



BSI Standards Publication

Lampholders for tubular fluorescent lamps and starterholders

National foreword

This British Standard is the UK implementation of EN 60400:2017+A2:2024. It is identical to IEC 60400:2017, incorporating amendment 1:2020 and amendment 2:2022. It supersedes BS EN 60400:2017+A1:2021, which is withdrawn.

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 UK participation in its preparation was entrusted to Technical Committee CPL/34/1, Electric lamps.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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For the Great Britain market (England, Scotland and Wales), if UK Government has designated this publication for conformity with UKCA marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

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© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 16067 3

ICS 29.140.10; 29.140.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2017.

Amendments/corrigenda issued since publication

Date	Text affected
31 May 2021	Implementation of IEC amendment 1:2020 with CENELEC endorsement A1:2021
30 September 2024	Implementation of IEC amendment 2:2022 with CENELEC endorsement A2:2024

English Version

Lampholders for tubular fluorescent lamps and starterholders
(IEC 60400:2017/AMD2:2022)

Douilles pour lampes tubulaires à fluorescence et douilles
pour starters
(IEC 60400:2017/AMD2:2022)

Lampenfassungen für röhrenförmige Leuchtstofflampen und
Starterfassungen
(IEC 60400:2017/AMD2:2022)

This amendment A2 modifies the European Standard EN 60400:2017; it was approved by CENELEC on 2024-07-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 34B/1900/FDIS, future edition 8 of IEC 60400, prepared by SC 34B “Lamp caps and holders” of IEC/TC 34 “Lamps and related equipment” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60400:2017.

The following dates are fixed:

- latest date by which the document has to be (dop) 2018-04-20
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2020-07-20
standards conflicting with the
document have to be withdrawn

This document supersedes EN 60400:2008.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60400:2017 was approved by CENELEC as a European Standard without any modification.

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

IEC 60061-1	NOTE	Harmonized as EN 60061-1.
IEC 60061-4	NOTE	Harmonized as EN 60061-4.
IEC 60068-2-20:2008	NOTE	Harmonized as EN 60068-2-20:2008.
IEC 60238	NOTE	Harmonized as EN 60238.
IEC 60664-1:2007	NOTE	Harmonized as EN 60664-1:2007.
IEC 60664-4:2005	NOTE	Harmonized as EN 60664-4:2005.
IEC 61199	NOTE	Harmonized as EN 61199.
IEC 60838-1:2016	NOTE	Harmonized as EN 60838-1:2017.
IEC 60838-1:2016/AMD1:2017	NOTE	Harmonized as EN 60838-1:2017/A1:2017.

European foreword to Amendment 1

The text of document 34B/2072/FDIS, future IEC 60400/A1, prepared by SC 34B "Lamp caps and holders" of IEC/TC 34 "Lighting" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60400:2017/A1:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2021-11-07 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-05-07 document have to be withdrawn

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For the relationship with EU Directive(s), see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60400:2017/A1:2020 was approved by CENELEC as a European Standard without any modification.

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IEC 61347-1:2015 NOTE Harmonized as EN 61347-1:2015 (not modified)

European foreword to Amendment 2

The text of document 34B/2110/CDV, future IEC 60400/AMD2, prepared by SC 34B "Lamp caps and holders" of IEC/TC 34 "Lighting" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60400:2017/A2:2024.

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- latest date by which the document has to be implemented at national (dop) 2025-04-23 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-07-23 document have to be withdrawn

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This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZZ, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60400:2017/AMD2:2022 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

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.

NOTE 1 Where 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.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60061-2	-	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 2: Lampholders	EN 60061-2	1993
			+ A1	1995
			+ A2	1995
			+ A3	1995
			+ A4	1996
			+ A5	1996
			+ A6	1996
			+ A7	1997
			+ A18	1998
			+ A19	1999
			+ A20	1999
			+ A21	2000
			+ A22	2001
			+ A23	2001
			+ A24	2001
			+ A25	2002
			+ A26	2002
			+ A27	2002
			+ A28	2003
			+ A29	2003
			+ A30	2003
			+ A31	2004
			+ A32	2005

		+ A33	2005
		+ A34	2006
		+ A35	2007
		+ A36	2007
		+ A37	2008
		+ A38	2009
		+ A39	2009
		+ A40	2010
		+ A41	2010
		+ A42	2011
		+ A43	2011
		+ A44	2012
		+ A45	2012
		+ A46	2013
		+ A47	2014
		+ A47/AC	2023
		+ A48	2015
		+ A49	2015
		+ A50	2015
		+ A51	2016
		+ A52	2017
		+ A53	2018
		+ A54	2018
		+ A55	2020
		+ A56	2020
		+ A57	2021
		+ A58	2022
		+ A59	2023
IEC 60061-3	-	Lamp caps and holders together with gauges EN 60061-3 for the control of interchangeability and safety - Part 3: Gauges	1993
		+ A1	1995
		+ A2	1995
		+ A3	1995
		+ A4	1996
		+ A5	1996
		+ A6	1996
		+ A7	1997
		+ A20	1998

