BS EN 62560:2012+A1:2015

Incorporating corrigenda January 2012 and June 2015

BSI Standards Publication

Self-ballasted LED-lamps for general lighting services by voltage > 50V — Safety specifications

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National foreword

This British Standard is the UK implementation of EN 62560:2012+A1:2015. It is derived from IEC 62560:2011, incorporating amendment 1:2015 and corrigenda January 2012 and June 2015. It supersedes BS EN 62560:2012 which is withdrawn.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C] ⟨C⟩.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [A1] ⟨A1⟩.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum January 2012 is indicated in the text by [AC1] ⟨AC1⟩.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and Related Equipment, to Subcommittee CPL/34/1, Electric lamps.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Date	Text affected
31 July 2015	Implementation of IEC amendment 1:2015 with CENELEC modifications. Annex ZA updated.
	Implementation of IEC corrigendum June 2015: correction of Figure 6 title introduced by amendment 1:2015

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62560:2012+A1

July 2015

ICS 29.140.30

English version

Self-ballasted LED-lamps for general lighting services by voltage > 50 V - Safety specifications

(IEC 62560:2011, modified + corrigendum Jan. 2012)

Lampes à DEL autoballastées pour l'éclairage général fonctionnant à des tensions > 50 V - Spécifications de sécurité (CEI 62560:2011, modifiée + corrigendum Jan. 2012)

LED-Lampen mit eingebautem Vorschaltgerät für Allgemeinbeleuchtung für Spannungen > 50 V - Sicherheitsanforderungen (IEC 62560:2011, modifiziert + corrigendum Jan. 2012)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 62560:2012 E

Foreword

This document (EN 62560:2012) consists of the text of IEC 62560:2011 + corrigendum Jan. 2012, prepared by SC 34A, "Lamps, of IEC/TC 34, Lamps and related equipment", together with the common modifications prepared by CLC/SR 34A "Lamps ".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2013-10-15
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2015-10-15

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This European Standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 62560:2011 + corrigendum Jan. 2012 was approved by CENELEC as a European Standard with agreed common modifications.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60400	NOTE	Harmonized as EN 60400.
IEC 60968	NOTE	Harmonized as EN 60968.

COMMON MODIFICATIONS

Lamps with the following caps are excluded from EN 62560:2012 as they do not comply with European safety requirements:

– E11;

– E12;

– E17;

– E26.

Foreword to amendment A1

The text of document 34A/1836/FDIS, future IEC 62560:2011/A1, prepared by SC 34A "Lamps" of IEC/TC 34 "Lamps and related equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62560:2012/A1:2015.

A draft amendment, which covers common modifications to IEC 62560:2011/A1 (34A/1836/FDIS), was prepared by CLC/TC 34A "Lamps" and approved by CENELEC.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-05-04
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-05-04

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COMMON MODIFICATIONS

Lamps with the following caps are excluded from EN 62560:2012/A1:2015 as they do not comply with European safety requirements:

– E11;

– E12;

– E17;

– E26;

– E26d;

– E39.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60061-1	-	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 1: Lamp caps	EN 60061-1	-
IEC 60061-3	-	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 3: Gauges	EN 60061-3	-
IEC 60360	-	Standard method of measurement of lamp cap temperature rise	EN 60360	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60598-1 (mod) + corr. October + corr. December -	2008 2011 2011 -	Luminaires - Part 1: General requirements and tests	EN 60598-1 + A11	2008 2009
IEC 60695-2-10	2000	Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure	EN 60695-2-10	2001
IEC 60695-2-11 + corr. January	2000 2001	Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products	EN 60695-2-11	2001
IEC 60695-2-12	2000	Fire hazard testing - Part 2-12: Glowing/hot-wire based test methods - Glow-wire flammability test method for materials	EN 60695-2-12[1)]	2001
IEC 60695-2-13	2000	Fire hazard testing - Part 2-13: Glowing/hot-wire based test methods - Glow-wire ignitability test method for materials	EN 60695-2-13[2)]	2001
IEC 61199	1999	Single-capped fluorescent lamps - Safety specifications	EN 61199[3)]	1999

[1)] EN 60695-2-12 is superseded by EN 60695-2-12:2010, which is based on IEC 60695-2-12:2010.

