IEC 60598-2-20

Edition 3.0 2010-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Withdrawn

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

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

IEC 60598-2-20:2010

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CONTENTS

FOREWORD 3
20.1 Scope 5
20.2 Normative references 5
20.3 General test requirements 6
20.4 Definitions 6
20.5 Classification of luminaires 6
20.6 Marking 6
20.7 Construction 7
20.8 Creepage distances and clearances 10
20.9 Provisions for earthing 10
20.10 Terminals 10
20.11 External and internal wiring 10
20.12 Protection against electric shock 12
20.13 Endurance tests and thermal tests 16
20.14 Resistance to dust and moisture 17
20.15 Insulation resistance and electric strength 17
20.16 Resistance to heat, fire and tracking 17
Annex A (informative) Tumbling barrel test 18
Bibliography 19

Figure 1 – Example of a suitable connection for lighting chains 14
Figure 2 – Example of test device suitable for checking security of lampholder contacts 15
Figure 3 – Example of test device suitable for winding a flexible pipe 16

Table 1 – Characteristics of the lighting chains 11

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Full document details: IEC 60598-2-20 2010

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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 third edition cancels and replaces the second edition published in 1996, its Amendment 1 (1998), its Amendment 2 (2002) and the interpretation sheets of March 2001 (1) and July 2003 (2 and 3). This third edition is based on the second edition, its Amendments 1 and 2 and the interpretation sheets of March 2001 (1) and July 2003 (2 and 3) and incorporates some changes relating to 20.7.15. This third edition constitutes a minor revision.

This publication is intended to be read in conjunction with IEC 60598-1: *Luminaires – Part 1: General requirements and tests*. It was established on the basis of the seventh edition (2008) of that standard.

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

FDIS	Report on voting
34D/946/FDIS	34D/955/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.

NOTE In this standard, the following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

The following differences exist in the countries indicated below:

20.11.1: In the USA, the requirements for the cables are different.

A list of all parts of the IEC 60598 series, 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.

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LUMINAIRES –

Part 2-20: Particular requirements – Lighting chains

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20.1 Scope

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

NOTE 1 A Christmas tree 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.

NOTE 2 For lighting chains fitted with lampholders of the push-in type, the appropriate requirements of this part of IEC 60598 apply.

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

NOTE 4 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 (and thereby in the certificate, if any).

20.2 Normative references

The following referenced 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 referenced document (including any amendments) applies.

IEC 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60238:2004, *Edison screw lampholders*[1)]
Amendment 1 (2008)

IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V*

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

IEC 60598-1:2008, *Luminaires – Part 1: General requirements and tests*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking*
Amendment 1 (1994)
Amendment 2 (2001)

IEC 61184, *Bayonet lampholders*

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1) There exists a consolidated edition 8.1 (2008) that comprises IEC 60238 (2004) and its Amendment 1 (2008).

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

20.3 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.

20.4 Definitions

For the purposes of this document, the definitions given in section 1 of IEC 60598-1 apply together with the following definitions.

20.4.1
lighting chain
luminaire comprising an assembly of series-connected lampholders, parallel-connected lampholders or series/parallel-connected lampholders and interconnecting insulated conductors

NOTE 1 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 For lighting chains with non-removable lamps, the lamps are regarded as part of the chain.

NOTE 3 A lighting chain may incorporate control devices (e.g. flasher units, see 20.7.16).

20.4.2
sealed chain
a lighting chain enclosed in a rigid or flexible insulating translucent pipe or tube, sealed at the ends and having no joints

20.5 Classification of luminaires

Luminaires shall be classified in accordance with the provisions of section 2 of IEC 60598-1 together with the requirements of 20.5.1 and 20.5.2.

NOTE As lighting chains are mandatorily required to be suitable for mounting on normally flammable surfaces they do not require F marking nor provision of a warning notice.

20.5.1 According to the type of protection against electric shock, lighting chains shall be classified as Class II or Class III.

20.5.2 According to the degree of protection against dust and moisture, lighting chains for outdoor use shall be classified as "of rain-proof, splash-proof, jet-proof or watertight construction".

20.6 Marking

The provisions of section 3 of IEC 60598-1 apply together with the requirements of 20.6.1 and 20.6.2.

20.6.1 The following information shall be marked on the lighting chains.

a) Lighting chains shall be marked with the type reference or the electrical data of the lamps and with the rated voltage of the complete chain. Where it is impractical to mark this information on the lighting chain, the information shall be marked on a durable non-removable sleeve or label fitted to the cable.

b) Lighting chains shall be accompanied by the substance of the following warnings:

   1) do not remove or insert lamps while the chain is connected to the supply;

Withdrawn

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2) for series-connected lamps, replace failed lamps immediately by lamps of the same rated voltage and wattage to prevent overheating; this requirement does not apply to sealed chains;

3) do not connect the chain to the supply while it is in the packing unless the packing has been adapted for display purposes;

4) for series-connected lamps where fused lamps are used to ensure compliance with 20.13.3 hereafter, do not replace a fused lamp with a non-fused lamp [see item e)].

