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مصابيح الصمام الثنائي الباعث للضوء (الليد) ذاتية الكبح لخدمات الإنارة
العامة بجهد أكبر من ٥٠ فولت – مواصفات السلامة

**SELF-BALLASTED LED-LAMPS FOR GENERAL
LIGHTING SERVICES BY VOLTAGE > 50 V – SAFETY
SPECIFICATIONS**

ICS: 29.140.30

مقدمة

قامت الهيئة السعودية للمواصفات والمقاييس والجودة بتبني المواصفة القياسية رقم " IEC 62560/2011 " مصابيح الصمام الثنائي الباعث للضوء (الليد) ذاتية الكبح لخدمات الإنارة العامة بجهد أكبر من ٥٠ فولت - مواصفات السلامة " والتي أصدرتها " الهيئة الدولية الكهنتقنية" وقد تم ترجمتها إلى اللغة العربية وذلك بواسطة الفريق الفني "الانارة وملحقاتها". وقد اعتمدت هذه اللائحة الفنية السعودية دون إدخال أي تعديلات فنية عليها .

Foreword

Saudi Standards, Metrology and Quality Organization (SASO) has adopted Standard No. (IEC 62560/2011) "SELF-BALLASTED LED-LAMPS FOR GENERAL LIGHTING SERVICES BY VOLTAGE > 50 V – SAFETY SPECIFICATIONS" issued by International Electrotechnical Commission which has been translated into Arabic by the technical team (lighting and accessories).

This standard has been approved as a Saudi Technical Regulation without any technical modifications.

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SELF-BALLASTED LED-LAMPS FOR GENERAL LIGHTING SERVICES BY VOLTAGE > 50 V – SAFETY SPECIFICATIONS

1 Scope

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

- a rated wattage up to 60 W;
- a rated voltage of > 50 V up to 250 V;
- caps according to Table 1.

The requirements of this standard relate only to type testing.

Recommendations for whole product testing or batch testing are identical to those given in Annex C of IEC 62031.

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

2 Normative references

The following reference 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 reference 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 60360, *Standard method of measurement of lamp cap temperature rise*

IEC 60432-1, *Incandescent lamps – Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60598-1:2008, *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*

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 60695-2-12:2000, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods; Glow-wire flammability test method for materials*

IEC 60695-2-13:2000, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods; Glow-wire ignitability test method for materials*

IEC 61199:1999, *Single-capped fluorescent lamps – Safety specifications*

IEC 61347-1:2007, *Lamp controlgear – Part 1: General and safety requirements*

IEC 62031:2008, *LED modules for general lighting – Safety requirements*

IEC/TR 62471-2, *Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety*

IEC/TS 62504, *Terms and definitions of LEDs and LED modules in general lighting*¹

ISO 4046-4:2002, *Paper, board, pulp 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 of IEC/TS 62504 (in preparation), IEC 62031 and the following apply.

3.1

self-ballasted LED-lamp

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

NOTE Lamp caps are given in IEC 60061-1.

3.2

rated voltage

voltage or voltage range marked on the lamp

3.3

rated wattage

wattage marked on the lamp

3.4

rated frequency

frequency marked on the lamp

3.5

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, in case of an Edison screw cap or a bayonet cap

NOTE The standard method for Edison screw cap or bayonet cap is that given in IEC 60360.

3.6

live part

conductive part which may cause an electric shock in normal use

¹ To be published.

3.7

type

lamps that have an identical electrical rating and a similar cap

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

4 General requirements and general test requirements

4.1 The 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 Self-ballasted LED-lamps are non-repairable, factory-sealed units. They 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 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 wattage 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 12.

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 trademark, 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 on the lamp or immediate lamp wrapping or container or in installation instructions.

- a) Burning position, if restricted, shall be marked with the appropriate symbol. Symbol examples are shown in Annex B.
- b) rated current (marked "A" or "ampere");
- 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 and lampholders and may impair contact making and lamp retention."

- 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 following symbol in Figure 1 may be used:



Figure 1 – Dimming not allowed

- e) For eye protection, see requirements of IEC/TR 62471-2

5.3 Compliance is checked by the following:

Presence and legibility of the marking required in 5.1 – by visual inspection.

