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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Luminaires –
Part 2-20: Particular requirements – Lighting chains

Luminaires –
Partie 2-20: Exigences particulières – Guirlandes lumineuses

IEC 60598-2-20:2014-11(en-fr)

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LUMINAIRES –

Part 2-20: Particular requirements – Lighting chains

FOREWORD

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International Standard IEC 60598-2-20 has been prepared by subcommittee 34D: Luminaires, of IEC technical committee 34: Lamps and related equipment.

This fourth edition cancels and replaces the third edition (2010).

This edition includes the following significant technical changes with respect to the previous edition, where the requirements for rope lights (sealed lighting chains) have been removed and are now dealt with in IEC 60598-2-21.

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

FDIS	Report on voting
34D/1145/FDIS	34D/1153/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is intended to be read in conjunction with IEC 60598-1 Luminaires – Part 1: General requirements and tests.

In this standard, the following print types are used:

– requirements: in roman type;
– *test specifications: in italic type;*
– notes: in small roman type.

A list of all the parts in the IEC 60598 series, published under the general title *Luminaires* can be found on the IEC website.

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

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- withdrawn,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

The contents of the Corrigendum 1 of December 2016 have been included in this copy.

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LUMINAIRES –

Part 2-20: Particular requirements – Lighting chains

20.1 Scope

This part of IEC 60598 specifies requirements for lighting chains fitted with series, parallel or a combination of series/parallel connected light sources for use either indoors or outdoors on supply voltages not exceeding 250 V.

For combinations where rope lights (also known as sealed lighting chains) are included, see IEC 60598-2-21.

Lighting chains provided with fixed or detachable attachments e.g. ornamental or decorative, are considered to be covered by this standard.

For lighting chains fitted with lampholders of the push-in type, the appropriate requirements of this standard applies.

NOTE 1 A Christmas tree lighting chain is an example of a lighting chain fitted with series or series/parallel connected lamps. A chain for illuminating ski-tracks or promenades is an example of a lighting chain fitted with parallel connected lamps.

For lighting chains with non-standardised lamps (e.g. lamps of the push-in type) the lamps are regarded as a part of the lighting chain and consequently included in the testing.

NOTE 2 For products where the lighting chain is permanently fixed to a frame or pre-lit Christmas tree the relevant clauses of IEC 60598-2-4 and/or IEC 60598-2-7 can also apply.

NOTE 3 In some countries the term "strings" is used instead of "chains".

NOTE 4 Candlestick luminaries are tested according to IEC 60598-2-4.

20.2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60238, *Edison screw lampholders*

IEC 60245-4:2011, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

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

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

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IEC 60906 (all parts), *IEC System of plugs and socket-outlets for household and similar purposes*

IEC 61184, *Bayonet lampholders*

IEC 61347-2-11, *Lamp controlgear – Part 2-11: Particular requirements for miscellaneous electronic circuits used with luminaires*

IEC 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

IEC 61984:2008, *Connectors – Safety requirements and tests*

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

20.3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60598-1 as well as the following apply.

20.3.1
lighting chain
luminaire comprising an assembly of series-connected lamps, parallel-connected lamps or series/parallel-connected lamps and interconnecting insulated conductors

Note 1 to entry: For lighting chains with non-standardised lamps (e.g. lamps of the push-in type) the lamps are regarded as part of the chain.

Note 2 to entry: For lighting chains with non-removable lamps, the lamps are regarded as part of the chain.

Note 3 to entry: A lighting chain may incorporate control devices (e.g. flasher units, see 20.7.8).

Note 4 to entry: Unless otherwise stated, references to lamps within this standard also refer to LEDs.

20.3.2
rope light
sealed lighting chain
lighting chain with non-replaceable light sources enclosed in a rigid or flexible insulating translucent pipe or tube, sealed at the ends, with or without joints

Note 1 to entry: Covered by IEC 60598-2-21.

20.4 General test requirements

The provisions of Section 0 of IEC 60598-1 apply. The tests described in each appropriate section of IEC 60598-1 shall be carried out in the order listed in this part of IEC 60598.

20.5 Classification of luminaires

20.5.1 General

Lighting chains shall be classified in accordance with the provisions of Section 2 of IEC 60598-1 together with the requirements of 20.5.2 and 20.5.3.

20.5.2 Protection against electric shock

Lighting chains shall be classified as Class II or Class III.

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20.5.3 Protection against dust, solid objects and moisture

Lighting chains for outdoor use shall have a protective index IP 44 or higher.

20.6 Marking

20.6.1 General

The provisions of Section 3 of IEC 60598-1 apply together with the requirements of 20.6.2 to 20.6.4.

20.6.2 Lighting chain marking

The following information shall be marked on the lighting chain:

– rated voltage of the complete chain;

– rated wattage of the complete chain.

Where the information is on the cable, it shall be marked on a durable non-removable sleeve or label.

20.6.3 Lighting chain and packing marking

The following marking shall be placed on the lighting chain and on the accompanying packing of lighting chains for indoor use only.