[2)] EN 60695-2-13 is superseded by EN 60695-2-13:2010, which is based on IEC 60695-2-13:2010 + corrigendum Feb. 2012.

[3)] EN 61199 is superseded by EN 61199:2011, which is based on IEC 61199:2011.

Publication	Year	Title	EN/HD	Year
IEC 61347-1	-	Lamp controlgear - Part 1: General and safety requirements	EN 61347-1	-
IEC 62031	2008	LED modules for general lighting - Safety specifications	EN 62031	2008
IEC/TR 62778	2014	Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires	-	-
IEC/TS 62504	-	General lighting - LEDs and LED modules - Terms and definitions	-	-
ISO 4046-4	2002	Paper, board, pulps and related terms - Vocabulary - Part 4: Paper and board grades and converted products	-	-

CONTENTS

INTRODUCTION

There will be and are already LED products in the market which substitute existing lamps, either as retrofit mains voltage incandescent or self-ballasted fluorescent lamps or as replacement for tungsten halogen lamps below 50 V.

The present document takes up the supply voltage range from > 50 V up to 250 V. A proposal for a safety standard for LED lamps with voltages ≤ 50 V may follow in due time.

Future work will also consequently comprise performance standards for all kind of LED lamps, including minimum photometric requirements for type testing.

Due to the urgent need of establishing this standard, it will be a stand-alone standard for the time being, not excluding a future relocation as a part of IEC 60968, self-ballasted lamps.

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 1 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.

〈A1〉 NOTE 2 This standard includes photobiological safety. 〈A1〉

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 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*

〈A1〉 IEC 61347-1:—, *Lamp controlgear – Part 1: General and safety requirements* 〈A1〉

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

〈A1〉 IEC TR 62778: 2014, *Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires* 〈A1〉

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

A1 **3.10**
ultraviolet hazard efficacy of luminous radiation
$K_{S,v}$
quotient of an ultraviolet hazard quantity to the corresponding photometric quantity

NOTE 1 Ultraviolet hazard efficacy of luminous radiation is expressed in mW/klm.

NOTE 2 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. A1

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) 〖C〗 *Text deleted* 〖C〗

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:

IEC 928/99

Figure 1 – Dimming not allowed

〖A1〗 e) Lamps with bulbs not suitable for water contact shall be marked with the symbol according to Figure 6. The marking shall be provided on the packaging or accompanying information. The height of the graphical symbol shall be at least 5 mm. The symbol is not needed if a written cautionary notice is provided such as ‘Use in Dry Locations only’.

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

Figure 6 – Lamp not suitable for use under moisture 〖A1〗

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	7006-4A
		Retention in lampholder	7006-4B
E14	7004-23	Max. dimensions of the screw thread	7006-27F
		Min. major diameter of the screw thread	7006-28B
		Dimension *S*1	7006-27G
		Contact making	7006-54
E27	7004-21	Max. dimensions of the screw thread	7006-27B
		Min. major diameter of the screw thread	7006-28A
		Dimension *S*1	7006-27C
		Contact making	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”	7006-142
		“Not Go”	7006-142D
		“Go” and “Not Go” for checking keyways	7006-142E
		“Not Go” for checking keyways	7006-142F

6.2 Bending moment and mass imparted by the lamp at the lamp holder

The value of the bending moment and mass, imparted by the lamp at the lampholder shall not exceed the value given in Table 2 or, where not given, the value in the system information on cap sheets specified in IEC 60061-1.

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.

