IEC 62561-6

Edition 3.0 2023-05
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Lightning protection system components (LPSC) – Part 6: Requirements for lightning strike counters (LSCs)

IEC 62561-6:2023-05 RLV(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC 62561-6

Edition 3.0 2023-05
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Lightning protection system components (LPSC) – Part 6: Requirements for lightning strike counters (LSCs)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.020, 91.120.40

ISBN 978-2-8322-7032-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 6: Requirements for lightning strike counters (LSCs)

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62561-6:2018. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62561-6 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2018. This edition constitutes a technical revision.

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

a) a new classification according to the internal circuit of LSCs has been added;
b) the tests flowchart in Annex C has been updated to reflect this new classification;
c) the applicability of previous tests has been added (Annex D).

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

FDIS	Report on voting
81/723/FDIS	81/726/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 62561 series, published under the general title *Lightning protection system components (LPSC)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC) ~~that may be~~ used to determine the number of impulses or nominal currents on specific conductors associated with a lightning protection system (LPS) designed and implemented according to the IEC 62305 series.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 6: Requirements for lightning strike counters (LSCs)

1 Scope

This part of IEC 62561 specifies the requirements and tests for devices intended to count the number of lightning strikes based on the current flowing in a conductor. This conductor ~~may~~ can be part of a lightning protection system (LPS) or connected to an SPD installation or other conductors, which are not intended to conduct a significant portion of lightning currents.

~~LSCs may also be suitable for use in hazardous atmospheres and there are therefore extra requirements necessary for the components to be installed in such conditions.~~

Extra requirements for the components can be necessary for LSCs intended for use in hazardous atmospheres.

NOTE In CENELEC member countries, testing requirements of components for explosive atmospheres are specified in CLC/TS 50703-2.

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 60068-2-52:~~1996~~2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60068-2-75:~~1997~~2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

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

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-3:2016, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

ISO 4892-4:2013, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame, carbon-arc lamps*

ISO 22479:2019, *Corrosion of metals and alloys – Sulphur dioxide test in a humid atmosphere (fixed gas method)*

ISO 6957:1988, *Copper alloys – Ammonia test for stress corrosion resistance*

~~ISO 6988:1985, *Metallic and other non-organic coatings – Sulphur dioxide test with general condensation of moisture*~~

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology 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
LSC
lightning strike counter
device intended to count the number of lightning strikes based on current flowing in a conductor

3.2
lightning strike counter Type I
LSC Type I
LSC classified by its design to count impulse discharge currents

3.3
lightning surge counter Type II
LSC Type II
LSC classified by its design to count nominal discharge currents

3.4
impulse discharge current
I_{imp}
crest value of an impulse current 10/350 through the LSC with specified charge transfer Q and specified energy W/R in the specified time

3.5
minimum impulse discharge current counted
$I_{imp\ min}$
minimum ~~peak~~ crest value of the impulse counting discharge current that the LSC will count

3.6
maximum impulse discharge current counted
$I_{imp\ max}$
maximum ~~peak~~ crest value of the impulse counting discharge current that the LSC will count and withstand

3.7
nominal discharge current ~~counted~~
I_n
crest value of a surge current 8/20 through the LSC ~~having a current wave shape of 8/20~~

3.8
minimum discharge current counted
$I_{n\ min}$
minimum ~~peak~~ crest value of the surge current that the LSC will count

3.9
maximum discharge current counted
$I_{n\ max}$
maximum ~~peak~~ crest value of the surge current that the LSC will count and withstand

3.10
IP code
degree of protection of enclosure
numerical classification according to IEC 60529, preceded by the symbol IP, applied to the enclosure of electrical apparatus to provide:

– protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure,

– protection of the electrical apparatus against ingress of solid foreign objects, and

– protection of the electrical apparatus against harmful ingress of water where indicated by the classification

[SOURCE: IEC 60050-426:~~2008~~2020, 426-04-02, modified – In the term, "code" has been added, in the definition, "according to IEC 60529" has been added, "equipment" has been replaced with "electrical apparatus" and the Notes to entry have been deleted.]