+ A21	1999
+ A22	1999
+ A23	2000
+ A24	2001
+ A25	2001
+ A26	2001
+ A27	2002
+ A28	2002
+ A29	2002
+ A30	2003
+ A31	2003
+ A32	2003
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+ A46	2012
+ A47	2013
+ A48	2014
+ A49	2015
+ A50	2015
+ A51	2015
+ A52	2016
+ A53	2017
+ A54	2018
+ A55	2018
+ A56	2019
+ A57	2020
+ A58	2020
+ A59	2023
+ A60	2024

EN 60400:2017+A2:2024 (E)

IEC 60068-2-20	2008	Environmental testing - Part 2-20: Tests - Test EN IEC 60068-2-20	2021
		T: Test methods for solderability and resistance to soldering heat of devices with leads	
IEC 60068-2-75	2014	Environmental testing - Part 2-75: Tests - Test EN 60068-2-75	2014
		Eh: Hammer tests	
IEC 60081	-	Double-capped fluorescent lamps - EN 60081	1998
		Performance specifications	
		+ A1	2002
		+ A2	2003
		+ A3	2005
		+ A4	2010
		+ A5	2013
		+ A6	2017
		+ A11	2018
IEC 60112	2003	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	2020
+ A1	2009		
IEC 60155		Glow-starters for fluorescent lamps	EN 60155 1995
		+ A1	1995
		+ A2	2007
IEC 60352-1	1997	Solderless connections - Part 1: Wrapped connections - General requirements, test methods and practical guidance	EN 60352-1 1997
IEC 60399	-	Barrel thread for lampholders with shade holder ring	EN 60399 2004
		+ A1	2008
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 1991
-	-	+ corrigendum	May 1993
+ A1	1999	+ A1	2000
+ A2	2013	+ A2	2013
IEC 60598-1	-	Luminaires - Part 1: General requirements and tests	EN IEC 60598-1 2021
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	EN IEC 60695-2-11 2021
IEC 60695-11-5	2016	Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5 2017
ISO 4046-4	2016	Paper, board, pulps and related terms -- Vocabulary - Part 4: Paper and board grades and converted products	-

Annex ZZ (informative)

Relationship between this European standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European standard has been prepared under a Commission's standardisation request relating to harmonised standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Table ZZ.1 — Correspondence between this European standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1. General conditions		
a) the essential characteristics, the recognition and observance of which will ensure that electrical equipment will be used safely and in applications for which it was made, shall be marked on the electrical equipment, or, if this is not possible, on an accompanying document;	Clause 8	
b) the electrical equipment, together with its component parts, shall be made in such a way as to ensure that it can be safely and properly assembled and connected;	Clause 10 and 11	
c) the electrical equipment shall be so designed and manufactured as to ensure that protection against the hazards set out in points 2 and 3 is assured, providing that the equipment is used in applications for which it was made and is adequately maintained.	See item 2 and 3 of this table	
2. Protection against hazards arising from the electrical equipment Measures of a technical nature shall be laid down in accordance with point 1, in order to ensure that:		

a) persons and domestic animals are adequately protected against the danger of physical injury or other harm which might be caused by direct or indirect contact;	Clauses 4, 9, 10, 11, 12 and 16	
b) temperatures, arcs or radiation which would cause a danger, are not produced;	Clauses 11, 12, 14, 17 and 18	
c) persons, domestic animals and property are adequately protected against non-electrical dangers caused by the electrical equipment which are revealed by experience;	Clauses 4, 11, 14, 15 and 19	
d) the insulation is suitable for foreseeable conditions.	Clauses 9, 11, 15, 17 and 18	
3. Protection against hazards which may be caused by external influences on the electrical equipment Technical measures shall be laid down in accordance with point 1, in order to ensure that the electrical equipment:		
a) meets the expected mechanical requirements in such a way that persons, domestic animals and property are not endangered;	Clauses 8, 11, 15 and 19	
b) is resistant to non-mechanical influences in expected environmental conditions, in such a way that persons, domestic animals and property are not endangered;	Clauses 11, 13, 17 and 18	
c) does not endanger persons, domestic animals and property in foreseeable conditions of overload.	Clauses 11, 13 and 18	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LAMPHOLDERS FOR TUBULAR FLUORESCENT LAMPS AND STARTERHOLDERS

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60400 has been prepared by subcommittee 34B: Lamp caps and holders, of IEC technical committee 34: Lamps and related equipment.

