

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Double-capped LED lamps designed to retrofit linear fluorescent lamps – Safety specifications

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Lampes à LED à deux culots conçues pour remplacer des lampes à fluorescence linéaires – Spécifications de sécurité

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IEC 62776

Edition 1.0 2014-12

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**IEC 62776**  
Edition 1.0 2014-12

**DOUBLE-CAPPED LED LAMPS DESIGNED  
TO RETROFIT LINEAR FLUORESCENT LAMPS –  
SAFETY SPECIFICATIONS**

**INTERPRETATION SHEET 1**

This interpretation sheet has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this interpretation sheet is based on the following documents:

FDIS	Report on voting
34A/2081/FDIS	34A/2090/RVD

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Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

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Interpretation of Clause 7 of IEC 62776:2014

The statement in the first paragraph of Clause 7 that “there shall not be any electrical continuity between the two ends of the lamp during the insertion” is in contradiction with the compliance requirements that follow. In the physical world, establishing the complete lack of any electrical continuity between the two ends is not possible since all materials may be characterized by their inherent conductivity however small it may be.

The compliance requirements described in the fourth paragraph of Clause 7 shall take precedence.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DOUBLE-CAPPED LED LAMPS DESIGNED  
TO RETROFIT LINEAR FLUORESCENT LAMPS –  
SAFETY SPECIFICATIONS**

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

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34A/1795/FDIS	34A/1816/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.

In this standard, the following print types are used:

- requirements proper: in roman type.
- *test specifications: in italic type.*
- Notes: in small roman type.

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.

The contents of the corrigendum of March 2015 and Interpretation Sheet 1 of June 2018 have been included in this copy.

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## INTRODUCTION

Double-capped fluorescent lamps are installed in big volume in office lighting, street lighting, industrial lighting and much more. Double-capped LED lamps are intended as a possible replacement for G5- or G13-capped fluorescent lamps. This standard safeguards that the change from fluorescent lamp to LED lamp and the backward change from LED lamp to fluorescent lamp is carried out with safe LED lamps and under specified exchange conditions.

The establishing of a safety standard for double-capped LED lamps does not exclude future relocation as a part of IEC 60968, self-ballasted lamps (if re-edited as an umbrella standard), and further inclusion of requirements for conversion type double-capped LED lamps.

This proposal covers double-capped LED lamps with cap G5 and G13 only, where the fluorescent tube is replaced by a tubular LED lamp, without modifications to the luminaire. Only in case of electromagnetic controlgear, the starter is replaced by a LED starter.

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# DOUBLE-CAPPED LED LAMPS DESIGNED TO RETROFIT LINEAR FLUORESCENT LAMPS – SAFETY SPECIFICATIONS

## 1 Scope

This International Standard specifies the safety and interchangeability requirements, and the exchange operation together with the test methods and conditions required to show compliance of double-capped LED lamps with G5 and G13 caps, intended for replacing fluorescent lamps with the same caps, having:

- a rated power up to 125 W;
- a rated voltage of up to 250 V.

Such LED lamps are designed for replacement without requiring any internal modification of the luminaire.

The existing luminaires, into which the double-capped LED lamps are fitted, can be operated with electromagnetic or electronic controlgear.

The requirements of this standard relate only to type testing.

Recommendations for whole product testing or batch testing are given in Annex A.

NOTE 1 Where in this standard the term “lamp(s)” is used, it is understood to stand for “double-capped retrofit LED lamp(s)”, except where it is obviously assigned to other types of lamps.

This standard does not cover double-capped conversion LED lamps where modification in the luminaire is required. The requirements in this standard are given for general lighting service (excluding for example explosive atmospheres). For lamps for other applications additional requirements may apply.

NOTE 2 This standard includes photobiological safety.

## 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 60061-1, *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 60061-4, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 4: Guidelines and general information*

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

IEC 60155, *Glow-starters for fluorescent lamps*

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

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

IEC 60695-2-10:2013, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods; Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000<sup>1</sup>, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products*

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

IEC 61195, *Double-capped fluorescent lamps – Safety specifications*

IEC 61347-1:— 2, *Lamp controlgear – Part 1: General and safety requirements*

IEC 61347-2-8, *Lamp controlgear – Part 2-8: Particular requirements for ballasts for fluorescent lamps*

IEC 62031, *LED modules for general lighting – Safety specifications*

IEC 62504, *General lighting - Light emitting diode (LED) products and related equipment - Terms and definitions*

IEC TR 62778, *Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires*

ISO 4046-4:2002, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62504, IEC 62031 as well as the following apply.

#### 3.1

##### **double-capped retrofit LED lamp**

tubular LED lamp which can be used as a replacement for double-capped fluorescent lamps without requiring any internal modification in the luminaire and which, after installation, maintains the same level of safety of the replaced lamp in the luminaire

Note 1 to entry: The replacement of a glow starter according to IEC 60155 with LED replacement starter having the same dimensions and fit, for the correct functioning of the double-capped LED lamp is not considered as a modification to the luminaire.

<sup>1</sup> First edition. This edition has been replaced in 2014 by IEC 60695-2-11:2014, *Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)*

<sup>2</sup> To be published.

**3.2****double-capped conversion LED lamp**

double-capped LED lamp which can be used as a replacement for another type of lamp with modification to the luminaire

**3.3****rated voltage**

voltage value for a characteristic of a lamp for specified operating conditions

Note 1 to entry: The value and the conditions are specified in this standard, or assigned by the manufacturer or responsible vendor.