3.11
point of strike
point where a lightning flash strikes the earth, or protruding structure

EXAMPLE: Structure, LPS, line, tree.

Note 1 to entry: A lightning flash ~~may~~ can have more than one point of strike.

3.12
strike
all strokes from a single lightning flash that attach to a point of strike on a structure

3.13
impulse current
transient current created by direct lightning strike into the LPS

3.14
surge
transient created by lightning electromagnetic pulse (LEMP) that appears either as an overvoltage or as an overcurrent, or both

4 Classification

~~LSCs are classified by type:~~

- ~~lightning strike counter (Type I) as defined in 3.2;~~
- ~~lightning surge counter (Type II) as defined in 3.3.~~

~~LSCs are also classified by location:~~

- ~~indoor LSCs are intended for use in enclosures and/or inside buildings or shelters;~~
- ~~outdoor LSCs are intended for use without enclosures and outside of buildings or shelters.~~

~~The IP codes defined in IEC 60529 are particularly relevant to the intended location of an LSC but may not be applicable to an LSC integral with an SPD.~~

4.1 Type of LSC

LSCs are classified according to the discharge current count:

a) Type I to count impulse discharge current count as defined in 3.2;
a) Type II to count nominal discharge current count as defined in 3.3.

4.2 LSC Internal circuit

LSCs are classified according to their internal circuit:

a) LSCs without electronic circuit;
b) LSCs with electronic circuit.

4.3 LSC installation location

LSCs are classified according to their installation location:

a) indoor LSCs are intended for use in enclosures or inside buildings or shelters;
b) outdoor LSCs are intended for use without enclosures and outside of buildings or shelters;
c) LSCs intended for use in special environments as specified by the manufacturer.

The degree of protection of enclosure (IP code) defined in IEC 60529 is particularly relevant to the intended location of an LSC but it is possible that they will not be applicable to an LSC integral with an SPD.

NOTE LSCs installed in outdoor enclosures or shelters are suitable for indoor use.

5 Requirements

5.1 General

~~The LSC shall be designed in such a way that in normal use its performance is reliable and without danger to persons and the surrounding.~~

LSCs shall be designed in such a manner that when they are installed in accordance with manufacturer's instructions, their performance shall be reliable, stable and safe to persons and surrounding equipment.

NOTE The choice of a material depends on its ability to match the particular application's requirements.

5.2 Documentation

The manufacturer or supplier of the LSC shall provide adequate information in their literature to ensure that the installer can select and install the counter in a suitable and safe manner.

The ranges for operating temperature, humidity, altitude, IP code and the classifications according to Clause 4 shall be declared by the manufacturer.

The following information shall also be provided (as applicable):

$$I_{\text{imp min}};\ I_{\text{imp max}};\ I_{\text{imp}};\ I_{\text{n}};\ I_{\text{n min}};\ I_{\text{n max}}.$$

where

$I_{\text{imp min}}$ is the minimum impulse discharge current counted;

$I_{\text{imp max}}$ is the maximum impulse discharge current counted;

I_{imp} is the impulse discharge current;

I_n is the nominal discharge current;

$I_{n\ min}$ is the minimum discharge current counted;

$I_{n\ max}$ is the maximum discharge current counted.

Compliance is checked by inspection in accordance with 6.2.

5.3 Marking

5.3.1 Content of marking

All products complying with this document shall be marked at least with the following:

a) the name of the manufacturer or his trademark;

b) the reference of the type or the serial number;

c) the classification;

d) $I_{imp\ min}$; $I_{imp\ max}$; ~~I_{imp}; I_n;~~ $I_{n\ min}$; $I_{n\ max}$;

e) the degree of protection (IP code);

f) conformity to this document.

If the device is small and sufficient space is not available for all the markings to appear, the indications cited in a) and b) above shall at least be reproduced on the apparatus and still be visible after installation. The indications cited in c), d), e) and f) can be given on the packaging ~~and/~~or in the installation data sheet (documentation) ~~and/~~, or in the catalogue of the manufacturer.

Compliance is checked in accordance with 6.3.1 a).