– “FOR INDOOR USE ONLY”.

– As an alternative to the text, the lighting chain can be marked with the symbol [SOURCE: IEC 60417-5957 (2004-12)]. The symbol shall be explained in the instructions.

NOTE In some countries (UK and Australia) national requirements are such that a plug must be fitted to a portable appliance. In situations where this plug does not provide the same ingress protection of the lighting chain information concerning the location of the plug/transformer may be given e.g. "Plug/transformer for indoor use only".

20.6.4 Packing or instruction marking

The following or similar marking shall be placed on the accompanying packing or instructions.

a) For all lighting chains where the packing has not been adapted for display purposes:
   – “Do not connect the chain to the supply while it is in the packing”.

b) For lighting chains with replaceable lamps:
   – voltage and wattage or manufacturer's article number of replacement lamps;
   – “Do not remove or insert lamps while the chain is connected to the supply”;
   – “Ensure that all lampholders are fitted with a lamp”.

c) Lighting chains designed to be used without a lamp in every lampholder:
   – adequate information about required blanking plug(s).

d) For chains with replaceable series-connected lamps:
   – “Replace failed lamps immediately by lamps of the same type as delivered or of a type specified by the manufacturer”.

e) For lighting chains with ‘fuse’ lamp(s):
   – “Do not replace a ‘fuse’ lamp with a non-’fuse’ lamp”; in order to indicate the difference from ‘ordinary’ lamps, ‘fuse’ lamps shall be partly coloured white;
   – information indicating that the chain is provided with ‘fuse’ lamps and explanation of their function.

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f) For lighting chains with non-replaceable lamps:

– “The lamps are not replaceable”.

g) For class II lighting chains with non-replaceable lamps, the substance of the following:

– where breakage or damage to lamps occurs the chain must not be used/energised but disposed of safely.

h) For lighting chains which rely on gaskets to provide the specified degree of protection against dust, solid objects and moisture:

– “WARNING – THIS LIGHTING CHAIN MUST NOT BE USED WITHOUT ALL GASKETS BEING IN PLACE”

i) For lighting chains intended for interconnection:

– “Do not interconnect parts of this lighting chain with parts of another manufacturer's lighting chain”;

– “Interconnection shall be made only by the use of the supplied connectors. Any open ends must be sealed-off before use”;

– maximum system length that may be interconnected;

– maximum number of lamps or max system wattage that may be interconnected.

j) For lighting chains incorporating lamp bridging device(s):

– information stating that the chain is fitted with a bridging device(s).

k) For class III lighting chains delivered without a supply source:

– relevant information concerning the required supply source.

l) For mains voltage lighting chains with series connected lamps:

– “WARNING – RISK OF ELECTRIC SHOCK IF LAMPS ARE BROKEN OR MISSING. DO NOT USE”

20.7 Construction

20.7.1 General

The provisions of Section 4 of IEC 60598-1 apply together with the requirements of 20.7.2 to 20.7.11

20.7.2 Lampholders

In lighting chains where non-standardised lampholders (e.g. of the push-in type) are used, the lampholders are regarded as parts of the lighting chain and tested accordingly.

Edison screw lampholders E5, E10, E14 and E27 shall meet the requirements of IEC 60238.

Bayonet lampholders shall meet the requirements of IEC 61184.

Insulation piercing terminals on lampholders are acceptable only if used in the SELV circuit of lighting chains or as permanent, non-rewireable connections in class II chains.

E5 and E10 lampholders and similar small lampholders of the push-in type shall be used only if the rated voltage of each lamp does not exceed:

– for E5 and similar small lampholders	25 V
– for series connected E10 lampholders	60 V
– for parallel connected E10 lampholders	250 V

Compliance is checked by inspection.

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Lampholders shall have a body of insulating material.

Compliance is checked by inspection.

20.7.3 Terminal blocks

Clause 4.6 of Section 4 of IEC 60598-1 referring to terminal blocks does not apply.

20.7.4 Terminals and supply connections

Clause 4.7 of Section 4 of IEC 60598-1 referring to terminals and supply connections applies together with the following requirement.

Interconnecting connectors for lighting chains shall, in addition, comply with the requirements and modifications given in Annex A.

Compliance is checked by inspection and by carrying out the tests of this standard.

20.7.5 Gaskets

Gaskets used to provide the specified degree of protection against dust, solid objects and moisture of lighting chains for outdoor use shall be weather resistant. Such gaskets shall remain in place on the chain when the lamp is removed and shall fit tightly round the inserted lamp.

Compliance is checked by inspection and by manual test.

NOTE A test to verify the weather resistance of gaskets is under consideration.

20.7.6 Mechanical strength

Compliance with the mechanical strength requirements of Clause 4.13 of Section 4 of IEC 60598-1 for Edison screw lampholders and small lampholders of the push-in type shall be checked by the tests given in Clause 15 of IEC 60238. The free fall test specified for E5 and E10 lampholders shall also apply for push-in lampholders.

