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Double-capped fluorescent lamps – Safety specifications

Lampes à fluorescence à deux culots – Prescriptions de sécurité

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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**DOUBLE-CAPPED FLUORESCENT LAMPS –
SAFETY SPECIFICATIONS**

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This consolidated version of IEC 61195 consists of the second edition (1999) [documents 34A/886/FDIS and 34A/900/RVD], its amendment 1 (2012) [documents 34A/1536/CDV and 34A/1577/RVC] and its corrigendum of August 2000. It bears the edition number 2.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 61195 has been prepared by sub-committee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

Annexes A, B and D form an integral part of this standard.

Annexes C and E are for information only.

The committee has decided that the contents of the base publication and its amendments 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

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INTRODUCTION

The standards IEC 62471 and IEC/TR 62471-2 contain horizontal requirements available that need to be introduced into product standards, e.g. to IEC 61195.

The horizontal requirements are transformed into requirements for double-capped fluorescent lamps.

The lamps within the scope of this standard are general lighting service (GLS) lamps according to the definition 3.11 of 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 are now covered in 2.13 of IEC 61195.

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

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DOUBLE-CAPPED FLUORESCENT LAMPS – SAFETY SPECIFICATIONS

1 General

1.1 Scope

This International Standard specifies the safety requirements for double-capped fluorescent lamps for general lighting purposes of all groups having Fa6, Fa8, G5, G13, 2G13, R17d and W4.3×8.5d caps.

It also specifies the method a manufacturer should use to show compliance with the requirements of this standard on the basis of whole production appraisal in association with his test records on finished products. This method can also be applied for certification purposes. Details of a batch test procedure which can be used to make limited assessment of batches are also given in this standard.

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.

NOTE Compliance with this standard concerns only safety criteria and does not take into account the performance of double-capped fluorescent lamps for general lighting purposes with respect to luminous flux, colour, starting and operational characteristics. Readers are referred to IEC 60081 for such characteristics.

1.2 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 60061-1, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps*

IEC 60061-2, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 2: Lampholders*

IEC 60061-3, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 3: Gauges*

IEC 60081, *Double-capped fluorescent lamps – Performance specifications*

IEC 60410, *Sampling plans and procedures for inspection by attributes*

IEC 60695-2-1/0, *Fire hazard testing – Part 2: Test methods – Section 1/sheet 0: Glow-wire test methods – General*

IEC 60921, *Ballasts for tubular fluorescent lamps – Performance requirements*

1.3 Definitions

For the purposes of this International Standard, the following definitions apply.

1.3.1

double-capped fluorescent lamp

double-capped low-pressure mercury discharge lamp of tubular form in which most of the light is emitted by a layer of fluorescent material excited by the ultra-violet radiation from the discharge

1.3.2

group

lamps having the same electrical and cathode characteristics, the same physical dimensions and the same starting method

1.3.3

type

lamps of the same group having the same photometric and colour characteristics

1.3.4

family

lamp groups which are distinguished by common features of materials, components, lamp diameter and/or method of processing

1.3.5

nominal wattage

wattage used to designate the lamp

1.3.6

design test

test made on a sample for the purpose of checking compliance of the design of a family, group or a number of groups with the requirements of the relevant clause

1.3.7

periodic test

test, or series of tests, repeated at intervals in order to check that the product does not deviate in certain respects from the given design

1.3.8

running test

test repeated at frequent intervals to provide data for assessment

1.3.9

batch

all the lamps of one family and/or group identified as such and put forward at one time for testing to check compliance

1.3.10

whole production

production during a period of twelve months of all types of lamps within the scope of this standard and nominated in a list of the manufacturer for inclusion in the certificate

1.3.11

specific effective radiant UV power

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

NOTE 1 Specific effective radiant UV power is expressed in mW/klm.

NOTE 2 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.

2 Safety requirements

2.1 General

Lamps shall be so designed and constructed that in normal use they present no danger to the user or surroundings.

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

NOTE Where testing can become unnecessarily difficult due to the lamp length, methods to alleviate the problem may be agreed between the supplier and the certification authority.

2.2 Marking

2.2.1 The following information shall be legibly and durably marked on the lamps:

- 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) the nominal wattage (marked "W" or "watts") or any other indication which identifies the lamp.

NOTE In some countries, the length of the lamp is marked in place of the wattage.

2.2.2 Compliance is checked by the following:

- a) presence and legibility of the marking by visual inspection;
- b) durability of marking by applying the following test on unused lamps.

The area of the marking on the lamp shall be rubbed by hand with a smooth cloth dampened with water for a period of 15 s.

After this test, the marking shall still be legible.

2.3 Mechanical requirements for caps

2.3.1 Construction and assembly

Caps shall be so constructed and assembled to the bulbs that they remain attached during and after operation.

Compliance is checked by the following tests:

2.3.1.1 For lamp types using caps G5, G13 and R17d:

- a) for unused lamps compliance is checked by applying a torque test to the pins, as follows:
 - the lamp cap shall remain firmly attached to the bulb and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6° when subjected to the torque levels listed in table 1.

Table 1 – Torque values for unused lamps

Cap type	Torque value Nm
G5	0,5
G13	1,0
R17d	1,0

The torque shall not be applied suddenly but shall be increased progressively from zero to the value specified in table 1.

The test holders for the application of the torque are shown in annex A. The test holder for the R17d cap is under consideration;

- b) following a heating treatment for a period of 2 000 h ± 50 h at a temperature of 120 °C ± 5 °C, the cap shall remain firmly attached to the bulb and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6° when subjected to the torque levels specified in table 2.