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.

Availability of information required in 5.2 – by visual inspection.

6 Interchangeability

6.1 Cap interchangeability

Interchangeability shall be ensured by the use of caps 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 – Interchangeability gauges and lamp cap dimensions

Lamp cap	Cap sheet no. from IEC 60061-1	Cap dimensions to be checked by the gauge	Gauge sheet no. from IEC 60061-3
B15d	7004-11	A max. and A min. D1 max. N min.	} 7006-10 and 7006-11
B22d	7004-10	Diametrical position of the pins Insertion in lampholder Retention in lampholder	7006-4A 7006-4B
E11	7004-6	"Go"	7006-6
E12	7004-28	"Go" Additional "Go" "Not Go" Contact-making	7006-27H 7006-27J 7006-28C 7006-32
E14	7004-23	Max. dimensions of the screw thread Min. major diameter of the screw thread Dimension S1 Contact making	7006-27F 7006-28B 7006-27G 7006-54
E17	7004-26	Max. dimensions of the screw thread Min. major diameter of the screw thread Contact making	7006-27K 7006-28F 7006-26D
E26	7004-21A	Max. dimensions of the screw thread Min. major diameter of the screw thread	7006-27D 7006-27E
E27	7004-21	Max. dimensions of the screw thread Min. major diameter of the screw thread Dimension S1 Contact making	7006-27B 7006-28A 7006-27C 7006-50
GU10	7004-121	"Go" and "Not Go"	7006-121
GZ10	7004-120	"Go" and "Not Go"	7006-120
GX53	7004-142	"Go" and "Not Go" "Not Go" "Go" and "Not Go" for checking keyways "Not Go" for checking keyways	7006-142 7006-142D 7006-142E 7006-142F

6.2 Bending moment, axial pull and mass

The value of the bending moment, imparted by the lamp at the lampholder shall not exceed the value given in Table 2.

The bending moment shall be determined by measuring the weight of the lamp (e. g. by means of a balance) at the tip of the bulb of the horizontally held lamp and multiplying this force by the distance between the tip of the bulb and the pivot line. The pivot line shall lie at the bottom end of the cylindrical part (for Edison and bayonet caps) or at the end of the contact pins (for pin caps). It shall be supported by an upright held thin metal sheet or a similar means.

The lamp construction shall withstand externally applied axial pull and bending moment.

For the measurement method, see A.2.1 of IEC 61199.

The mass as given in Table 2 shall not be exceeded.

Table 2 – Bending moments and masses

Cap	Bending moment (Nm)	Mass (kg)
B15d	1	*
B22d	2	1
E11	0,5	*
E12	0,5	*
E14	1	*
E17	1	*
E26	2	*
E27	2	1
GU10	0,1	*
GZ10	0,1	*
GX53	0,3	*

* Under consideration.