**3.4****rated power**

power marked on the lamp

**3.5****rated frequency**

frequency marked on the lamp

**3.6****cap temperature rise**

$\Delta t_s$

surface temperature rise (above ambient) of the lamp cap

**3.7****live part**

conductive part which may cause an electric shock in normal use

**3.8****type**

double-capped LED lamp, representative of the production

**3.9****type test**

conformity test on one or more double-capped LED lamps with similar cap, representative of the production

**3.10****type test sample**

one or more double-capped LED lamps with similar cap, submitted by the manufacturer or responsible vendor for the purpose of the type test

**3.11****ultraviolet hazard efficacy of luminous radiation**

$K_{S,v}$

quotient of an ultraviolet hazard quantity to the corresponding photometric quantity

Note 1 to entry: Ultraviolet hazard efficacy of luminous radiation is expressed in mW/klm

Note 2 to entry: The ultraviolet hazard efficacy of luminous 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, such as mechanical damage or discoloration.

**4 General requirements and general test requirements**

**4.1** The lamps shall be so designed and constructed that in normal use they function safely causing no danger to the user or surroundings.

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

**4.2** Double-capped LED lamps shall normally not be opened for tests. In the case of doubt based on the inspection of the lamp and the examination of the lamp circuit diagram, and in agreement with the manufacturer or responsible vendor, lamps shall be specially prepared so that a fault condition can be simulated and shall be submitted for testing (see Clause 13). Opened lamps or inspection of internal component parts of the lamp may be required to verify conformity with Clauses 11, 12 and 14 of this standard.

**4.3** In general, all tests are carried out on each type of lamp or, where a range of similar lamps is involved, for each power in the range or on a representative selection from the range, as agreed with the manufacturer.

**4.4** When the lamp fails safely during one of the tests, it is replaced, provided that no fire, smoke or flammable gas is produced. Further requirements on failing safe are given in Clause 13.

**4.5** Internal wiring shall be carried out as in Clause 5.3 of IEC 60598-1.

**4.6** For construction of the electrical circuit, 15.1 and 15.2 of IEC 61347-1:— shall be regarded and for the other parts, Clauses 4.11, 4.12 and 4.25 of IEC 60598-1 shall be regarded.

**5 Marking**

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**5.1 Marking on the lamp**

Lamps shall be clearly and durably marked with the following markings, the size of which shall be minimum 2 mm for letters/numbers and 5 mm for symbols.

- a) Mark of origin (this may take the form of a trademark, the manufacturer’s name or the name of the responsible vendor).
- b) Rated voltage or voltage range (marked “V” or “volts”).

NOTE 1 The rated voltage or voltage range of the lamp can differ from the open circuit voltage.

- c) Rated power (marked “W” or “watts”).
- d) Rated frequency or frequency range (marked in “Hz” or “kHz”).
- e) Double-capped LED lamps suitable to be used in combination with some type of ballast only (e.g. with magnetic ballast) shall be marked with the symbol as in Figure 1 and/or Figure 2.



[SOURCE: 60417-6095 (2011-11)]

**Figure 1 – Lamp suitable for high frequency operation**



[SOURCE: 60417-6094 (2011-11)]

**Figure 2 – Lamp suitable for 50 Hz or 60 Hz operation**

- f) Double-capped LED lamps shall be marked according to Figure 3 and with the following information: “This lamp is not suitable to be used in emergency luminaires designed for double-capped fluorescent lamp(s)”.

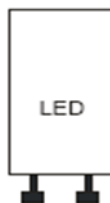
NOTE 2 For the future, additional requirements to support use for emergency lighting can be developed



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**Figure 3 – Lamp not suitable for emergency operation**

- g) If double-capped LED lamps need to be used with components which replace the starter, they shall be marked with the type reference of the LED replacement starter. The LED replacement starter shall be marked as in Figure 4.



NOTE: The symbol is under development as IEC 60417-Pr14-181.

**Figure 4 – LED replacement starter**

- h) Provide information on the ingress of dust and water.

For lamps that should be used in dry conditions or in a luminaire that provides protection, see Figure 5.



[SOURCE: IEC 60417-6179-1 (2014-10)]

**Figure 5 – Lamp to be used in dry conditions or in a luminaire that provides protection**

- i) Rated ambient temperature range of the lamp.

**5.2 Marking on the lamp, on the immediate lamp wrapping (or container) or in the instructions**

In addition, the following information shall be given by the lamp manufacturer on the lamp or immediate lamp wrapping or container or in the instruction manual. Explanation of Figures 1 and 2 shall be given in the instruction manual.

- a) Rated current (marked “A” or “ampere”).
- b) 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 lamps may be marked according to Figure 6.

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NOTE: The symbol is under development as IEC 60417-Pr14-205.

**Figure 6 – Dimming not allowed**

**5.3 Instruction manual**

**5.3.1 General**

In addition to the information listed in 5.2, double-capped LED lamps shall be accompanied by instructions, describing all necessary steps for the replacement of the fluorescent lamp with a LED lamp, such as replacement of the starter.

All required instructions detailed by this safety standard shall be given either on the lamp, on the product packaging or in the manufacturer’s instructions provided with the lamp. The meaning of the symbols shown in 5.1 and 5.2 should be clearly explained (using words) in the instruction manual.

The content of the instructions shall include the following.

**5.3.2 Declaration of the product**

The provisions requested under the following items 1) to 5) shall be supplied.

- 1) A list of all parts supplied shall be provided.