This eighth edition cancels and replaces the seventh edition published in 2008, Amendment 1:2011 and Amendment 2:2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) alignment with ISO/IEC drafting rules;
- b) renumbering of clauses, tables and figures.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
34B/1900/FDIS	34B/1911/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.

This document 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 smaller roman type.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION to Amendment 1

Two changes needed for IEC 60400 became obvious during the work relating to Edition 8.0 of IEC 60400.

Change 1:

Actual lamp holder safety standards require a ball pressure test in line with IEC 60695-10-2 in sections "Resistance to heat, fire and tracking". Within this test there is an alternative depth indentation method described for the calculation of the indentation diameter.

This alternative calculation option was removed from the latest edition of IEC 60695-10-2 dated 2014 and during its meeting held in Sydney in 2018, SC 34B/WG1 agreed to delete the alternative method as well from IEC 60400.

Change 2:

Based on IEC 60664-1:2007, 4.8.1.5 "Non tracking materials":

"For glass, ceramics or other inorganic insulating materials which do not track, creepage distances need not be greater than their associated clearance for the purpose of insulation coordination. The dimensions of Table F.2 for inhomogeneous field conditions are appropriate."

This is not completely reflected in TC 34 standards as revised recently. For applications with ELV it is of high importance whether the creepage distance shall be 0,6 mm or may be 0,2 mm in case where inorganic insulating material is used.

An informative annex for the explanation of U_{out} should give some additional information.

INTRODUCTION to Amendment 2

Lampholders specified in this standard are used not only for fluorescent lamps but also now for retrofit LED lamps. LED lamp designers, as well as lampholder designers, refer to this standard. However, it may lead to a misread of the original intention of the relaxation in Clause 17, which indicates that creepage distances or clearances between lamp contacts can be reduced.

The purpose of this amendment is to make the relaxation provision clear and to avoid misreading, i.e.

- the relaxation provision has been moved from the end of Clause 17 to the footnotes in Table 3,

and

- an explanatory note for this relaxation has been added to Table 3.

LAMPHOLDERS FOR TUBULAR FLUORESCENT LAMPS AND STARTERHOLDERS

1 Scope

This document states the technical and dimensional requirements for lampholders for tubular fluorescent lamps and for starterholders, and the methods of test to be used in determining the safety and the fit of the lamps in the lampholders and the starters in the starterholders.

This document covers independent lampholders and lampholders for building-in, used with tubular fluorescent lamps provided with caps as listed in Annex A, and independent starterholders and starterholders for building-in, used with starters in accordance with IEC 60155, intended for use in AC circuits where the working voltage does not exceed 1 000 V r.m.s.

This document also covers lampholders for single-capped tubular fluorescent lamps integrated in an outer shell and dome similar to Edison screw lampholders (e.g. for G23 and G24 capped lamps). Such lampholders are tested in accordance with the following clauses and subclauses of IEC 60238: 9.4; 9.5; 9.6; 10.3; 11.7; 12; 13.2; 13.5; 13.6; 13.7; 14; 16.3; 16.4; 16.5 and 16.9.

This document also covers lampholders which are integral with a luminaire or intended to be built into appliances. It covers the requirements for the lampholder only. For all other requirements, such as protection against electric shock in the area of the terminals, the requirements of the relevant appliance standard are applicable and tested after building into the appropriate equipment, when that equipment is tested according to its own standard. Lampholders for use by luminaire manufacturers only are not for retail sale.

This document also applies, as far as is reasonable, to lampholders and starterholders other than the types explicitly mentioned above and to lamp connectors.

Where the term "holder" is used in this document, both lampholders and starterholders are intended.

Where the term "bi-pin lampholder" is used, lampholders for wedged caps are also intended.

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 60061-2, *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 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

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

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*
IEC 60112:2003/AMD1:2009

IEC 60155, *Glow-starters for fluorescent lamps*

IEC 60352-1:1997, *Solderless connections – Part 1: Wrapped connections – General requirements, test methods and practical guidance*

IEC 60399, *Barrel thread for lampholders with shade holder ring*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

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

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)*

IEC 60695-11-5:2016 *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

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 following terms and definitions 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

rated voltage

voltage declared by the manufacturer to indicate the highest working voltage for which the holder is intended

3.2

working voltage

highest r.m.s. voltage which may occur across any insulation, transients being disregarded, both when the lamp or starter is operating under normal conditions and when the lamp or starter is removed

3.3

flexible lampholders for linear double-capped fluorescent lamps

pair of lampholders in which the base of each holder is rigidly mounted in the luminaire but which has one or both of the lampholders so designed as to allow axial movement of the contacts to provide compensation for variations in lamp lengths and, where necessary, to permit insertion and removal of the lamp

Note 1 to entry: In case of doubt as to whether a lampholder G5, GX5 or G13 provides the required axial movement of the contacts, a test with the device shown in Figure 3 can be carried out.