Table 2 – Bending moments and masses

Cap	Bending moment Nm	Mass kg
B15d	1	u.c.
B22d	2	1
E11	0,5	u.c.
E12	0,5	u.c.
E14	1	u.c.
E17	1	u.c.
E26	2	1
E27	2	1
E39	1 (u.c.)	u.c.
E40	1 (u.c.)	u.c.
GU10	0,1	u.c.
GZ10	0,1	u.c.
GX53	0,3	u.c.
u.c.: 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.

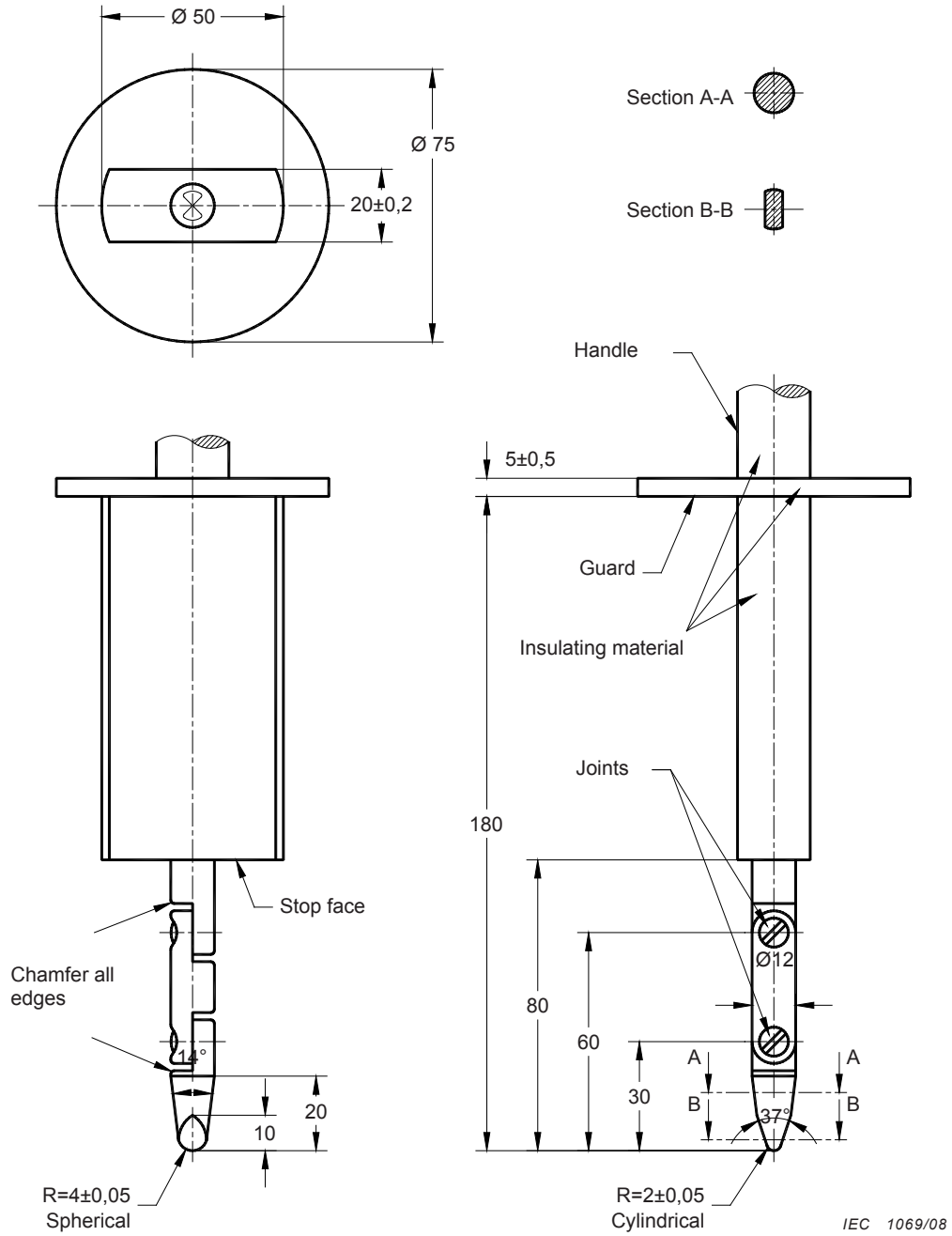
NOTE 2 It should be taken care that the luminaire surface where the lampholder is fixed to can withstand the bending moment. For the calculation of this bending moment, the length of the lampholder needs to be taken into account when measuring the overall length. This should be made sure for the elevated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

NOTE 3 Requirements for lamps with additional mechanical fixation e.g. rim mounted lamps, is under consideration.