For G13 capped lamps with a nominal wattage greater than 40 W, the heating shall be performed at a temperature of 140 °C ± 5 °C.

Table 2 – Torque values after heating treatment

Cap type	Torque value Nm
G5	0,3
G13	0,6
R17d	0,6

2.3.1.2 For lamp types using caps Fa6 and Fa8, compliance is checked by inspection on unused lamps.

2.3.1.3 For lamp types using cap 2G13:

- a) for unused lamps the cap shall remain firmly attached to the bulb when subjected to an axial pull of 40 N or a bending moment of 3 Nm. The bending moment shall be applied by holding in a uniform manner that part of the glass tubes closest to the cap, the pivot point lying at the cap reference plane (mating plane with the lampholder). The pulling force and bending moment shall not be applied suddenly but shall be increased gradually from zero to the specified value;
- b) following a heating treatment for a period of 2 000 h ± 50 h at a temperature of 120 °C ± 5 °C, the cap shall remain firmly attached to the bulb when subjected to the pulling forces and bending moments which are under consideration.

2.3.2 Dimensional requirements for caps

2.3.2.1 Lamps shall use standardized caps in accordance with the requirements of IEC 60061-1.

2.3.2.2 Compliance is checked by using the gauges shown in table 3.

Table 3 – Sheet references of IEC 60061

Cap type	Sheet numbers	
	IEC 60061-1	IEC 60061-3
	Lamp caps	Gauges
G13	7004-51	7006-45
G5	7004-52	7006-46A
Fa6	7004-55	7006-41
R17d	7004-56	7006-57
Fa8	7004-57	7006-40/7006-40A
2G13	7004-33	7006-33

2.4 Insulation resistance

2.4.1 The insulation resistance between the metal shell of the cap and the pin(s) or contacts shall not be less than 2 MΩ.

2.4.2 Compliance is checked by measurement with suitable test equipment using a d.c. voltage of 500 V.

2.5 Electric strength

2.5.1 This test shall not apply to lamps having caps with internal resistors.

2.5.2 The insulation between the shell of the cap and the pin(s) or contacts shall withstand the test voltage. No flash-over or breakdown shall occur during the test.

2.5.3 Compliance is checked with a 1 500 V a.c. voltage of substantially sine-wave form, with a frequency of 50 Hz or 60 Hz and applied for 1 min. Initially, not more than half the prescribed voltage shall be applied; it shall then be raised rapidly to the full value.

Glow discharges without a drop in voltage are neglected.

2.6 Parts which can become accidentally live

2.6.1 Metal parts intended to be insulated from live parts shall not be or become live.

2.6.2 With the exception of cap pins no live part shall project from any part of the cap.

2.6.3 Compliance is checked by a suitable measuring system which may include visual inspection where appropriate. In addition, there shall be regular daily checks of the equipment or a verification of the effectiveness of the inspection. See 3.5.4.

2.7 Resistance to heat and fire

2.7.1 Insulating material of caps shall be resistant to heat.

2.7.2 Compliance is checked by the following test.

Samples are tested in a heating cabinet at a temperature of 125 °C ± 5 °C for a period of 168 h.

For G13 caps to be used on lamps with a nominal wattage greater than 40 W, the samples shall be tested at a temperature of $140\text{ °C} \pm 5\text{ °C}$.

At the end of the test, the samples shall not have undergone any change impairing their further safety, especially in the following respects:

- reduction in the protection against electric shock as required in 2.4 and 2.5;
- loosening of cap pins, cracks, swelling and shrinking as determined by visual inspection.

At the end of the test, the dimensions shall comply with the requirements of 2.3.2.

2.7.3 External parts of insulating material shall be resistant to abnormal heat and to fire.

2.7.4 Compliance is checked by the following test.

Parts are subjected to a test using a nickel-chromium glow-wire heated to 650 °C . The test apparatus shall be that described in IEC 60695-2-1/0.

The sample to be tested is mounted vertically on the carriage and pressed against the glow-wire tip with a force of 1 N, preferably 15 mm or more from the upper edge of the sample. The penetration of the glow-wire into the sample is mechanically limited to 7 mm. After 30 s the sample is withdrawn from contact with the glow-wire tip.

Any flame or glowing of the sample shall extinguish within 30 s of withdrawing the glow-wire and any burning or molten drop shall not ignite a piece of tissue paper consisting of five layers spread out horizontally $200\text{ mm} \pm 5\text{ mm}$ below the sample.

The glow-wire temperature and heating current shall be constant for 1 min prior to commencing the test. Care shall be taken to ensure that heat radiation does not influence the sample during this period. The glow-wire tip temperature is measured by means of a sheathed fine-wire thermocouple constructed and calibrated as described in IEC 60695-2-1/0.

NOTE Precautions should be taken to safeguard the health of personnel conducting tests against risk of

- explosion or fire;
- inhalation of smoke and/or toxic products;
- toxic residues.

2.8 Creepage distance for caps

2.8.1 The minimum creepage distance between contact pin(s) or contacts and the metal shell of the cap shall be in accordance with the requirements in IEC 60061-1. Relevant cap standard sheet numbers are given in table 3.

2.8.2 Compliance is checked by measurement in the most onerous position.

2.9 Lamp cap temperature rise

2.9.1 For lamps using caps G5, G13 and 2G13, and designed for operation with the use of a starter, the lamp cap temperature rise above ambient temperature shall not exceed 95 K. For lamps with W4.3×8.5d caps, the lamp cap temperature rise at the measuring point shall not exceed 55 K (see figure 1).