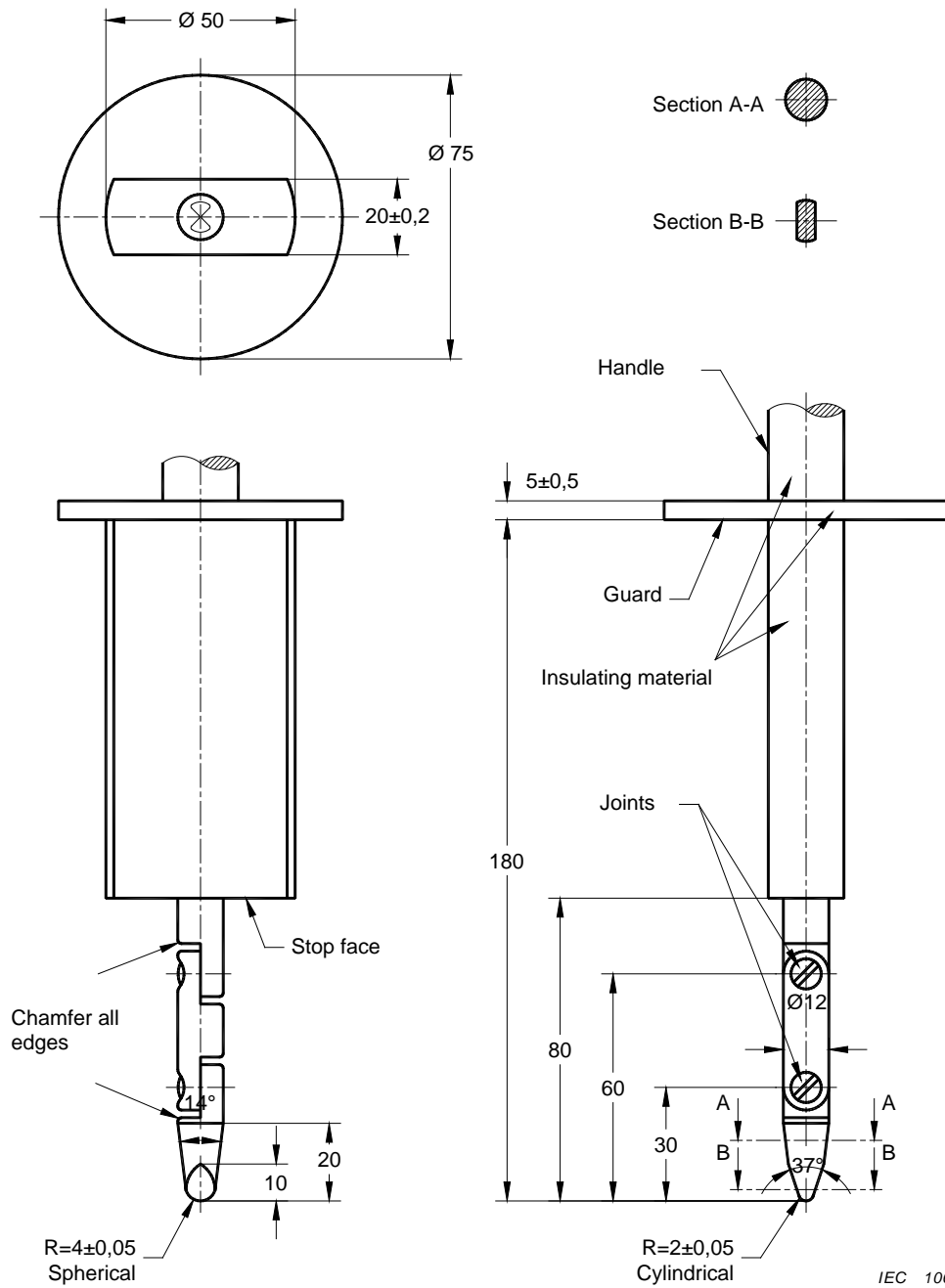
NOTE 1 For lamps with caps different to those in Table 2, the effect of the bending moment should be regarded and limited. A measurement method for these lamps with these caps is under consideration.

NOTE 2 It should be taken care that the luminaire surface where the lampholder is fixed to can withstand the bending moment. For the calculation of this bending moment, the length of the lampholder needs to be taken into account when measuring the overall length. This should be made sure for the elevated temperature during operation in order to check the possible softening of the surface material.

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 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 the relevant IEC lampholder data sheet.

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



Linear dimensions in millimetres

Material: metal, except where otherwise specified

Tolerances on dimensions without specific tolerance:

- on angles: $\begin{matrix} +0 \\ -10 \end{matrix}$
- on linear dimensions:
 - up to 25 mm: $\begin{matrix} +0 \\ -0,05 \end{matrix}$
 - over 25 mm: $\pm 0,2$ 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)
(from IEC 60400, Figure 41)

Lamps with Edison screw caps shall be so designed that they comply with the requirements for inaccessibility of live parts 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.

Requirements for lamps with E26 caps are under consideration.

Lamps with B22, B15, GU10 or GZ10 caps are subject to the same requirements as normal incandescent lamps with this cap.

Requirements for lamps with GX53 caps are under consideration.

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 live 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 DC voltage of approximately 500 V, 1 min after application of the voltage.