NOTE 1 Marking can be applied, for example, by moulding, pressing, engraving, printing adhesive labels~~, or water slide transfers~~.

NOTE 2 Marking can be applied with water slide transfers for only components installed indoors.

5.3.2 Durability and legibility

The marking shall be durable and legible.

Compliance is checked by test in accordance with 6.3.1 b).

5.4 Design

The lightning strike counter shall be designed to carry out its function of counting the number of lightning strikes causing a current to flow in a conductor.

These devices shall detect and record lightning strikes regardless of the polarity of the current.

LSCs intended to be used outdoors shall be able to withstand environmental conditions including temperature, dust and humidity. The minimum degree of protection is IP 43 obtained by itself or in combination with a box in accordance with IEC 60529.

This test is necessary for LSCs designed to be installed outdoors or in specific environments.

Non-metallic LSC housings for outdoor application shall withstand ultraviolet (UV) effects.

Compliance is checked in accordance with 6.4, 6.5, 6.6.

The manufacturer shall provide information regarding the range of environmental operating conditions, such as temperature, altitude and humidity which the strike counter is designed to operate within.

LSCs shall be capable of counting and withstanding specified currents without unacceptable changes in their characteristics.

Compliance is checked in accordance with 6.7, 6.8.2, 6.8.3, 6.8.4 and 6.8.5.

The size of the characters in the display, if any, shall allow a normal reading, i.e. by normal or corrected vision without magnification, of the number of lightning strikes recorded, when the LSC is installed in accordance with the instructions of the manufacturer.

Compliance is checked by visual inspection.

The fixing system of the LSC should not apply an unacceptable stress or damage to the conductor.

The materials of the LSC shall be compatible with that of the lightning conductor, so that corrosion due to galvanic coupling may be avoided.

Compliance is checked by visual inspection.

~~Their material shall be compatible with that of the conductor (galvanic coupling).~~

6 Tests

6.1 General test conditions

6.1.1 General

The tests in accordance with this document are type tests, performed in a sequence according to Annex C. Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use according to the manufacturer's or supplier's instructions.

All tests are carried out on new specimens.

Unless otherwise specified, three specimens are subjected to the tests and the requirements are satisfied if all the tests are met. If only one of the specimens does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which ~~may~~ could have influenced the results of the test shall be repeated and also the tests which follow shall be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements.

NOTE 1 One set of three specimens can be used for more than one test, subject to agreement by the manufacturer.

NOTE 2 The applicant can also submit an additional set of specimens which can be used should one specimen fail. The testing laboratory will then, without further request, test the additional set of specimens and will reject the set only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will entail rejection.

~~The LSC submitted for testing shall be identified by means of the following elements:~~

~~– marks and indications specified in 4.3;~~

~~– installation instructions with reference and date.~~

~~The LSC shall be mounted in accordance with the instructions specified by the manufacturer in his installation instructions.~~

Unless otherwise specified, the tests are carried out at an ambient temperature ranging between 5 °C and 35 °C and the ambient temperature shall not vary during the duration of the test by more than 3 °C. The LSC shall be protected from excessive heating or excessive external cooling.

See Annex C, Figure C.1 for a flowchart for testing LSCs.

For products already tested according to IEC 62561-6:2011 and IEC 62561-6:2018, the applicability of previous tests according to Annex D, Table D.1 may be applied.

For new products, complete type tests and samples according to clauses specified in Annex A and Annex B are required.

6.1.2 Impulse discharge current count for LSC Type I

The impulse discharge current passing through the device under test is defined by the crest value I_{imp}, the charge Q and the specific energy W/R. The impulse current shall show no polarity reversal and shall reach I_{imp} within 50 µs.

The transfer of the charge Q shall occur within 5 ms and the specific energy W/R shall be dissipated within 5 ms.

The impulse duration shall not exceed 5 ms.

Table 1 gives values of Q (As) and W/R (kJ/Ω) for example values of I_{imp} (kA).

The relationships between I_{imp}, Q and W/R are as follows:

$$Q = I_{imp} \times a$$

where $a = 5 \times 10^{-4}$ s.

$$W/R = I_{imp}^2 \times b$$

where $b = 2{,}5 \times 10^{-4}$ s.