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: $^{+0}_{-10'}$

– on linear dimensions:

  - up to 25 mm: $^{+0}_{-0,05}$
  - over 25 mm: ± 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

A1 *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 or a d.c. voltage equal to the peak voltage of the prescribed a.c. voltage as follows.*

NOTE The use of either a.c. or d.c. voltage is advised by the manufacturer.

During the test, the supply contacts of the cap are short-circuited. Accessible parts of insulating material of the lamp are covered with metal foil. Initially, no more than half the voltage prescribed in IEC 60598-1, Table 10.2, reference d) for double and reinforced insulation is applied between the contacts and the metal foil. It is then gradually raised to the full value. Care shall be taken that the metal foil is so placed that no flashover occurs at the edges of the insulation. A1

[A1] No flashover or breakdown shall occur during the test. Measurements shall be carried out in the humidity cabinet. [A1]

9 Mechanical strength

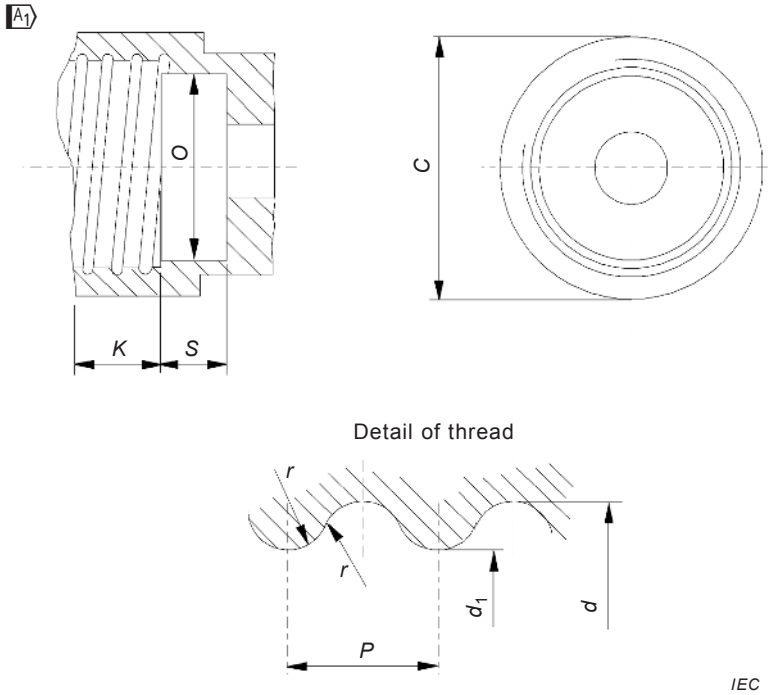
[A1] 9.1 Requirements

Lamps shall be able to withstand the relevant mechanical strength tests as given in 9.2.

9.2 Tests

9.2.1 Torsion resistance of unused lamps

In order to test the connection of the cap to the lamp shell the torsion resistance of unused lamps is tested as follows. [A1]