3.4

inflexible lampholders for linear double-capped fluorescent lamps

pair of lampholders intended for rigid mounting and in which no axial movement of the contacts is provided or is needed, either for the insertion and removal of the lamp or as compensation for variation in lamp lengths

3.5

flexibly mounted lampholders for linear double-capped fluorescent lamps

pair of lampholders which do not in themselves provide for any axial movement of the contact system but which are intended to be mounted in a luminaire in a specified manner so that the combination provides the necessary axial movement of the contact system

Note 1 to entry: Lampholders of this type may or may not also be suitable for rigid mounting.

3.6

lamp connectors

set of contacts mounted on flexible conductors which provide for electrical contact but do not support the lamp

3.7

holder for building-in

holder designed to be built into a luminaire, an additional enclosure or the like

3.7.1

unenclosed holder

holder for building-in so designed that it requires additional means, for example an enclosure, to meet the requirements of IEC 60400 with regard to protection against electric shock

3.7.2

enclosed holder

holder for building-in so designed that on its own it fulfils the requirements of IEC 60400 with regard to protection against electric shock and IP classification, if appropriate

3.8

independent holder

holder so designed that it can be mounted separately from a luminaire and at the same time providing all the necessary protection according to its classification and marking

3.9

rated operating temperature

highest temperature for which the holder is designed

3.10

rated lampholder rearside temperature

rearside temperature for lampholders with T marking ascertained by test b) in 18.1 of IEC 60400, or a higher temperature as declared by the manufacturer

3.11

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

3.12

type test sample

sample consisting of one or more similar specimens submitted by the manufacturer or responsible vendor for the purpose of a type test

3.13

live part

conductive part which may cause an electric shock

3.14

rated ignition voltage

highest peak value of the ignition voltages the holder is able to withstand

3.15

multilamp ballast

electronic mains ballast designed and declared to comply for the application of lamps with different keys

3.16

impulse withstand category

numeral defining a transient overvoltage condition

Note 1 to entry: Impulse withstand categories I, II, III and IV are used.

a) Purpose of classification of impulse withstand categories

Impulse withstand categories are to distinguish different degrees of availability of equipment with regard to required expectations on continuity of service and on an acceptable risk of failure.

By selection of impulse withstand levels of equipment, insulation co-ordination can be achieved in the whole installation reducing the risk of failure to an acceptable level providing a basis for overvoltage control.

A higher characteristic numeral of an impulse withstand category indicates a higher specific impulse withstand of the equipment and offers a wider choice of methods for overvoltage control.

The concept of impulse withstand categories is used for equipment energized directly from the mains.

b) Description of impulse withstand categories

Equipment of impulse withstand category I is equipment which is intended to be connected to the fixed electrical installations of buildings. Protective means are taken outside the equipment – either in the fixed installation or between the fixed installation and the equipment – to limit transient overvoltages to the specific level.

Equipment of impulse withstand category II is equipment to be connected to the fixed electrical installations of buildings.

Equipment of impulse withstand category III is equipment which is part of the fixed electrical installations and other equipment where a higher degree of availability is expected.

Equipment of impulse withstand category IV is for use at or in the proximity of the origin of the electrical installations of buildings upstream of the main distribution board.

3.17

primary circuit

circuit which is directly connected to the AC mains supply

Note 1 to entry: It includes, for example, the means for connection to the AC mains supply, the primary windings of transformers, motors and other loading devices.

3.18

secondary circuit

circuit which has no direct connection to a primary circuit and derives its power from a transformer, converter or equivalent isolation device, or from a battery

Note 1 to entry: *Exception:* autotransformers. Although having direct connection to a primary circuit, the tapped part of them is also deemed to be a secondary circuit in the above sense.

Note 2 to entry: Mains transients in such a circuit are attenuated by the corresponding primary windings. In addition, inductive ballasts reduce the mains transient voltage height. Therefore, components located after a primary circuit or after an inductive ballast can be suited for an impulse withstand category of one step lower, i.e. for impulse withstand category II.

3.19

basic insulation

insulation applied to live parts to provide basic protection against electric shock

Note 1 to entry: Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.20

supplementary insulation

independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation

3.21

double insulation

insulation comprising both basic insulation and supplementary insulation

3.22

reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified

Note 1 to entry: The term "insulation system" does not imply that the insulation shall be one homogeneous piece. It can comprise several layers which cannot be tested singly as supplementary or basic insulation.

3.23

enclosed reinforced insulated lampholder

lampholder for building-in so designed that on its own it fulfils the requirements for double or reinforced insulated parts in class II applications

3.24

partly reinforced insulated lampholder

lampholder for building-in, so designed that some parts of the lampholder require additional means to fulfil the requirements with regard to double or reinforced insulation

Note 1 to entry: In some cases, the dimensions might be achieved only after mounting into the luminaire.