Table 1 – Preferred parameters for impulse discharge currents counted (I_{imp})

I_{imp} (~~peak~~crest value) kA ± 10 % within 50 µs	Q As $^{+20}_{-10}$ % within 5 ms	W/R kJ/Ω $^{+45}_{-10}$ % within 5 ms
100	50	2 500
50	25	625
25	12,5	156
10	5	25
5	2,5	6,25
2	1	1
1	0,5	0,25
NOTE One of the possible test impulses which meet the above parameters is the 10/350 wave shape proposed in IEC 62305-1.		

6.1.3 Nominal discharge current count for LSC Type II

The nominal discharge current passing through the device under test is defined by the crest value I_n (see Table 2) and has the wave shape 8/20 according to IEC 62475.

Table 2 – Preferred parameters for nominal discharge currents counted (I_n)

I_n (8/20), crest value kA ±10 %
100
80
60
40
20
1
0,5

The tolerances on the current wave shape passing through the device under test are as follows:

front time T_1 ±20 %;

time to half value T_2 ±20 %.

A small overshoot or oscillation is ~~tolerated~~ tolerable provided that the amplitude of any oscillation is not more than 5 % of the crest value. Any polarity reversal after the current has fallen to zero shall not be more than 30 % of the crest value.

~~NOTE The test impulse that meets the above parameters is the 8/20 wave shape proposed in IEC 62475.~~

NOTE For T_1 and T_2, see IEC 62305-1:2010, Figure A.1.

6.2 Documentation and installation instructions

6.2.1 General conditions

The content of the installation instructions is checked as per its completeness by review.

6.2.2 Acceptance criteria

Documentation and installation instructions are deemed to be acceptable if they contain the information given in 5.2.

6.3 Marking test

6.3.1 General test conditions

All three specimens used and complying with tests described in 6.2 shall be subjected to the marking test:

~~Marking made by moulding, pressing or engraving is not subjected to this test.~~

~~The marking is checked by inspection and~~

a) as per its completeness by review, in accordance with 5.3.1 and

b) as per its durability and legibility by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with white spirit.

~~After the test, the marking shall be legible. Marking shall allow the identification of the LSC. It should not be possible to easily remove the labels and for those to retract.~~

NOTE Marking made by moulding, pressing or engraving is not subjected to the test b).

6.3.2 Acceptance criteria

The specimen is deemed to have passed the test if:

a) the marking contains all the information given in 5.3.1;

b) after the test of 5.3.2, the marking remains fixed and legible.

6.4 Ultraviolet (UV) light resistance

6.4.1 General test conditions

~~This test is necessary for LSCs designed to be installed outdoors or in specific environments.~~

~~Non-metallic LSC housings for outdoor application shall withstand UV effects.~~

One set of three new specimens shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene [PTFE]) in accordance with the manufacturer's installation instructions.

Ensure that the surface of the mounting plate is suitable to resist UV radiation.

The specimens shall be subjected to an environmental test consisting of an UV light test as specified in Annex A.

6.4.2 ~~Pass~~ Acceptance criteria

The specimens are deemed to have passed this part of the test if there are no signs of disintegration and no cracks visible to normal or corrected vision.

~~Ensure that the surface of the mounting plate is suitable to resist UV radiation.~~

6.5 Resistance tests to corrosion (for metallic parts)

6.5.1 General test conditions

This test is necessary for LSCs having metallic housings or parts designed to be installed outdoors or in specific environments.

The specimens used and compliant with the test in 6.4 shall be subjected to corrosion tests as per Annex B.

~~The specimens shall be subjected to an additional ammonia atmosphere treatment for those made of copper alloy with a copper content less than 80 % as specified in Clause B.4.~~

~~The manufacturer or supplier shall provide proof of the copper content of any part of the assembly made from a copper alloy.~~

This only applies to LSCs having housings with metallic parts. For LSCs with metal housings three new samples are required.

6.5.2 Acceptance criteria

After the parts have been dried during 10 min in a drying oven at a temperature of 100 °C ± 5 °C, they shall not present any trace of rust on surfaces.