The insulation resistance between live 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 MΩ. The requirements of IEC 61347-1, Annex A, shall be complied with.

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 AC voltage as follows.

During the test, the supply contacts of the cap are short-circuited. Accessible parts of insulating material of the cap are covered with metal foil. Initially, no more than half the voltage prescribed in IEC 60598-1, Table 10.2 for Class II luminaires is applied between the contacts and the metal foil. It is then gradually raised to the full value.

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

NOTE The distance between the foil and the live parts is under consideration.

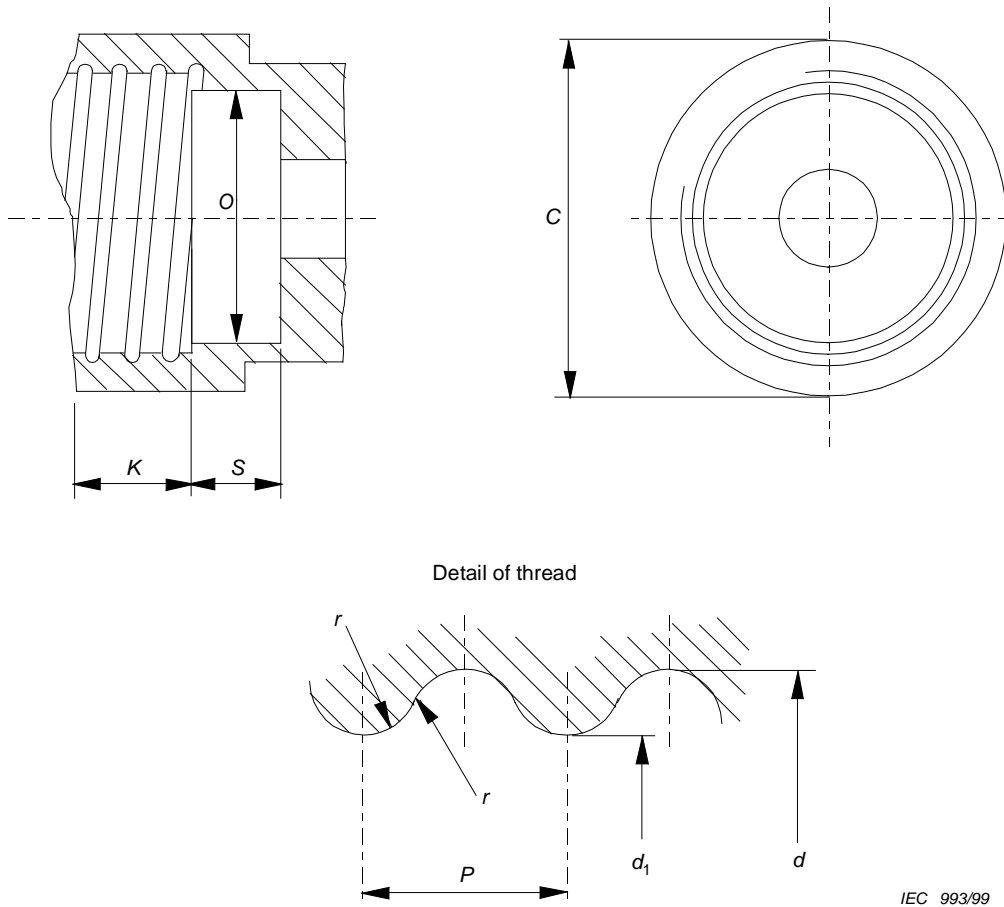
9 Mechanical strength

9.1 Torsion resistance of unused lamps

The torsion resistance of unused lamps is tested as follows.

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 in Table 3 below.

Tests are made according to the description of the relevant lamp standard per lamp type in IEC 60432-1 and by means of the test holders shown in Figures 3 and 4.



Surface finish of screw thread $R_a = 0,4 \mu\text{m}$ minimum (see note).

NOTE A smoother surface might result in mechanical overloading of the cap - see also IEC 60432-1, Annex C, Subclause C.1.2.