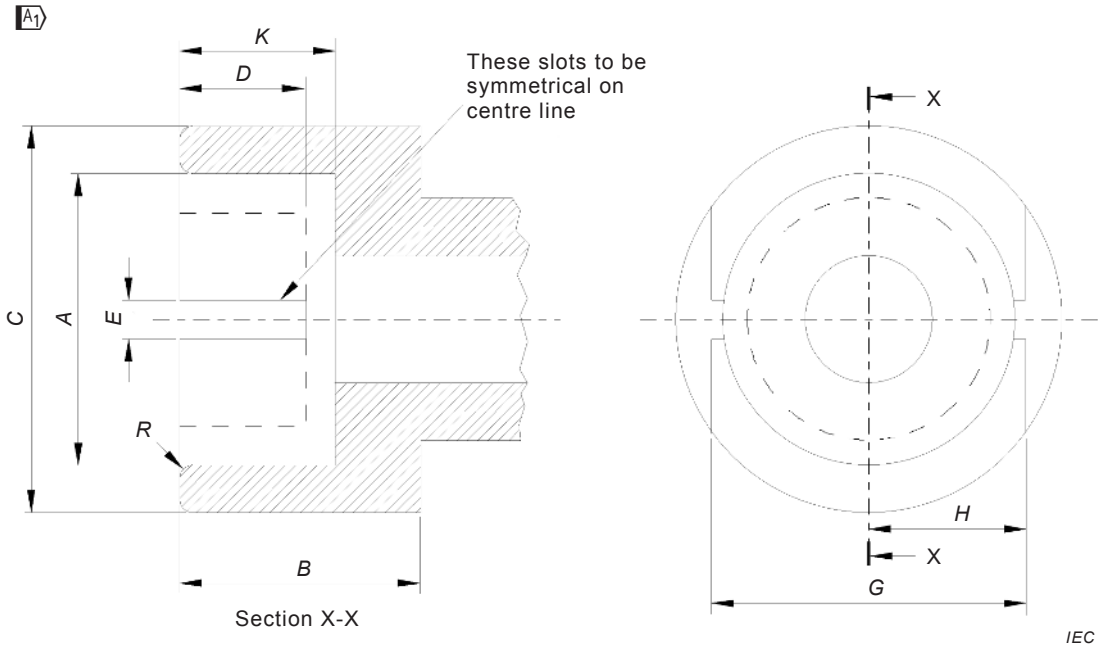
Surface finish of screw thread R_a = 0,4 μm minimum (see note).

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

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) A1



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) A1

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	3
E26d	3
E27	3
E39	5
E40	5
GU10	u.c.
GZ10	u.c.
GX53	3
u.c.: under consideration	

Before each use, the test holder for screw caps shall be checked to ensure that it is clean and completely free of lubricants and grease.

The cap of the test lamp shall be placed in the appropriate holder shown in Figures 3 and 4. Either the cap or the part of the lamp which is used for inserting or removing the lamp may be mechanically clamped.

Torque shall be applied steadily to the appropriate lamp component, so that no jerk occurs. The application of the torque may follow either of the following schemes.

a) The required torque shall be applied, according to the limits given in Table 3.

b) Higher torque values than the relevant limit shall be applied so that the value of torque for failure is obtained. In this case, the equipment is to be provided with suitable means for measuring torque over a wide range of failure levels.

Compliance:

The cap shall remain firmly attached to the bulb or that part of the lamp which is used for inserting or removing the lamp when subjected to the torque levels listed in Table 3 above. Some lamps are made with parts designed to be moved after insertion (for example a light sensor or decorative ring). Movement of these parts does not constitute non-compliance.

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

9.2.2 Torsion resistance of lamps after a defined time of usage

The torsion resistance of used lamps is under consideration.

9.2.3 Externally applied axial pull and bending moment

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

A1 The bending shall be applied by holding in a uniform manner that part of the material closest to the cap. The pivot point lies at the cap reference plane (mating plane with the lamp holder). The pulling force and bending moment shall not be applied suddenly but shall be increased gradually from zero to the specified value.

Values are under consideration.

9.3 Compliance criteria

After the mechanical strength test of 9.2, the sample shall comply with the requirements of Clause 8.

9.4 Axial strength of Edison caps

The lamps shall be screwed into gauge of Table 4. After full insertion an axial force of Table 4 is applied to the central contact. See Figure 7.

