

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**GX16t-5 capped tubular led lamp – Safety specifications**

**Lampe à led tubulaire munie d'un culot GX16t-5 – Spécifications de sécurité**

IEC 62931:2017

<https://standards.iteh.ai/catalog/standards/sist/5e77d9ee-5c66-48b5-92f0-36268800bb18/iec-62931-2017>



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## GX16t-5 CAPPED TUBULAR LED LAMP – SAFETY SPECIFICATIONS

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

FDIS	Report on voting
34A/1957/FDIS	34A/1974/RVD

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

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## GX16t-5 CAPPED TUBULAR LED LAMP – SAFETY SPECIFICATIONS

### 1 Scope

This document specifies the safety and interchangeability requirements together with the test methods and conditions required to show compliance of non-integrated tubular LED lamps, intended for general lighting purposes, having:

- a rated wattage up to 70 W,
- a rated voltage up to 190 V ripple free DC,
- GX16t-5 cap as listed in Table 1.

The requirements of this document relate only to type testing.

NOTE 1 Where in this document the term “lamp(s)” is used, it is understood to stand for “non-integrated GX16t-5 capped tubular LED-lamp(s)”, except where it is obviously assigned to other types of lamps.

NOTE 2 The lamp specified in this document is operated with a controlgear specified in Annex B. See Clause 18.

NOTE 3 This document includes photobiological safety.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60061-4, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 4: Guidelines and general information*

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

IEC 60400:2008, *Lampholders for tubular fluorescent lamps and starterholders*

IEC 60400:2008/AMD1:2011

IEC 60400:2008/AMD2:2014

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods; Glow-wire apparatus and common test procedure<sup>1</sup>*

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<sup>1</sup> Withdrawn



IEC 60838-2-3, *Miscellaneous lampholders – Part 2-3: Particular requirements – Lampholders for double-capped linear LED lamps*

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 (GWEPT)*<sup>2</sup>

IEC 61347-1:2015, *Lamp controlgear – Part 1: General and safety requirements*

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 62778:2014, *Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires*

ISO 4046-4:2016, *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 and IEC 62031, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **non-integrated double-capped LED lamp**

tubular LED lamp having two caps which needs a separate controlgear to operate

#### 3.2

##### **GX16t-5 capped LED lamp**

non-integrated tubular LED lamp(s) equipped with the GX16t-5 cap system

#### 3.3

##### **cap temperature rise**

$\Delta t_s$

surface temperature rise (above ambient) of the lamp cap

#### 3.4

##### **ultraviolet hazard efficacy of luminous radiation**

$K_{S,v}$

quotient of an ultraviolet hazard quantity to the corresponding photometric quantity

Note 1 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  $SUV(\lambda)$ . 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.

Note 2 to entry: Ultraviolet hazard efficacy of luminous radiation is expressed in mW/klm.

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<sup>2</sup> Withdrawn

## 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** GX16t-5 capped LED lamps shall normally 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, either the output terminals shall be short-circuited or, in agreement with the manufacturer, lamps specially prepared so that a fault condition can be simulated shall be submitted for testing (see Clause 14). Opened lamps or inspection of internal component parts of the lamp may be required to verify conformity with Clauses 11, 12 and 13.

**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 during one of the tests without any fire, smoke and flammable gas, it is regarded as a safe failure and shall be replaced in the test. Further requirements on failing safely are given in Clause 14.

**4.5** Internal wiring shall be carried out according to the requirements in IEC 60598-1:2014, 5.3.

**4.6** For the construction of the electrical circuit, the requirements in IEC 61347-1:2015, 15.1 and 15.2 shall be taken into account and for the construction of other parts, the requirements in IEC 60598-1:2014, 4.11, 4.12 and 4.25 shall be taken into account.

NOTE Temperature conditions can be modified in the regional standards according to the climate there.

## 5 Marking

### 5.1 Marking on the lamp

Lamps shall be clearly and durably marked with the following marking:

- a) mark of origin (this may take the form of a trademark, the manufacturer's name or the name of the responsible vendor);
- b) lamp identification;
- c) rated wattage (units: "W" or "watts");
- d) Information on the ingress of dust and water, see Figure 1:
  - for lamps which do not comply with 16.3.