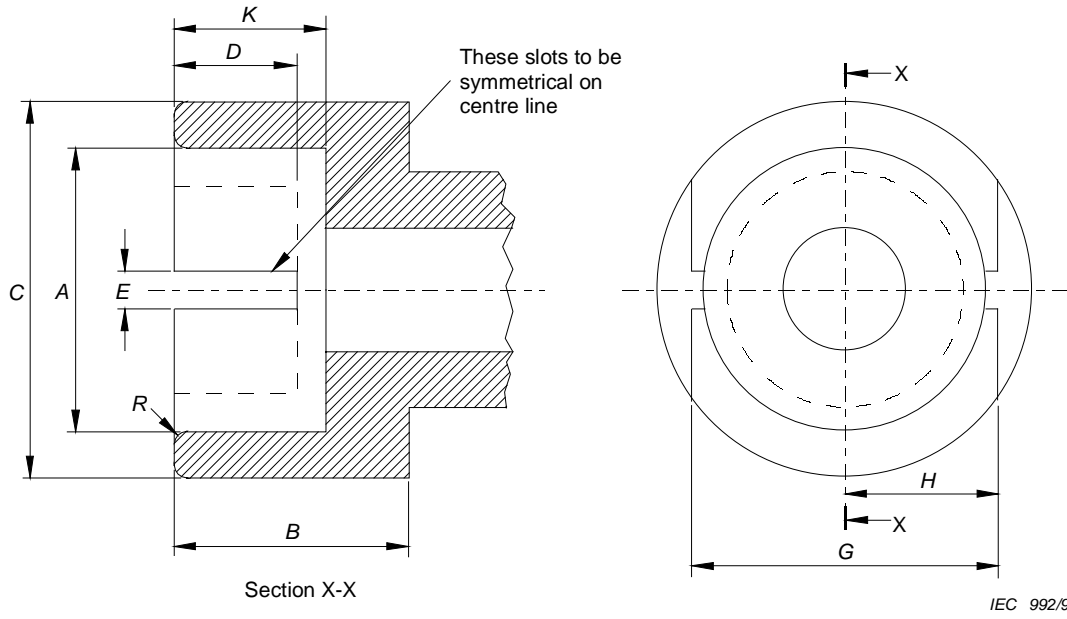
Dimensions in millimetres

Dimension	E12	E14	E17	E26 and E26d	E27	Tolerance
C	15,27	20,0	20,0	32,0	32,0	Min.
K	9,0	11,5	10,0	11,0	13,5	0,0 -0,3
O	9,5	12,0	14,0	23,0	23,0	+0,1 -0,1
S	4,0	7,0	8,0	12,0	12,0	Min.
d	11,89	13,89	16,64	26,492	26,45	+0,1 0,0
d ₁	10,62	12,29	15,27	24,816	24,26	+0,1 0,0
P	2,540	2,822	2,822	3,629	3,629	-
r	0,792	0,822	0,897	1,191	1,025	-

NOTE The drawing illustrates the essential dimensions of the holder which need only be checked if doubt arises from the application of the test.

Figure 3 – Holder for torque test on lamps with screw caps

(from IEC 60432-1, Figure C.2)



Dimension	B15 mm	B22 mm	Tolerance mm
A	15,27	22,27	+0,03
B	19,0	19,0	Min.
C	21,0	28,0	Min.
D	9,5	9,5	Min.
E	3,0	3,0	+0,17
G	18,3	24,6	±0,3
H	9,0	12,15	Min.
K	12,7	12,7	±0,3
R	1,5	1,5	Approximate

NOTE The drawing illustrates the essential dimensions of the holder which need only be checked if doubt arises from the application of the test.

Figure 4 – Holder for torque test on lamps with bayonet caps

(from IEC 60432-1, Figure C.1)

Table 3 – Torque test values for unused lamps

Cap	Torsion moment Nm
B15d	1,15
B22d	3
E11	0,8
E12	0,8
E14	1,15
E17	1,5
E26 and E27	3
GX53	3 u.c.
u.c.: under consideration	

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

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

9.2 Torsion resistance of lamps after a defined time of usage

The torsion resistance of used lamps is under consideration.