In case axial strength of the cap does not decrease when the unmounted cap was assembled to the finished lamp, test results on the unmounted cap can be applied.

NOTE The gauges are used to hold the lamp. Calibration is not required.

Compliance:

After this test the insulation around the central contact shall remain intact. The application of the torque test in 9.2.1 shall not lead to impressing the bottom part of the cap into the shell.

Table 4 – Values for axial force

Cap	Gauge sheet no. from IEC 60061-3	Axial force N	Additional information
E11	7006-6-1	u.c.	
E12	7006-27H-1	u.c.	The portion for contact making check is not needed; Full threaded gauge with *T*1 height; *C* and *H* dimension are irrelevant
E14	7006-27F-1	80	
E26	7006-27B-1	120	
E26d	7006-27B-1	120	
E27	7006-27B-1	120	
E39	7006-24B-1	u.c.	
E40	7006-27-7	u.c.	
u.c.: under consideration			

A1

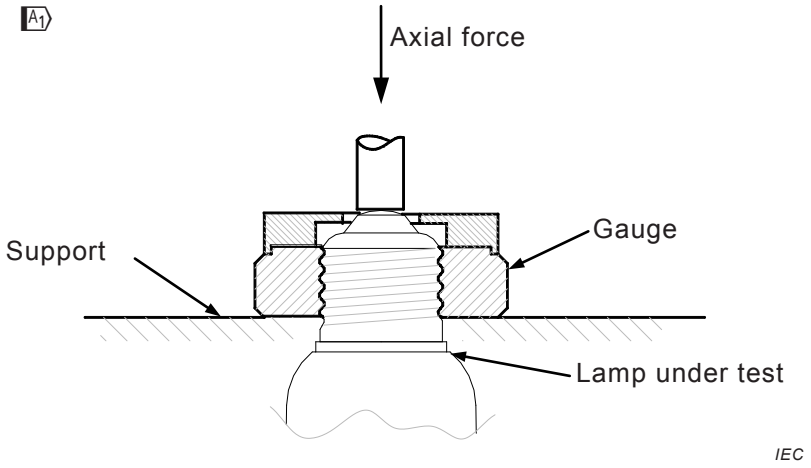


Figure 7 – Test equipment for applying an axial force

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.

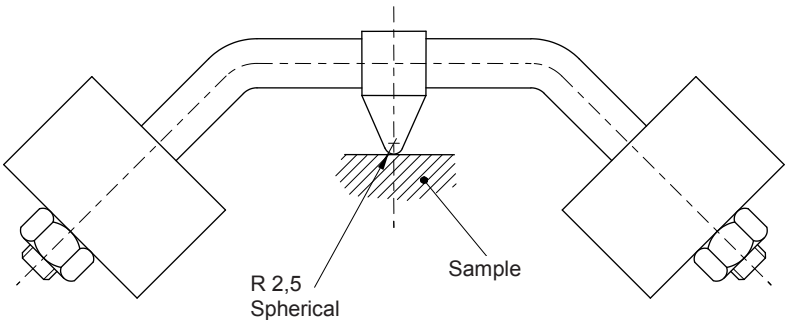
The cap temperature rise Δt_s of the complete lamp shall not exceed 120 K. The value of Δt_s corresponds to a 60 W max. incandescent lamp. The operating position and ambient temperature are detailed in IEC 60360.

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.



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 requirements

The lamps shall not impair safety when operated under fault conditions which may occur during the intended use.

13.2 Test conditions

The following fault conditions is applied in turn, as well as any other associated fault conditions that may arise from it as logical consequences. Only one component at a time is subjected to a fault condition.

Opening or bridging component in the circuit where the diagram or construction indicates that such a fault condition may impair safety.

Examination of the lamp and its circuit diagram will generally show the fault conditions which should be applied. These are applied in sequence in the order that is most convenient.

Components or devices in which a short-circuit does not occur shall not be bridged. Similarly, components or devices in which an open circuit cannot occur shall not be interrupted.