3.25

rated current

current declared by the manufacturer to indicate the highest current for which the lampholder is intended

[SOURCE: IEC 60838-1:2016 3.3]

3.26

critical frequency

f_{crit}
frequency at which the reduction of the breakdown voltage of a clearance begins (occurs)

Note 1 to entry: $f_{crit} \approx 0,2/d$ [MHz] where d (in mm) is the clearance according to Table 3 (basic or supplementary insulation and reinforced insulation respectively) disregarding the frequency.

[SOURCE: IEC 61347-1:2015, 3.40, modified — the note has been added]

3.27

ignition voltage

peak voltage applied to ignite a discharge lamp

[SOURCE: IEC 61347-1:2015, 3.46]

3.27.1**ignition pulse voltage**

peak ignition voltage with a total duration of $\leq 750 \mu\text{s}$ (summation of all pulse durations) within 10 ms, with the duration time (width) of each pulse being measured at the level of 50 % of the maximum absolute peak value

Note 1 to entry: Ignition pulse waveforms, which are considered as ignition pulse voltage, should not contain any dominant frequency above 30 kHz or should be usually highly damped (after 20 μs the peak voltage level should be less than one half of the maximum peak voltage). For the assessment of the dominant frequency IEC 60664-4:2005, Annex E should be consulted.

[SOURCE: IEC 61347-1:2015, 3.46.1]

3.28**maximum working voltage** U_{out}

maximum occurring working voltage (r.m.s.) between the output terminals of a controlgear or between the output terminals and earth, during normal or abnormal operating condition

Note 1 to entry: Transients and ignition voltages have to be neglected.

[SOURCE: IEC 61347-1:2015, 3.33, modified — "of a controlgear" has been added]

3.29**maximum working peak output voltage** $\hat{U}_{\text{out}}$

maximum repetitive occurring peak working voltage between the output terminals of a controlgear or between its output terminals and earth, during normal or abnormal operating condition and with transients neglected

[SOURCE: IEC 61347-1:2015, 3.45, modified — "of a controlgear" has been added]

3.30**equivalent transformed peak voltage** U_{p}

transformed output peak voltage, which is converted for the worst case peak voltage with its related frequency into an ignition pulse voltage

Note 1 to entry: The value of the declared equivalent transformed output peak voltage is the essential parameter for selecting the associated components.

Note 2 to entry: See 3.27.1.

Note 3 to entry: To determine the declared equivalent transformed output peak voltage for basic insulation U_{p} [basic] the worst case combination of the maximum occurring peak voltage and frequency has to be taken into account, which means the maximum clearance according to IEC 61347-1:2015, Table 10 for basic insulation.

Note 4 to entry: To determine the declared equivalent transformed output peak voltage for the reinforced insulation U_{p} [reinforced] the worst case combination of the maximum occurring peak voltage and frequency has to be taken into account, which means the maximum clearance according to IEC 61347-1:2015, Table 11 for reinforced insulation.

[SOURCE: IEC 61347-1:2015, 3.47]

4 General requirement

Holders shall be so designed and constructed that, in normal use, they function reliably and cause no danger to persons or surroundings.

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

In addition, the enclosure of independent holders shall comply with the appropriate requirements of IEC 60598-1, including the classification and marking requirements of that standard.

5 General conditions for tests

5.1 Tests according to this document are type tests.

NOTE The requirements and tolerances given in this document are related to testing of a type test sample submitted for that purpose.

Compliance of the type test sample does not ensure compliance of the whole production of a manufacturer with this safety standard.

In addition to type testing, conformity of production is the responsibility of the manufacturer and can include routine tests and quality assurance.

For further information, see IEC 60061-4 (inclusion of guidance on conformity testing during manufacture is in preparation).

5.2 *Unless otherwise specified, the tests are made at an ambient temperature of 20 °C ± 5 °C and with the holder in the most unfavourable position for normal use.*

5.3 *The tests shall be carried out in the order of the clauses, unless another succession of tests is specified.*

Holders intended to provide an IP classification greater than IP20 shall be subjected to the tests in 12.1 and 12.2 after the test in 18.1.

5.4 The tests and inspections are carried out on a total of:

- *eight pairs of matching lampholders intended for linear double-capped fluorescent lamps;*

NOTE If a pair of lampholders consists of identical holders, it is sufficient for one holder instead of one pair to be subjected to all the tests, except for the test of item d) in 11.5, where one pair is used.

- *eight specimens intended for single-capped fluorescent lamps and eight starter-holders;*

in the order of the clauses, as follows:

- *two pairs or two specimens: Clause 6 up to and including Clause 17 (except for 10.2 and 10.5);*

NOTE The tests of 10.2 are carried out on the number of separate specimens as required by the relevant standards.