Traces of rust on the edges or a yellowish stain removed by rubbing are not taken into account. White rust is not considered as corrosive deterioration.

6.6 ~~Mechanical tests~~ Impact test

6.6.1 General test conditions

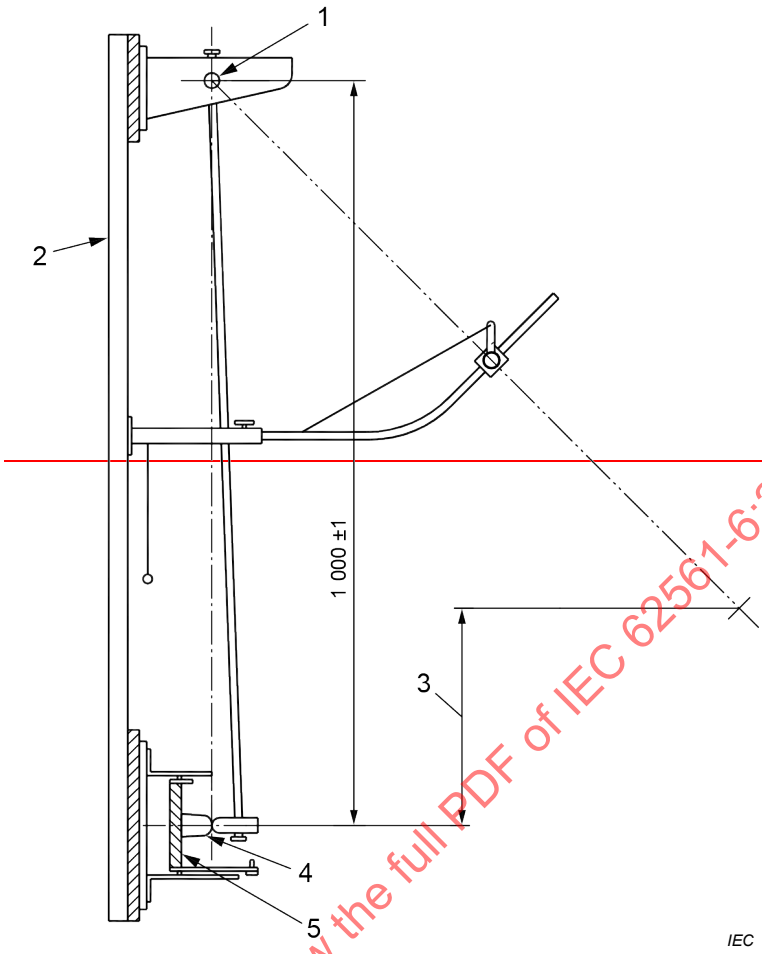
All specimens complying with 6.4 or 6.5 shall be stressed three times by a mechanical test.

All specimens are subjected to a mechanical test by applying mechanical impacts.

The impacts are carried out on the LSC's accessible parts which in use ~~may~~ can be mechanically stressed accidentally.

The specimens are assembled under their normal operating conditions specified in the manufacturer's documentation.

The LSC is mounted on a pendulum hammer test apparatus according to IEC 60068-2-75:~~1997~~2014, Clause 4 ~~as shown in Figure 1~~. The striking element material shall be polyamide as per IEC 60068-2-75:~~1997~~2014, Table 1 and its mass shall be ~~200~~ 250 g as per IEC 60068-2-75:~~1997~~2014, Table 2, impact energy 0,35 J.



~~Key~~

~~1 pendulum~~

~~2 frame~~

~~3 height of fall~~

~~4 arrangement of specimens~~

~~5 mounting fixture~~

~~Figure 1 – Pendulum hammer test apparatus~~

The hammer shall fall from a height of ~~200~~ 140 mm so that one impact on each side is applied, as far as possible perpendicular to the length of the arrangement. The drop height is the vertical distance between the position of the point of control, when the pendulum is released, and the position of this point at the time of the impact.