Manufacturers or responsible vendors shall produce evidence that the components behave in a way that does not impair safety, for instance, by showing compliance with the relevant specification.

Compliance is checked by operating the sample free burning, vertical cap up position at room temperature and at the most critical test voltage between 90 % and 110 % of the rated voltage.

In case a rated voltage range is declared, the test has to be carried out at the most critical test voltage between 90 % and 110 % of the mean voltage of that declared range or at the most critical test voltage within the declared voltage range, whatever range is greater.

In case of alternative rated voltages the test shall be performed separately for each rated voltages.

Example 1:

Declared voltage range: 220 V to 240 V: →Test voltage within 207 V to 253 V.

(90 % to 110 % of 230 V is wider than declared range)

[A1] Example 2:

Declared voltage range: 170 V to 280 V:→ Test voltage within 170 V to 280 V.

(Declared range is wider than 90 % to 110 % of 225 V.)

13.3 Compliance

Compliance is checked by operating the sample free burning at room temperature and at the most critical test voltage until stable conditions have been reached, then introducing the fault condition.

The sample is then tested for a further 8 h. During this test it shall not catch fire, or produce flammable gases and live parts shall not become accessible.

To check if accessible parts have become live, a test in accordance with Clause 7 is made. The insulation resistance (see 8.1) is checked with a d.c. voltage of approximately 1 000 V. [A1]

14 Creepage distances and clearances

[AC1] The requirements of IEC 61347-1 apply except that for conductive accessible parts IEC 60598-1 is applicable. [AC1]

[A1] 15 Abnormal operation

Self-ballasted lamps shall not create hazard under abnormal operating conditions.

Self-ballasted lamps shall be constructed so that as a result of abnormal or careless operation, the risk of fire and mechanical damage impairing safety of protection against electric shock is obviated.

Applying non-dimmable self-ballasted lamps on a dimmer or an electronic switch is to be tested as a possible case of abnormal operation.

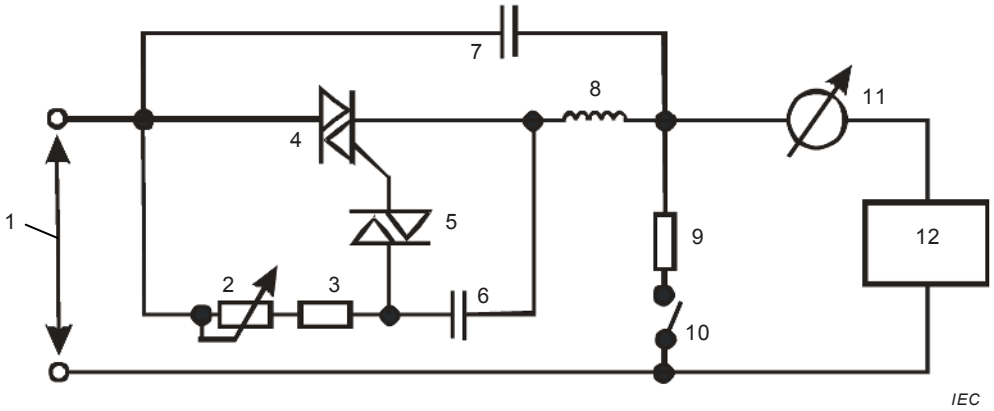
Test procedure:

Test non-dimmable lamp in test circuit shown in Figure 8.

Determine R1 and S1 setting at which the maximum $I_{r.m.s.}$ occurs.

Test at this situation, and if the lamp passively fails within 60 min, repeat the test at 10 % lower $I_{r.m.s.}$. The lower $I_{r.m.s.}$ shall be set in the decreasing potentiometer resistance direction.