IEC 60417-6179:2012-10

**Figure 1 – Lamp not suitable for use under dust and moisture**

## 5.2 Marking on the packing or in instructions

In addition, the following information shall be given by the lamp manufacturer on immediate lamp wrapping (or container) or in instructions.

- a) Mark of origin (this may take the form of a trademark, the manufacturer's name or the name of the responsible vendor);
- b) Lamp identification;
- c) rated wattage (units: "W" or "watts");
- d) Rated lamp current (units: "A" or "ampere");
- e) Nominal dimensions;
  - unit: mm;
  - example of marking: 1 200 mm × 26 mm.
- f) Rated ambient temperature range of the lamp;

The ambient temperature range for which the lamp is rated shall be declared. Where the minimum ambient temperature of the range is higher than  $-20\text{ °C}$  or the maximum ambient temperature of the range lower than  $+60\text{ °C}$  the instruction manual for the lamp shall contain the following information.

"This lamp may not be suitable for use in all applications where a traditional fluorescent lamp has been used. The temperature range of this lamp is more restricted. In cases of doubt regarding the suitability of the application the manufacturer of this lamp should be consulted."

NOTE 1 This document is based on the assumption that the normal expected ambient temperature range of the fluorescent lamps that can be replaced by these retro-fit products is  $-20\text{ °C}$  to  $+60\text{ °C}$ .

- g) Purpose of usage. Example of marking: "This lamp is designed for general lighting service (excluding e.g. explosive atmospheres)."

NOTE 2 The above mentioned information can also be marked on the lamp.

## 5.3 Durability and legibility of marking

*Compliance with 5.1 and 5.2 is checked by the following:*

*Presence and legibility of the marking by visual inspection.*

*The durability of the marking – as far as applied on the lamp – 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. Availability of information required in 5.2 by visual inspection.*

## 6 Interchangeability

### 6.1 Dimensional requirements of caps

Interchangeability shall be ensured by the use of GX16t-5 cap in accordance with IEC 60061-1 and gauges in accordance with IEC 60061-3. See Table 1.

*Compliance is checked by the use of the relevant gauges.*

**Table 1 – Sheet references of IEC 60061-1 and IEC 60061-3**

Lamp cap	Cap sheet in IEC 60061-1	Cap dimensions to be checked by the gauge	Gauge sheet in IEC 60061-3
GX16t-5	7004-183	All dimensions to be checked	7006-183 and 7006-183A

### 6.2 Mass

The value of the lamp mass shall not exceed 500 g for a length up to and including 1,2 m and 1 000 g for a length above 1,2 m.

*Compliance is checked by inspection using appropriate gauges (e.g. meter sticks and mass balances).*

### 6.3 Dimensions

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#### 6.3.1 General

For safe application to luminaires, dimensions of the lamp shall comply with the dimension shown in the relevant lamp datasheet in Annex D over the rated ambient temperature range of the lamp. The minimum value of the rated ambient temperature range of the lamp shall not be higher than  $-5\text{ °C}$  and the maximum value shall not be lower than  $50\text{ °C}$ .

*Compliance is checked by the tests in 6.3.2, 6.3.3 and 6.3.4.*

NOTE 1 For the purposes of this document, the minimum and maximum temperature range for fluorescent lamps has been assumed to be  $-20\text{ °C}$  to  $+60\text{ °C}$ . Lamp lengths critical for stress at the holders at elevated temperatures and critical for contact making at lowered temperatures are considered.

NOTE 2 Acceptable length variation of the LED lamp is based on thermal expansion of the general luminaire construction assuming a steel tray construction for mounting the lampholders and having a thermal expansion coefficient of  $11,7 \times 10^{-6}/\text{K}$ .

#### 6.3.2 Dimensions at $25\text{ °C}$ (non-operating)

Dimensions of the lamp shall comply with the dimensions specified in the relevant lamp datasheet in Annex D at  $25\text{ °C}$ . Measured dimensions shall be noted as  $A_{25\text{ °C}}$  and  $D_{25\text{ °C}}$

*Compliance is checked by inspection.*

#### 6.3.3 Dimension A at maximum ambient temperature (operating)

The lamp shall be installed into the luminaire incorporating lampholders specified in IEC 60838-2-3 without any mechanical stress to the luminaire at maximum ambient temperature when the lamp is operating.