- *three pairs or three specimens: 10.5 and 18.1;*
- *two pairs or two specimens: 18.2 up to and including 18.5 (of which one specimen for the test in 18.2 and the other for the tests in 18.4 and 18.5);*
- *one pair or one specimen: 18.6 and Clause 19.*

In the case of flexible and inflexible lampholders G5, GX5 or G13 (see 3.3 and 3.4 respectively), the specimens are mounted on two pairs of mounting sheets as specified in Figure 2.

One pair of holders is mounted so as to represent the minimum mounting distance for this pair of holders according to the manufacturer's mounting instructions; the other pair is mounted at the maximum distance. The matching mounting sheets are marked.

In special cases, it may be necessary to test more than the number of specimens specified above.

Together with these specimens, the manufacturer's mounting instructions (see 8.3) shall be supplied.

For holders intended to provide an IP classification greater than IP20 with detachable gaskets having a maximum operating temperature different from the values in 18.1, an additional set of gaskets shall be supplied with the specimen, together with information on their maximum operating temperature (this is part of the manufacturer's mounting instructions).

This does not refer to detachable gaskets on the mounting surface of the holder (see 18.1).

5.5 *Holders are deemed to comply with this document if no specimen fails in the complete series of tests specified in 5.4.*

If one specimen fails in one test, that test and the preceding ones which may have influenced the result of that test are repeated on another set of specimens to the number required in 5.4, all specimens of which shall then comply with the repeated tests and with the subsequent tests. Holders are deemed not to comply with this document if there are more failures than that of one specimen in one of the tests.

In general, it will only be necessary to repeat the relevant test, unless the specimen fails in the tests according to Clause 14 or Clause 15, in which case the tests shall be repeated from the test according to Clause 13 onwards.

NOTE A second type test sample, which can be required should one specimen fail, can be submitted together with the first sample.

If the additional type test sample is not submitted at the same time, a failure of one specimen entails a rejection.

5.6 For verification purposes, Annex D gives an overview of clauses containing new or more stringent requirements with respect to the previous edition of this document.

6 Electrical rating

The electrical rating shall be:

- not less than 125 V and not more than 1 000 V AC r.m.s.;
- not less than 1 A;
- not less than 2 A for lampholders GX5, G13, 2G8, 2G13, G20, Fa6, Fa8 and R17d.

In countries where marking of rated wattage is required in place of rated current, the rating of the G5 lampholder should be not less than 75 W.

7 Classification

Holders are classified as follows.

7.1 According to the protection against electric shock:

- unenclosed lampholders;
- enclosed lampholders;
- independent lampholders;
- partly reinforced insulated lampholders;
- enclosed reinforced insulated lampholders.

Where a lampholder is used with a working voltage of 50 % or less of its maximum rating, it may be regarded as equivalent to a reinforced insulated lampholder.

7.2 According to the degree of protection against ingress of dust or water in accordance with the system of classification (IP Code) explained in IEC 60529.

Symbols for the degrees of protection are given in 8.4 (independent and enclosed holders only).

7.3 According to the resistance to heat:

- holders for rated operating temperatures up to and including 80 °C;
- holders for rated operating temperatures over 80 °C.

NOTE The measuring point for the operating temperature is that area of the lampholder where it touches the lamp cap.

7.4 Moreover, starterholders are classified according to the possibility of accepting different types of starters:

- starterholders intended for starters according to IEC 60155;
- starterholders intended for starters according to IEC 60155, Annex B only.

8 Marking

8.1 Holders shall be marked with the following:

- a) mark of origin (this may take the form of a trade mark, a manufacturer's identification mark or the name of the responsible vendor);
- b) type reference;

Available technical documentation of the manufacturer like printed catalogues or online catalogues should allow a clear identification of a lampholder either by a unique catalogue number or by an identifying reference on the holder, specifying the essential characteristic features and the basic design of the product supplemented by a clear description. Variations of the basic design, for example different cable length, fixing means, colours, which do not affect safety or performance of the lampholder, may be disregarded in the type reference marked on the product. Variations included in the type testing procedure are listed in the corresponding test reports.

- c) – rated voltage in volts
 - rated ignition voltage, in kilovolts, if applicable and higher than
 - 2,5 kV for lamp holders rated 250 V;
 - 4 kV for lamp holders rated 500 V.

For holders where, during dimming, i.e. reduction of the load, exceeding of the marked voltage rating is permissible (increased creepage distances and clearances), the maximum allowed value under these operating conditions should be given in the manufacturer's catalogue or the like (for example, maximum dimming voltage: ...V).