9.3 Repetition of Clause 8

After the mechanical strength test, the sample shall comply with the requirements of accessibility (see Clause 8).

10 Cap temperature rise

The surface temperature rise (above ambient) of a lampholder fitted to the lamp shall not be higher than that of the lamp type which is being replaced by the lamp.

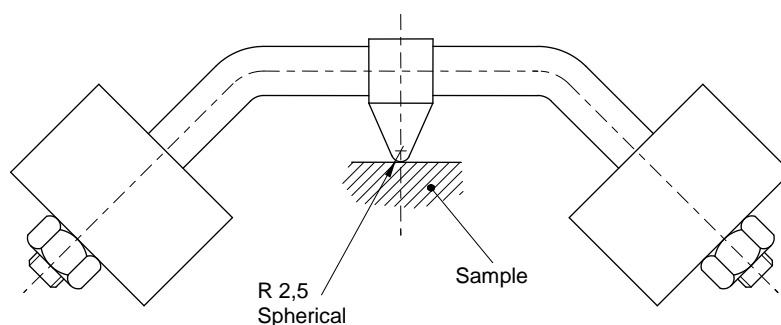
The cap temperature rise Δt_s of the complete lamp shall not exceed 120 K. The value of Δt_s corresponds to a 60 W max. incandescent lamp. The operating position and ambient temperature are detailed in IEC 60360.

Measurement shall be carried out at rated voltage. If the lamp is marked with a voltage range, it shall be measured at the maximum voltage of that range.

11 Resistance to heat

The lamp shall be sufficiently resistant to heat. External parts of insulating material providing protection against electric shock, and parts of insulating material retaining live parts in position shall be sufficiently resistant to heat.

Compliance is checked by subjecting the parts to a ball-pressure test by means of the apparatus shown in Figure 5.



IEC 494/08

Dimensions in millimetres

Figure 5 – Ball-pressure test apparatus

(from IEC 60598-1, Figure 10)

The test is made in a heating cabinet at a temperature of (25 ± 5) °C in excess of the operating temperature of the relevant part according to Clause 10, with a minimum of 125 °C for parts retaining live parts in position and 80 °C (value 80 °C under consideration)

for other parts. The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter pressed against this surface with a force of 20 N.

The test load and the supporting means are placed within the heating cabinet for a sufficient time to ensure that they have attained the stabilized testing temperature before the test commences.

The part to be tested is placed in the heating cabinet, for a period of 10 min, before the test load is applied.

The surface where the ball presses should not bend, if necessary the surface shall be supported. For this purpose, if the test cannot be made on the complete specimen, a suitable part may be cut from it.

The specimen shall be at least 2,5 mm thick, but if such a thickness is not available on the specimen, then two or more pieces are placed together.

After 1 h, the ball is removed from the specimen, which is then immersed for 10 s in cold water for cooling down to approximately room temperature. The diameter of the impression is measured, and shall not exceed 2 mm.

In the event of curved surfaces, the shorter axis is measured if the indent is elliptical.

In case of doubt, the depth of the impression is measured and the diameter calculated using the formula

$$\Phi = 2\sqrt{p(5 - p)}$$

in which p is the depth of impression.

The test is not made on parts of ceramic material.

12 Resistance to flame and ignition

Parts of insulating material retaining live parts in position and external parts of insulating material providing protection against electric shock are subjected to the glow-wire test in accordance with IEC 60695-2-10, IEC 60695-2-11, IEC 60695-2-12 and IEC 60695-2-13, subject to the following details.

- The test specimen is a complete lamp. It may be necessary to take away parts of the lamp to perform the test, but care is taken to ensure that the test conditions are not significantly different from those occurring in normal use.
- The test specimen is mounted 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, into the centre of the surface to be tested. The penetration of the glow-wire into the specimen is mechanically limited to 7 mm.

If it is not possible to make the test on a specimen as described above because the specimen is too small, the above test is made on a separate specimen of the same material, 30 mm square and with a thickness equal to the smallest thickness of the specimen.

- The temperature of the tip of the glow-wire is 650 °C. After 30 s, the specimen is withdrawn from contact with the glow-wire tip.