*Compliance is checked by the following tests:*

- a) *Measurement of variation of dimension A due to self-heating at  $25\text{ °C}$*

The lamp is placed in a draught free environment and operated at its rated current. Dimension A is measured after the lamp is stabilized and noted as  $A_{\text{operating}}$ . The difference in length is calculated from the value measured in this operating state:

$$\Delta A = A_{\text{operating}} - A_{25\text{ }^{\circ}\text{C}}$$

b) *Dimension A at maximum ambient temperature*

The lamp is placed in the climate chamber at the maximum specified ambient temperature, i.e.  $+60\text{ }^{\circ}\text{C}$  or at the maximum specified ambient temperature,  $t_{\text{max}}$ . After having attained the temperature  $t_{\text{max}}$  for 1 h, the lamp is taken off the climate chamber and the length of the lamp is measured immediately. Care should be taken that during measurement no significant change of temperature of the lamp occurs. The temperature of the lamp is recorded during the length measurement, after having taken it off from the climate chamber. The length A at the maximum of the rated ambient temperature range shall be noted as  $A_{t_{\text{max}}}$ .

c) *Compliance*

The value  $A_1$  calculated with the formula below shall comply with the dimension A specified in Annex D.

$$A_1 = A_{t_{\text{max}}} + \Delta A - A_{25\text{ }^{\circ}\text{C}} (t_{\text{max}} - 25) 11,7 \times 10^{-6}$$

### 6.3.4 Dimension A at minimum ambient temperature (non-operating)

The lamp shall be installed into the luminaire having correct lampholders specified in IEC 60838-2-3 without any mechanical stress to the luminaire at minimum ambient temperature when the lamp is operating.

Compliance is checked by the following tests:

a) *The lamp is placed in a climate chamber at the minimum ambient temperature, i.e.  $-20\text{ }^{\circ}\text{C}$ , or at the minimum specified ambient temperature ( $t_{\text{min}}$ ). After having attained the storage temperature ( $t_{\text{min}}$ ) for 1 h, the lamp is taken off the climate chamber and the lamp length is measured immediately. Care has to be taken that during measurement no significant change of temperature of the lamp occurs. The temperature of the lamp is recorded during the length measurement of dimension A. The value at minimum of the rated temperature range shall be considered for compliance and noted as  $A_{t_{\text{min}}}$ .*

b) *Compliance*

The value  $A_2$  calculated with the formula below shall comply with the dimension A specified in Annex D.

$$A_2 = A_{t_{\text{min}}} - A_{25\text{ }^{\circ}\text{C}} (t_{\text{min}} - 25) 11,7 \times 10^{-6}$$

## 6.4 Temperature

Except for lamp caps, the LED lamp temperature shall not be higher than  $75\text{ }^{\circ}\text{C}$  measured on any location of the lamp. The requirement applies for lamp surfaces which can be touched with a test finger specified in Figure 2.

Compliance is checked by the following tests:

*The lamp is measured positioned horizontally at  $25\text{ }^{\circ}\text{C}$  ambient temperature in free air. For details of this test setup, see Annex A in this document. The lamp under test shall consist of a complete unit, operated at its rated current. When stable conditions have been reached, the maximum surface temperature on the lamp shall be measured. These shall not exceed  $75\text{ }^{\circ}\text{C}$ .*

## 6.5 Lamp bowing (sag)

Gravitational displacement of the lamp centre when horizontally mounted in a GX16t-5 system shall not be greater than 10 mm for lamps of which the nominal length is up to and including 1 200 mm and shall not be greater than 20 mm for longer lamps.

## 6.6 Pin connection

The connection of lamp pins of caps shall not have polarity requirement.

NOTE Polar free property for pin connection of the lamp can be achieved with full-wave rectification circuit in the lamp.

*Compliance shall be checked by the following test: a lamp shall light up with a 350 mA test current on both polarities.*