5) ensure all lampholders are fitted with a lamp.

c) Ordinary lighting chains shall additionally be accompanied by the substance of the following information:

"FOR INDOOR USE ONLY"

Lighting chains which rely on gaskets to provide the specified degree of protection against dust and moisture shall additionally be accompanied by the substance of the following information:

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

d) Lighting chains not intended for interconnection shall in addition be accompanied by the substance of the following warning:

"Do not connect this chain electrically to another chain."

e) Lighting chains fitted with fused lamps to ensure compliance with 20.13.3 shall be accompanied by information indicating the means for identification of fused lamps (see 20.6.3).

NOTE For the purpose of this subclause, a fused lamp is a lamp designed so as to break the circuit in the event of an overcurrent either by means of a separate fuse incorporated within the lamp or by any other means e.g. a special filament.

f) Lighting chains with non-standardised lamps shall be accompanied by information indicating that replacement lamps must be of the same type as delivered or of a type specified by the manufacturer (see 20.6.2).

g) Lighting chains provided with non-replaceable lamps shall be accompanied by the information that the lamps are not replaceable.

The information required under items b)3), f) and g) shall be indicated on the packing.

20.6.2 The following information shall be marked on the lampholder or on the cable, or on a durable non-removable sleeve or label fitted to the cable.

a) Mark of origin (this may take the form of a trade mark, the manufacturer's identification mark or the name of the responsible vendor).

b) Symbol for class II or class III, if applicable.

c) Marking for degree of protection against dust and moisture, if applicable, or warning that the chain is for indoor use only.

d) Rated voltage of class III chains.

e) Voltage and wattage of replacement lamps.

f) Use only replacement lamps of the same kind provided with this lighting chain.

20.6.3 Fused lamps used to ensure compliance with 20.13.3 shall have a suitable means of identification, such as a special colour.

20.7 Construction

The provisions of section 4 of IEC 60598-1 apply together with the requirements of 20.7.1 to 20.7.16.

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

Bayonet lampholders shall meet the requirements of IEC 61184.

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

E5 and similar small lampholders of the push-in type shall meet the requirements of the appropriate clauses of IEC 60238.

In lighting chains fitted with parallel-connected lamps, E27 and B22 lampholders with insulation piercing contacts shall meet the requirements listed in this part of IEC 60598.

20.7.2 Clause 4.6 of section 4 of IEC 60598-1 referring to terminal block does not apply.

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

The method of connection of wiring, external or internal, to components of chains shall give reliable electrical contact over the service life of the component.

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

20.7.4 Only 4.11.4 and 4.11.5 of 4.11 of section 4 of IEC 60598-1, referring to electrical connections and current-carrying parts, apply.

20.7.5 Gaskets used to provide the specified degree of protection against dust 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 shall be checked by inspection and by manual test.

No requirements are specified at present for checking the weather resistance of gaskets.

20.7.6 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 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.

20.7.7 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 and similar small lampholders	60 V;
– for parallel connected E10 lampholders	250 V.

Compliance is checked by inspection.

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20.7.8 For lighting chains fitted with series-connected lamps, resistors, if any, for bridging the lamp filaments shall be contained within the lamps. The protection against electric shock and fire shall not be impaired when these resistors are functioning.

Compliance is checked by inspection and, where appropriate, by a test during which the filaments of the lamps are interrupted.

20.7.9 Flasher units forming an integral part of the lighting chain, shall be enclosed in non-flammable insulating material; they shall be securely fixed to the cable of the chain.

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

20.7.10 No requirement.

20.7.11 Lampholders for replaceable push-in lamps shall have a body of insulating material.

Compliance is checked by inspection.

20.7.12 The lamp (bulb) glass of push-in lamps shall not rotate in relation to the lamp cap and the lamp cap 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 then occur between the parts during the test.

20.7.13 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 between 3 N and 10 N (under consideration). Withdrawal of the lamp from the holder shall be effected when subjected to a pull force of between 3 N and 10 N (under consideration).

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 a new sample by manual test, by measurement of the forces and by inspection.

The sample is then placed in an oven at a temperature of 120 °C ± 5 °C for 2 h (under consideration) following which it is allowed to cool down to room temperature.

The sample is then re-submitted to the same tests, requirements and compliance criteria as those specified for the sample before the heating treatment.