- d) rated current, in amperes (see note to Clause 6);
- e) rated operating temperature T if greater than 80 °C, in steps of 10 °C;
- f) degree of protection against ingress of dust and water, for drip-proof holders only (see 8.4);

Marking of IP20 on ordinary holders is not required;

- g) for holders protected against dust and moisture, the holder manufacturer shall indicate in his instructions the nominal diameter of the lamp(s) or starter for which the holder is intended.

Compliance is checked by inspection.

8.2 The following information shall be indicated in the manufacturer's catalogue or the like. The indication shall correspond to the type reference on the products:

- the temperature T_m for the rearside of the holder, for holders tested according to item b) in 18.1. This marking can additionally been given on the holder;
- the temperature measured for the screwless terminals, for holders tested according to item b) in 18.1. This marking can additionally been given on the holder;
- a declaration in compliance with 10.3 of the cross-section of the conductor(s) for which the holder terminals are suitable. This marking can additionally been given on the holder;
- information that for lampholders according to this document, the distances for impulse withstand category II are applicable;
- information that enclosed reinforced insulated lampholders offer an adequate level of protection for use in luminaires where they are accessible in normal use;
- information that for partly reinforced insulated lampholders, sufficient creepage distances and clearances to outer accessible surface will require additional protection to some parts of the lampholder by the luminaire design or by the use of additional attachment(s) or cover(s);
- information that if a single holder G5/G13 is declared to be suitable to be connected directly across the mains, it enables the application of G5/G13 capped LED lamps without external controlgear;

Compliance is checked by inspection.

8.3 The instructions supplied by the holder manufacturer or responsible vendor in order to ensure correct mounting and operation of a pair of holders for linear double-capped fluorescent lamps shall contain at least the following information:

- method of mounting. For flexibly mounted holders, it shall be clearly stated whether both or only one of the methods of mounting is intended;

NOTE A pair of flexible holders could consist of two holders each having a spring or one holder with and the second without a spring. The two methods of mounting are with and without a separate spring for flexible mounting.

- mounting distance, with tolerance or reference to standard sheets;
- which holders shall be used as a pair;
- required mounting plate thickness, if the holder is designed for screwless mounting.

The above information may be part of the manufacturer's or responsible vendor's catalogue.

Compliance is checked by inspection.

8.4 If symbols are used, these shall be as follows:

a) for electrical rating:

- volt: V
- ampere: A
- watt: W

NOTE Alternatively, for volt and ampere ratings, figures can be used alone, the figure for the rated current being marked before or above that for the rated voltage and separated from the latter by an oblique stroke or a line.

Therefore, the marking of current and voltage may be as follows:

2A 250V or 2/250 or $\frac{2}{250}$

b) for operating temperature: T,

followed by the operating temperature in degrees Celsius (°C), for example T 200

c) for degrees of protection against ingress of dust or water:

- ordinary: IP20
- protected against dripping water (drip-proof): IPX1
- protected against dripping water when tilted up to 15°: IPX2
- protected against spraying water (rain-proof): IPX3
- protected against splashing water (splash-proof): IPX4
- protected against water jet (jet-proof): IPX5
- protected against the effects of immersion (watertight): IPX7
- protected against submersion (pressure watertight): IPX8
- protected against ingress of solid objects greater than 1,0 mm: IP4X
- dust-protected (dust-proof): IP5X
- dust-tight: IP6X

Where X is used in an IP number in 8.4, it is intended to indicate a missing numeral in the symbol, but both the appropriate numerals in accordance with IEC 60529 shall be marked on the holder.

d) for cross-section of conductors:

- the relevant value, or values in the case of a range, in square millimetres (mm²), followed by a small square (for example 0,5 □).

Compliance is checked by inspection.

8.5 Marking shall be suitably placed.

The marking of items a) to e) in 8.1 on holders, when installed as in normal use, shall be easily discernible, covers being removed if necessary. If item f) is marked on holders for building-in, it shall not be visible when the holder is installed as in normal use, in order to avoid the mark being applied to the complete luminaire.

Compliance is checked by inspection.

8.6 Marking shall be durable and easily legible.

Compliance is checked by inspection and, after the tests of 18.1 have been completed, by trying to remove the marking by rubbing lightly for 15 s with a piece of cloth soaked with water and for a further 15 s with a piece of cloth soaked with petroleum spirit.

After the test, the marking shall still be legible.

The petroleum spirit used typically consists of a solvent hexane with a content of aromatics of maximum 0,1 volume percentage, a kauri-butanol value of 29, an initial boiling-point of approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0,68 g/cm³.

9 Protection against electric shock

9.1 Holders shall be so designed that their live parts are not accessible when the holder has been built-in or installed and wired as in normal use and is fitted with the appropriate lamp and/or starter.

For enclosed holders, compliance is checked by means of the standard test finger shown in Figure 41. This test finger is applied in every possible position with a force of 10 N, an electrical indicator being used to show contact with live parts. It is recommended that a voltage of not less than 40 V be used.