## 7 Protection against accidental contact with live parts

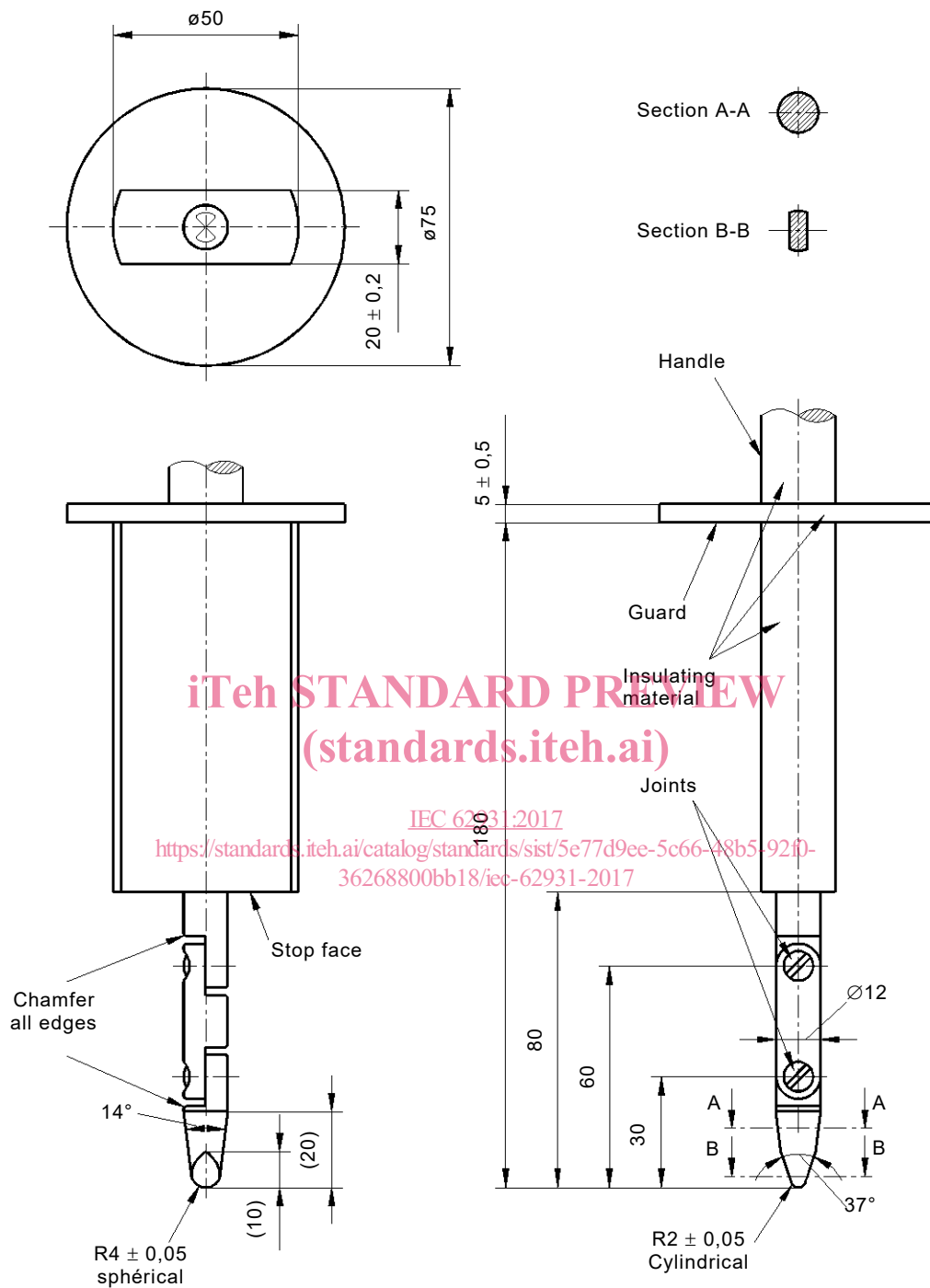
The lamps shall be so constructed that, without any additional enclosure in the form of a luminaire, no internal metal parts, basic insulated external metal parts (other than caps) or live metal parts of the lamp cap or of the lamp itself are accessible when the lamp is installed in a lampholder according to IEC 60838-2-3.

*Compliance: the accessibility is checked with a test finger specified in Figure 2, with a force of 10 N.*

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 the insulation resistance test and electric strength test between the pin(s) or contacts of one cap and the pin(s) or contacts of the other cap according to Clause 8.*

Linear dimensions in millimetres



IEC1

Material: metal, except where otherwise specified

Tolerances on dimensions without specific tolerance:			
on angles:	on linear dimensions:		
+0	up to 25 mm:	+0 mm	over 25 mm: ± 0,2 mm
-10'		-0,05 mm	

Both joints shall permit movement in the same plane and the same direction through an angle of 90° with a 0° to +10° tolerance.

Figure 2 – Standard test finger (according to IEC 60529)