Repeat this procedure until stable operation is achieved for minimum 60 min. [A1]



Key

1 mains
2 potentiometer R1 = 470 kΩ
3 resistor R = 3,3 kΩ
4 Triac BTA16/700
5 Diac DB3
6 capacitor C1 = 100 nF
7 capacitor C2 = 68 nF to 150 nF
8 induction L1 = 3 mH
9 basic load, incandescent lamp P = 60 W
10 switch S1
11 $I_{r.m.s.}$ Ammeter
12 device under test (DUT) (lamp)

NOTE The most onerous situation for possible safety implication occurs at the maximum $I_{r.m.s.}$ that does not cause an immediate (passive) failure.

Figure 8 – Test circuit for testing a non-dimmable lamp at a dimmer or electronic switch

Operate the lamp for 8 h at the above most onerous dimming level (potentiometer adjustment).

Compliance

Compliance is checked by operating the sample free burning, vertical cap up position or in the burning position indicated on the packaging at room temperature and at the rated voltage.

In case a voltage range is declared, the test has to be carried out at the mean voltage of that declared range.

In case of alternative rated voltages, the test shall be performed separately for each rated voltage.

During this test the lamp shall not catch fire, or produce flammable gases and live parts shall not become accessible with the standard test finger.

16 Test conditions for dimmable lamps

Test shall be carried out at maximum power setting for Clause 10 and Clause 17.

Test conditions for Clause 13 are under consideration.

17 Photobiological safety

17.1 UV radiation

The ultraviolet hazard efficacy of luminous radiation of an LED lamp shall not exceed 2 mW/klm.

Compliance is checked by measurement of the spectral power distribution and subsequent calculation of the ultraviolet hazard efficacy of luminous radiation. LED lamps not relying on the conversion of UV radiation are not expected to exceed the maximum allowed ultraviolet hazard efficacy of luminous radiation. They do not require measurement.

17.2 Blue light hazard

The blue light hazard shall be assessed according to IEC TR 62778, which shall be regarded as normative when testing LED lamps to this standard. LED lamps shall be classified as risk group 0 unlimited or risk group 1 unlimited.

NOTE Clause C.2 of IEC TR 62778 gives a method to classify lamps where full spectral data is not available.

17.3 Infrared radiation

LED lamps are not expected to reach a level of infrared radiation where marking or other safety measurements are required.

18 Ingress protection

18.1 Requirements

Lamps shall be suitable for water contact unless marked with Figure 6.

18.2 Tests

Suitability for water contact is tested as follows.

The lamp is subjected to an IPX4 test according to IEC 60598-1. During this test, lampholders sealing to the diameter of the lamp ends and providing protection to the contact area of IPX4 shall be fitted.

The compliance provisions of 9.2 of IEC 60598-1 apply.

NOTE For more information about ingress protection (IP), see IEC 60598-1, Annex J.

A lamp constructed so that it is sealed (e.g. lamp designs having one piece homogeneous glass or plastic bulb penetrating the lampholder sealing) to exclude water need not be subjected to this test.

19 Information for luminaire design

For information for luminaire design, Annex A applies.

Annex A
(informative)

Information for luminaire design

Lamps marked with the symbol according to Figure 6 should be protected from direct water contact, e.g. by drips, splashing etc., by the luminaire if rated at IPX1 or higher.

NOTE The X in the IP number indicates a missing numeral but both of the appropriate numerals are marked on the luminaire.

Any IPX1 or better protection of the lamp contact area can only be achieved in luminaires having lampholder with proper IP rating also for the sealing to the diameter of the lamp end and providing protection to the lamp end components containing the contact area.

Annex B deleted

Bibliography

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

〈C〉 NOTE Harmonized as EN 60400. 〈C〉

〈A1〉 IEC 60432-1, *Incandescent lamps – Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes* 〈A1〉

〈C〉 NOTE Harmonized as EN 60432-1. 〈C〉

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

〈C〉 NOTE Harmonized as EN 60968. 〈C〉

〈A1〉 IEC 62471, *Photobiological safety of lamps and lamp systems* 〈A1〉

〈C〉 NOTE Harmonized as EN 62471. 〈C〉

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