For bayonet lampholders, the tests in Clause 15 of IEC 61184 apply.

The tests are made on three samples of the lampholder without the lamp inserted. After the test, the relevant compliance requirements of Clause 4.13 of Section 4 of IEC 60598-1 shall be met.

Accessories, for example plugs, interconnecting connectors, etc. incorporated in a lighting chain shall comply with the mechanical requirements of 4.13.6 of IEC 60598-1.

20.7.7 Lamp bridging devices

Protection against electric shock and fire shall not be impaired when devices for bridging lamp filaments in series connected chains are functioning.

Compliance is checked by inspection and, where appropriate, by the test of 20.13.3

20.7.8 Control units

Control units and similar devices forming an integral part of the lighting chain, shall be enclosed in non-flammable insulating material. In addition they shall be securely fixed to the cable of the chain.

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Compliance is checked by inspection and, for the non-flammability of the insulating material, by the tests of Clause 20.16.

Any electronic control device (e.g. flasher units) shall, in addition to the requirements of this standard, comply with the requirements of IEC 61347-2-11.

LED-drivers shall comply with the requirements of IEC 61347-2-13.

Compliance is checked by carrying out the relevant tests.

20.7.9 Lamp rotation

The lamp (bulb) glass of push-in lamps shall not rotate in relation to the lamp cap, if any, and the lamp cap, if any, shall not rotate in relation to the lampholder.

Compliance is checked by applying a torque of 0,025 Nm for 1 min between the glass envelope and the lampholder. No displacement shall occur between the parts during the test.

20.7.10 Lamp insertion/withdrawal force

Replaceable push-in type lamps shall remain in the seated position when the lamp is subjected to a pull force of up to 3 N. Replaceable push-in type lamps shall make electrical contact with the lampholder contacts by applying a push-in force of up to 3 N. Withdrawal of the lamp from the holder shall be effected when subjected to a pull force of between 3 N and 10 N.

Non-replaceable lamps shall withstand a pull force of 10 N ± 1 N during which the lamp shall remain seated and shall not have become unsafe.

During each application of the specified forces no damage shall occur impairing safety and in particular no breakage or separation of the lamp glass envelope from the lamp cap shall take place.

Compliance is checked on three new samples, by manual test, by measurement of the forces and by inspection.

The samples are then placed in an oven at a temperature of 120 °C ± 5 °C for 2 h, following which it is allowed to cool down to room temperature. During this test, lampholders for replaceable lamps are left empty.

The same three samples are then re-submitted to the same tests, requirements and compliance criteria as those specified for the sample before the heating treatment. For lampholders for replaceable lamps, the lamps are reintroduced by a push-in force of 5 N ± 1 N.

20.7.11 Lamp mechanical requirements

The lamps of Class II lighting chains shall be resistant to typical handling forces.

The bulb (envelope) of the following lamps shall be tested:

– non-removable lamps,
– non-standardized lamps.

Compliance is checked by the test of 4.13.1 of IEC 60598-1 using an impact energy of 0,2 Nm and with the lamp held against a suitable rigid wooden board.

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20.8 Creepage distances and clearances

The provisions of Section 11 of IEC 60598-1 apply.

20.9 Provisions for earthing

The provisions of Section 7 of IEC 60598-1 do not apply.

20.10 Terminals

The provisions of Sections 14 and 15 of IEC 60598-1 apply.

20.11 External and internal wiring

20.11.1 General

The provisions of Section 5 of IEC 60598-1 apply together with the requirements of 20.11.2 to 20.11.4.

20.11.2 Cables for lighting chains

Subclause 5.2.2 of Section 5 of IEC 60598-1 is replaced by the following.

Internal and external cables for lighting chains shall not be lighter than those given in Table 1 and below.

Table 1 – Cables for lighting chains

Class II ordinary lighting chains	60227 IEC 52[a]
Class II lighting chains other than ordinary	60245 IEC 57[a]
Class III lighting chains and parts of chains supplied by SELV	Insulation according to 5.3.1 of IEC 60598-1[b]
[a] The cable may consist of a single core cable provided with a two-layer insulation corresponding to the specified standard sheet. [b] The insulation may consist of rubber or PVC	

Compliance is checked by inspection and measurement.

The nominal cross-sectional area of the conductors shall provide adequate current-carrying capacity and mechanical properties but shall not be less than the following values:

a) 0,5 mm^2 for class II lighting chains;

b) 1,5 mm^2 for class II lighting chains with E14, E27, B15 or B22 lampholders and fitted with parallel-connected lamps;

c) 0,15 mm^2 for class III lighting chains and parts of chains supplied by SELV;

d) 1 mm^2 for separate supply cables and extension cables for interconnection between different parts of extendable class II lighting chains.

Compliance is checked by inspection and measurement.

For the mechanical properties the relevant requirements given in 4.14.1 and 4.14.2 of IEC 60598-1 apply.

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