The point of control as per IEC 60068-2-75:~~1997~~2014 is located on the surface of the striking part where the line passing by the point of intersection of the axes of the steel tube of the pendulum and the part of striking, perpendicular to the plane crossing the two axes, comes into contact with the surface.

The impacts are not applied to the display window or to the connectors.

NOTE In theory, the centre of gravity of the striking part will be the point of control but, in practice, as it is difficult to determine the centre of gravity, the point of control has been chosen as described above.

6.6.2 ~~Pass~~ Acceptance criteria

After the test, the LSC shall show no cracks or similar damage visible to normal or corrected vision without magnification and shall not present damage which can potentially affect its later use.

After the test, the LSC shall not have increased nor decreased the count value in the display (especially for electromechanical LSCs).

6.7 Index of protection confirmation (IP Code)

IP code confirmation shall be performed in accordance with IEC 60529, on the used specimens and in compliance with the test of 6.6.

The specimens shall be in compliance with IEC 60529 requirements.

6.8 Electrical tests

6.8.1 General test conditions

After the test of 6.7, each specimen shall be tested with the following electrical tests.

LSCs classified as Type I and Type II according to ~~5.2~~ 4.1 shall be tested with their listed impulse discharge currents and nominal discharge currents.

6.8.2 Minimum discharge current counting test ~~$I_{imp\ min}$~~

6.8.2.1 LSC Type I

6.8.2.1.1 General test conditions

For an LSC Type I, an impulse discharge current 10/350 with a ~~peak~~ crest value equal to $I_{imp\ min}$ is applied with positive and negative polarity.

6.8.2.1.2 ~~Pass~~ Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.2.2 LSC Type II

6.8.2.2.1 General test conditions

For an LSC Type II, a nominal discharge current 8/20 with a ~~peak~~ crest value equal to $I_{n\ min}$ is applied with positive and negative polarity.

6.8.2.2.2 ~~Pass~~ Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.2.3 LSC Type I and Type II

6.8.2.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents $I_{imp\ min}$ 10/350 and the corresponding nominal discharge currents $I_{n\ min}$ 8/20 are applied with positive and negative polarity.

6.8.2.3.2 ~~Pass~~ Acceptance criteria

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by four.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3 Threshold current test

6.8.3.1 LSC Type I

6.8.3.1.1 General test conditions

For an LSC Type I, an impulse discharge current with a ~~peak~~ crest value equal to 0,5 $I_{imp\ min}$ 10/350 is applied with positive polarity and with negative polarity.

6.8.3.1.2 ~~Pass~~ Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3.2 LSC Type II

6.8.3.2.1 General test conditions

For an LSC Type II, a nominal discharge current with a ~~peak~~ crest value equal to 0,5 $I_{n\ min}$ 8/20 is applied with positive polarity and with negative polarity.

6.8.3.2.2 ~~Pass~~ Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3.3 LSC Type I and Type II

6.8.3.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge current 0,5 $I_{imp\ min}$ 10/350 and the corresponding nominal discharge current 0,5 $I_{n\ min}$ 8/20 are applied with positive and negative polarity.

6.8.3.3.2 ~~Pass~~ Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4 Maximum impulse current counting test

6.8.4.1 LSC Type I

6.8.4.1.1 General test conditions

For an LSC Type I, three impulse discharge currents with a ~~peak~~ crest value equal to $I_{\text{imp max}}$ 10/350 are applied with positive and negative polarity.

6.8.4.1.2 ~~Pass~~ Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4.2 LSC Type II

6.8.4.2.1 General test conditions

For an LSC Type II, three nominal discharge currents with a ~~peak~~ crest value equal to $I_{\text{n max}}$ 8/20 are applied with positive and negative polarity.

6.8.4.2.2 ~~Pass~~ Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4.3 LSC Type I and Type II

6.8.4.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents $I_{\text{imp max}}$ 10/350 and the corresponding nominal discharge currents $I_{\text{n max}}$ 8/20 are applied three times with positive and negative polarity.

6.8.4.3.2 ~~Pass~~ Acceptance criteria

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by twelve.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.5 Performance verification test

This test shall be performed after the maximum current counting test of 6.8.4.

For this purpose, the test described in 6.8.2 shall be repeated once.