Enclosed holders are mounted as in normal use, i.e. on a supporting surface or the like, fitted with the most unfavourable conductor size for which it is intended, before being subjected to the above test.

Unenclosed holders are only tested after appropriate installation in a luminaire or other additional enclosure.

9.2 Protection against electric shock shall be provided when the holder is installed as in normal use, both without lamp or starter, and during insertion or removal of the lamp and starter.

The insertion of only one pin of the lamp (in case of caps with more than one pin) or starter to the first point of contact shall be prevented. This requirement is not applicable to G10q holders.

In the case of side entry lampholders for linear G5, GX5 and G13 capped lamps, compliance is checked:

- for lampholders G5 by means of gauge II as per IEC 60061-3, standard sheet 7006-47C, and*
- for lampholders GX5 by means of gauge II as per IEC 60061-3, standard sheet 7006-47E, and*
- for lampholders G13 by means of gauge II as per IEC 60061-3, standard sheet 7006-60C,*
with the gauge face touching the lampholder face.

NOTE 1 A side entry holder is a holder where the cap pins enter the insertion slot(s) of the holder in a direction perpendicular to the lamp axis. For further information, see Figures C.1a), C.1b) and C.1c)

Lampholders incorporating a rotating part shall be tested with this part in the position of normal lamp insertion.

Protection against electric shock shall be ensured when a lamp is inserted into a lampholder at an angle not greater than 5° from the axis of the normal inserted position of the lamp. This requirement does not apply to lampholders G20, Fa6, Fa8 and R17d.

NOTE 2 For further information, see Figure C.1d).

Compliance is checked as follows:

- for starterholders, by means of the standard test finger shown in Figure 41;*
- for lampholders G5, by means of the gauge as per IEC 60061-3, standard sheet 7006-47A, and in conjunction with gauge II as per IEC 60061-3, standard sheet 7006-47C and the standard test finger shown in Figure 41;*

NOTE 3 To prevent electrical contact between the test finger and the metal body of gauge II, the "cap" face of the gauge is covered with insulating material, having a thickness not exceeding 0,1 mm.

- for lampholders G13, by means of the gauge II as per IEC 60061-3, standard sheet 7006-60C and the standard test finger shown in Figure 41;*

NOTE 4 To prevent electrical contact between the test finger and the metal body of gauge II, the "cap" face of the gauge is covered with insulating material, having a thickness not exceeding 0,1 mm.

- for lampholders GX5, by means of the gauge as per IEC 60061-3, standard sheet 7006-47A, and in conjunction with gauge II as per IEC 60061-3, standard sheet 7006-47E and the standard test finger shown in Figure 41;*

- for lampholders Fa8 and R17d, by means of a gauge having a cylindrical form with a hemispherical end radius of 5,2 mm;
- for all other lampholders, by means of the standard test finger shown in Figure 41.

9.3 Parts providing protection against electric shock shall have adequate mechanical strength and shall not work loose in normal use. It shall not be possible to remove these parts by hand.

Compliance is checked by inspection, by manual test and by the tests according to Clauses 14 and 15.

9.4 External parts of holders accessible after installation shall either be of insulating material or, if of conducting material, be adequately insulated from live parts of the holder.

Compliance is checked by inspection and by the relevant tests of this document.

10 Terminals

10.1 Holders shall be provided with at least one of the following means of connection:

- screw type terminals;
- screwless terminals;
- tabs or pins for push-on connections;
- posts for wire wrapping;
- soldering lugs;
- connecting leads (tails).

Compliance is checked by inspection.

10.2 Terminals shall comply with the following requirements with the restriction that the requirements referring to internal wiring relate to wiring inside independent holders and to wiring inside luminaires for holders for building-in.

All terminal tests shall be made on separate specimens which have not been subjected to any other test:

- screw type terminals shall comply with Section 14 of IEC 60598-1;
- screwless terminals shall comply with Section 15 of IEC 60598-1; however, if the resistance to heat of the lampholder has to be tested in accordance with the test in 18.1 b), then the recorded screwless terminal temperature according to 18.1 b) shall apply for the test in Section 15 of IEC 60598-1;
- tabs or pins for push-on connections shall comply with Section 15 of IEC 60598-1;
- posts for wire wrapping shall comply with IEC 60352-1;
Wire wrapping applies only to single solid round wire for internal wiring.
- soldering lugs shall comply with the requirements for good solderability. Suitable requirements can be found in IEC 60068-2-20;
- connecting leads (tails) shall comply with the requirements specified in 10.5.

10.3 Unless otherwise specified in Sections 14 and 15 of IEC 60598-1, terminals shall permit the connection of conductors with a cross-sectional core area from 0,5 mm² to 1,0 mm² for holders for building-in and from 1,0 mm² to 1,5 mm² for independent holders.