The glow-wire temperature and heating current are constant for 1 min prior to commencing the test. Care is taken to ensure that heat radiation does not influence the specimen 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 60695-2-10.

- Any flame or glowing of the specimen shall extinguish within 30 s of withdrawing the glow-wire, and any flaming drop shall not ignite a piece of the tissue paper, spread out horizontally 200 ± 5 mm below the specimen. The tissue paper is specified in 4.187 of ISO 4046-4.

The test is not made on parts of ceramic material.

13 Fault conditions

13.1 General

Lamps shall not impair safety when operated under fault conditions which may occur during the intended use. Each of the following fault conditions is applied in turn, as well as any other associated fault condition that may arise from them as logical consequence.

13.2 Extreme electrical conditions (dimmable lamps)

If lamps are marked with a voltage range, rated voltage is taken as the maximum of the voltage range marked unless the manufacturer declares another voltage as the most critical one. The lamp is switched on at ambient temperature (definition as in IEC/TS 62504 and conditions as in Clause H.1 of IEC 61347-1) and adjusted to the most critical electrical conditions as indicated by the manufacturer or the power is increased until 150 % of the rated power is reached. The test is continued until the lamp is thermally stabilised. A stable condition is reached, if the lamp cap temperature does not change by more than 1 K in 1 h (test as described in IEC 60360). The lamp shall withstand the extreme electrical conditions for at least 15 min, after stabilization is reached.

A lamp which fails safe and has withstood the extreme electrical conditions for 15 min, has passed the test, provided the compliance (see 4.1 and 13.6) is fulfilled.

If the lamp contains an automatic protective device or circuit which limits the power, it is subjected to a 15 min operation at this limit. If the device or circuit effectively limits the power over this period, the lamp has passed the test, provided the compliance (see 4.1 and 13.6) is fulfilled.

13.3 Extreme electrical conditions (non-dimmable lamps)

Lamps, which according to the marking, are not suitable for dimming, shall be tested as far as possible according to Subclause 13.2 under the most adverse electrical conditions as indicated by the manufacturer. If lamps are marked with a voltage range, rated voltage is taken as the maximum of the voltage range marked unless the manufacturer declares another voltage as the most critical one.

13.4 Short-circuit across capacitors

Only one component at a time is subjected to a fault condition.

13.5 Fault conditions across electronic components

Open or bridge points in the circuit where the diagram indicates that such a fault condition may impair safety.

Only one component at a time is subjected to a fault condition.

13.6 Compliance

During the tests 13.2 to 13.5 the lamp shall not catch fire, or produce flammable gases or smoke and live parts shall not become accessible.

To check if gases liberated from component parts are flammable or not, a test with a high-frequency spark generator is made.

To check if accessible parts have become live, a test in accordance with Clause 7 is made.

