp in or out when subjected to the torque levels listed below.

B22d	3 Nm
B15d	1,15 Nm
E26 and E27	3 Nm
E14	1,15 Nm

The test is made by means of the test holders shown in Figures 3 and 4.

The torque shall not be applied suddenly, but shall be increased continuously from zero to the specified value.

In the case of uncemented caps, relative movement between cap and bulb is permitted provided it does not exceed 10° .

After the mechanical strength test, the sample shall comply with the requirements of accessibility (see Clause 7).

10 Cap temperature rise

The cap temperature rise Δt_s of the complete lamp during run-up, stabilization period and after stabilization shall not exceed the values mentioned below when measured under the conditions specified in IEC 60360:

B22d.....	125 K
B15d.....	120 K
E27.....	120 K
E14.....	120 K
E26.....	under consideration

Measurement shall be carried out at rated voltage. If the lamp is marked with a voltage range, it shall be measured at the mean voltage of that range, provided the limits of the voltage range do not differ by more than 2,5 % from the mean voltage. For lamps with a wider range, the measurement shall be made at the highest value of the range.