~~**6.6.6 Multi pulse test**~~

~~Under consideration.~~

7 Electromagnetic compatibility (EMC)

7.1 Electromagnetic immunity

LSCs containing electronic circuits ~~have to~~ shall fulfil the requirements of IEC 61000-6-2.

7.2 Electromagnetic emission

LSCs ~~have to~~ shall fulfil the requirements of IEC 61000-6-4.

8 Structure and content of the test report

8.1 General

The purpose of Clause 8 is to provide general requirements for ~~laboratory~~ test reports. It is intended to promote clear, complete reporting procedures for laboratories submitting test reports.

The results of each test carried out by the laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be given in a test report and shall include all the information necessary for the interpretation of the test results and all information required by the method used.

~~Particular care and attention shall be paid to the arrangement of the report, especially with regard to presentation of the test data and ease of assimilation by the reader.~~ The report shall be arranged and presented in such a way that it is easily assimilated by the reader, especially with regards to presentation of the test data. The format shall be ~~carefully and~~ specifically designed for each type of test carried out, but the headings shall be standardized as indicated below.

The structure of each report shall include at least the information ~~according to~~ given in 8.2 to 8.9.

8.2 Report identification

The following information shall be included[1]:

a) a title or subject of the report;

b) name, address and telephone number of the test laboratory;

c) name, address and telephone number of the sub-testing laboratory where the test was carried out, if different from the company which has been assigned to perform the test;

d) unique identification number (or serial number) of the test report;

e) name and address of the vendor;

f) ~~report shall be~~ paginated report and indication of the total number of pages ~~indicated~~ on each page, including appendices or annexes;

g) date of issue of the report;

h) date(s) test(s) was (were)performed;

i) signature and title, or an equivalent identification of the person(s) authorized to sign by the testing laboratory for the content of the report;

---

[1] ~~It is suggested to insert in the test report a specific declaration to avoid its misuse. A declaration example is: "This type test report may not be reproduced other than in full, except with the prior written approval of the issuing testing laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production."~~

j) signature and title of person(s) conducting the test;

k) the following declaration report in order to avoid misuse: "This type test report shall not be reproduced other than in full, except with the prior written approval of the issuing testing laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production".

8.3 Specimen description

a) sample description;

b) detailed description and unambiguous identification of the test sample and~~/or~~ test assembly;

c) characterization and condition of the test sample and~~/or~~ test assembly;

d) sampling procedure, where relevant;

e) date of receipt of test samples;

f) photographs, drawings or any other visual documentation, if available.

8.4 Standards and references

a) identification of the test standard used and the date of issue of the standard;

b) other relevant documentation with the documentation date.

8.5 Test procedure

a) description of the test procedure;

b) justification for any deviations from, additions to or exclusions from the referenced standard;

c) any other information relevant to a specific test such as environmental conditions;

d) configuration of testing assembly and measuring set-up;

e) location of the arrangement in the testing area and measuring techniques.

8.6 Testing equipment description

Description of equipment used for every test conducted, e.g. conditioning~~/~~ or ageing device.

8.7 Measuring instruments description

Characteristics and calibration dates of all instruments used for measuring the values specified in this document, e.g. meters.

8.8 Results and parameters recorded

The measured, observed or derived results shall be clearly identified at least for:

a) impulse discharge current (10/350);

b) ~~peak~~ crest value I_{imp};

c) charge Q;

d) specific energy W/R;

e) nominal discharge current (8/20);

f) ~~peak~~ crest value;

g) front time;

h) time to half value;

i) current reversal;

j) IP code test;

k) impact test;

l) corrosion test;

m) UV test;

n) marking test;

o) minimum discharge current counting test.

The above shall be presented by means of tables, graphs, drawings, photographs or other documentation of visual observations as appropriate.

8.9 Statement of pass/fail

A statement of pass/fail is necessary, identifying the part of the test for which the specimen has failed and also a description of the failure.

Annex A
(normative)

Resistance to UV light

A.1 General

For non-metallic LSC housings, one sample shall be subjected to UV light conditioning specified in Clauses A.2, A.3 or A.4. The tested sample is considered representative of the material's entire colour range.