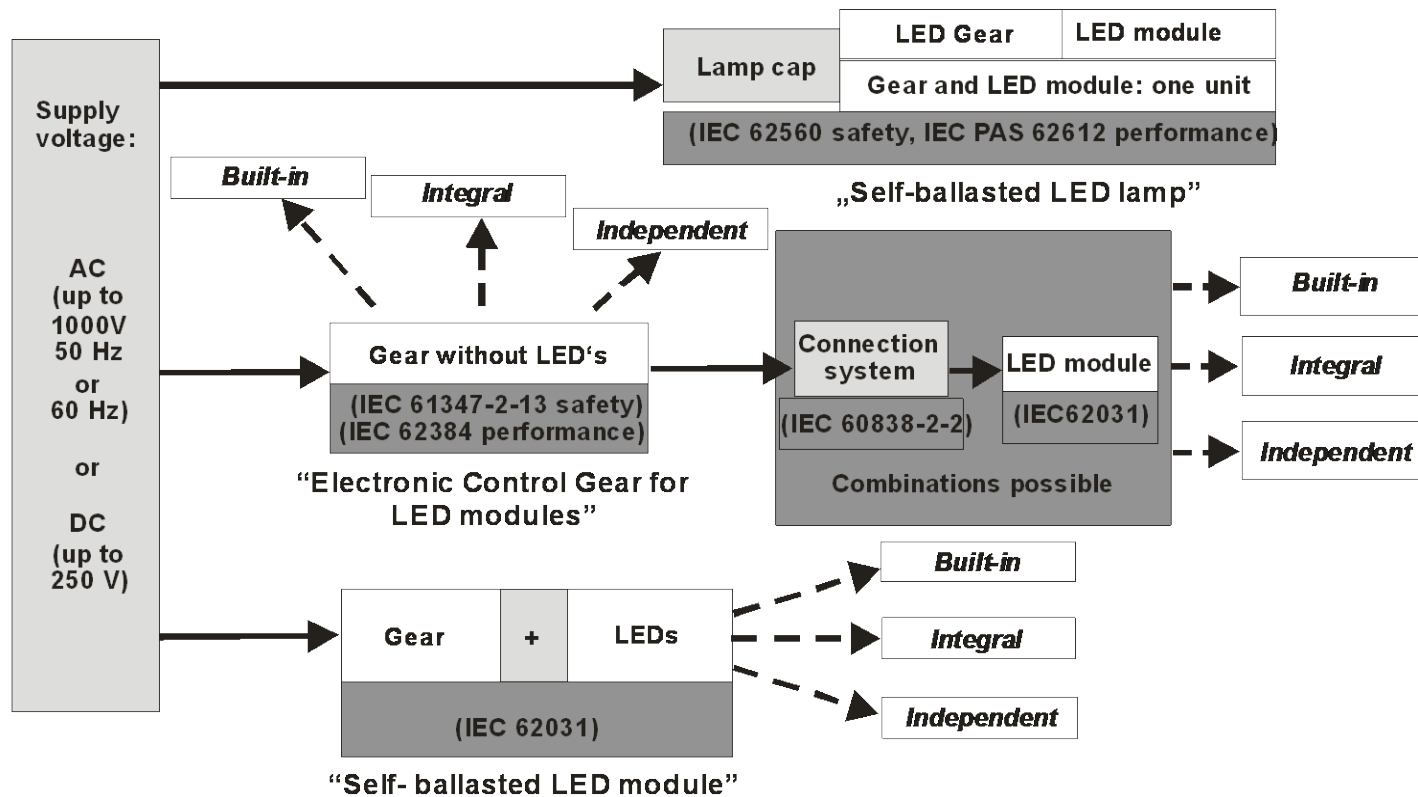
After testing in 13.2 to 13.5, the lamp shall meet the insulation resistance requirements of 8.1 except the applied voltage shall be a DC voltage of approximately 1 000 V.

14 Creepage distances and clearances

The requirements of IEC 61347-1 apply except that for conductive accessible parts IEC 60598-1 is applicable.

Annex A (informative)

Overview of systems composed of LED modules and control gear



Annex B
(normative)

Lamps with operating position limitations (see 5.2)

These symbols are to indicate that only cap-down to horizontal operation is permitted because of possible overheating.

There shall be text in the vicinity of the symbol in order to avoid it being read upside down.

The symbols for candle and round bulb lamps shown in Figure B.1 are given as examples.

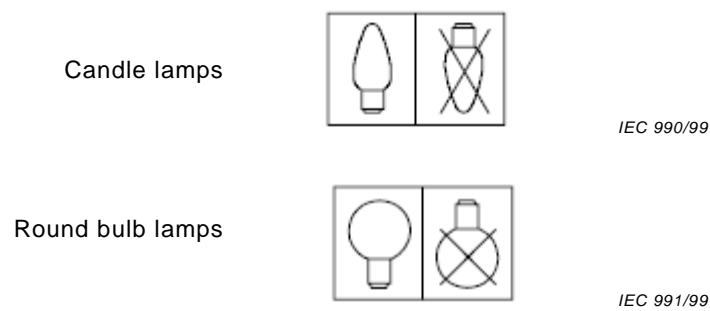


Figure B.1 – Operating and non-operating positions

(from IEC 60432-1. Annex B)

Bibliography

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

IEC 60968, *Self-ballasted lamps for general lighting – Safety requirements*