20.7.14 Sealed lighting chains shall have adequate mechanical strength.

For rigid sealed lighting chains, compliance is checked by subjecting the pipe 45 times to each of the following tests carried out in turn:

a) a pull of 60 N, the stress being applied to the ends of the pipe, without jerks, for 1 min;

b) a torque of 0,15 Nm, the stress being applied to the ends of the pipe in the most unfavorable direction (alternatively in cases of doubt) without jerks for 1 min.

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For flexible sealed lighting chains, compliance is checked by the tests of a) and b) above followed by the additional test below:

Test:

Wind the pipe on a cylinder of 250 mm diameter with a pull of 60 N for the number of operations and at the ambient temperature given below:

– for chains having an IP number up to and including 20	10 times at 25 °C ± 5 °C
– for chains having an IP number over 20	10 times at 25 °C ± 5 °C followed by 10 times at –15 °C ± 5 °C

After the test, the pipe shall show no damage affecting the safety of the chain and shall comply with the electric strength test of Clause 20.15 applied between live parts and the body.

NOTE 1 Failure of lamps during the test is permitted.

NOTE 2 An example of a test device suitable for winding a flexible pipe is given in Figure 3.

20.7.15

The lamp bulbs in lighting chains shall meet the mechanical requirements of Subclause 4.13.1 of IEC 60598-1 using an impact energy of 0,2 Nm when:

a) the lamps are non-removable;

or

b) the lamps are non-standardized and parallel connected.

20.7.16 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.

Compliance is checked by carrying out the relevant tests.

20.8 Creepage distances and clearances

The provisions of section 11 of IEC 60598-1 apply except that for Edison screw lampholders and small lampholders of the push-in type, Clause 17 of IEC 60238 applies.

20.9 Provisions for earthing

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

20.10 Terminals

The provisions of section 15 of IEC 60598-1 apply.

20.11 External and internal wiring

20.11.1 Subclause 5.2.2 of section 5 of IEC 60598-1 does not apply. Internal and external cables of lighting chains shall not be lighter than the following (see Table 1):

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Table 1 – Characteristics of the lighting chains

For Class II ordinary lighting chains and ordinary sealed chains	60227 IEC 43 60227 IEC 52*
For Class II chains other than ordinary, using series-connected lampholders	60245 IEC 57*
For Class II chains other than ordinary, using parallel-connected lampholders and the connection cable for sealed lighting chains other than ordinary	60245 IEC 57*
For Class II chains other than ordinary, where the length of cable between the point of supply and the nearest lampholder exceeds 3 m – for that part of the cable	60245 IEC 66
For Class III chains and parts of chains supplied by SELV and with a maximum rated wattage exceeding 50 W	60227 IEC 42*
For Class III chains and parts of chains supplied by SELV and with a maximum rated wattage not exceeding 50 W	Insulation according to 5.3.1 of 60598-1
* The cable may consist of a single core cable provided with a two-layer insulation corresponding to the specified standard sheet.	

Compliance is checked by inspection, measurement and by calculation.

The nominal cross-sectional area of the conductors shall not be less than the following values:

a) 0,5 mm^2 for class II lighting chains with E5 or E10 lampholders or other small lampholders;

b) 0,75 mm^2 for class II lighting chains with E14, E27, B15 or B22 lampholders and fitted with series connected lamps;

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

d) 0,5 mm^2 for class III chains and parts of chains supplied by SELV and with a maximum rated wattage exceeding 50 W;

e) 0,4 mm^2 for class III chains and parts of chains supplied by SELV and with a maximum rated wattage not exceeding 50 W;

f) 1 mm^2 for the cable between the plug and a sealed chain without joints;

g) 1,5 mm^2 for the cable between the plug and a sealed chain with joints.

If the maximum rated wattage of class III lighting chains and parts of chains supplied by SELV is less than 50 W, then the conductors of the internal and external cables may have a cross-sectional area of 0,4 mm^2 or less provided that the current-carrying capacity and the mechanical properties are adequate. If the maximum rated wattage exceeds 50 W, the cables shall comply with 60227 IEC 42 (see asterisk above). If the wattage is less than 50 W, the insulation of the cables shall comply with the requirements of 5.3.1 of IEC 60598-1.

For sealed chains, the internal conductors may have a cross-sectional area of 0,4 mm^2 or less provided the current-carrying capacity and the mechanical properties are adequate. In addition, conductors without insulation are accepted provided adequate precautions have been taken to ensure maintenance of the minimum creepage distances and clearances and compliance with the requirements of 5.3.1 of IEC 60598-1.

Compliance is checked by inspection, measurement and calculation.

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