The sample shall be mounted on the inside of the cylinder in the UV light apparatus and shall be positioned in such a way that the fixation surface for the rod is perpendicular to the light source.

Passing criteria: after the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

A.2 Test

The specimens shall be exposed for (1 000 ± 1) h to a xenon-arc, in accordance with ISO 4892-2:2013, Method A. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (120 ± 1) min consisting of a (102 ± 1) min light exposure and a (18 ± 1) min exposure to water spray with light, shall be used. The apparatus shall operate with a water-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0,35 W × m^{-2} × nm^{-1} at 340 nm and a black panel temperature of (65 ± 3) °C. The temperature of the chamber shall be (45 ± 5) °C. The relative humidity in the chamber shall be (50 ± 5) %.

A.3 First alternative test to Clause A.2

The specimens shall be exposed for (720 ± 1) h to an open-flame sunshine carbon-arc, in accordance with ISO 4892-4:2013. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (120 ± 1) min consisting of a (102 ± 1) min light exposure and a 18 min exposure to water spray with light, shall be used. The apparatus shall operate with an open-flame sunshine carbon-arc lamp, borosilicate glass Type 1 inner and outer optical filters, a spectral irradiance of 0,35 W × m^{-2} × nm^{-1} at 340 nm and a black panel temperature of (65 ± 3) °C. The temperature of the chamber shall be (45 ± 5) °C with a relative humidity of (50 ± 5) %.

A.4 Second alternative test to Clause A.2

The specimens shall be exposed to total irradiation energy equal to the values given in Clause A.2, and to fluorescent UV in accordance with ISO 4892-3:2016. The exposure conditions shall be by continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (360 ± 1) min light exposure and (60 ± 1) min exposure to water spray with light as described in ISO 4892-3:2016, Table 4, Method A, cycle 3.

Annex B
(normative)

~~Conditioning/ageing~~ Resistance to corrosion tests for LSCs

B.1 General

The ~~conditioning/ageing~~ resistance to corrosion test consists of a salt mist treatment as specified in Clause B.2 followed by a humid sulphurous atmosphere treatment as specified in Clause B.3 and an additional ammonia atmosphere treatment for specimens where any component part is made of copper alloy with a copper content less than 80 %, as specified in Clause B.4.

The manufacturer or supplier shall provide proof of the copper content of any part of the assembly made from a copper alloy.

B.2 Salt mist test

The salt mist ~~test~~ treatment shall be in accordance with IEC 60068-2-52:~~1996~~2017 except for Clauses 7, 10 and 11 which are not applicable. The test is carried out using ~~severity~~ test method (2).

If the salt mist chamber ~~maintains~~ can maintain the temperature conditions as specified in IEC 60068-2-52:~~1996~~2017, 9.3 and a relative humidity of not less than 90 % then the specimen ~~may~~ can remain in the chamber for the humidity storage period.

B.3 Humid sulphurous atmosphere test

The humid sulphurous atmosphere treatment shall be in accordance with ~~ISO 6988:1985~~ ISO 22479:2019, Method B with 7 cycles with a ~~volume concentration of sulphur dioxide of $667 \times 10^{-6} \pm 25 \times 10^{-6}$~~ sulphur dioxide content 0,2 L (at 300 ± 10) L of capacity, except for Clauses 9 and 10 which are not applicable.

Each cycle which has a duration of 24 h is composed of a heating period of 8 h at a temperature of 40 °C ± 3 °C in the humid saturated atmosphere which is followed by a rest period of 16 h. After that, the humid sulphurous atmosphere is replaced.

If the test chamber maintains the temperature conditions as specified in ~~ISO 6988:1985, 6.5.2~~ ISO 22479:2019, 8.5, then the specimen ~~may~~ can remain in the chamber for the storage period.

B.4 Ammonia atmosphere treatment

The ammonia atmosphere treatment shall be in accordance with ISO 6957:1988 for a moderate atmosphere with the pH value 10, except for 8.4 and Clause 9, which are not applicable.

Annex C
(normative)

Flowchart for testing LSCs

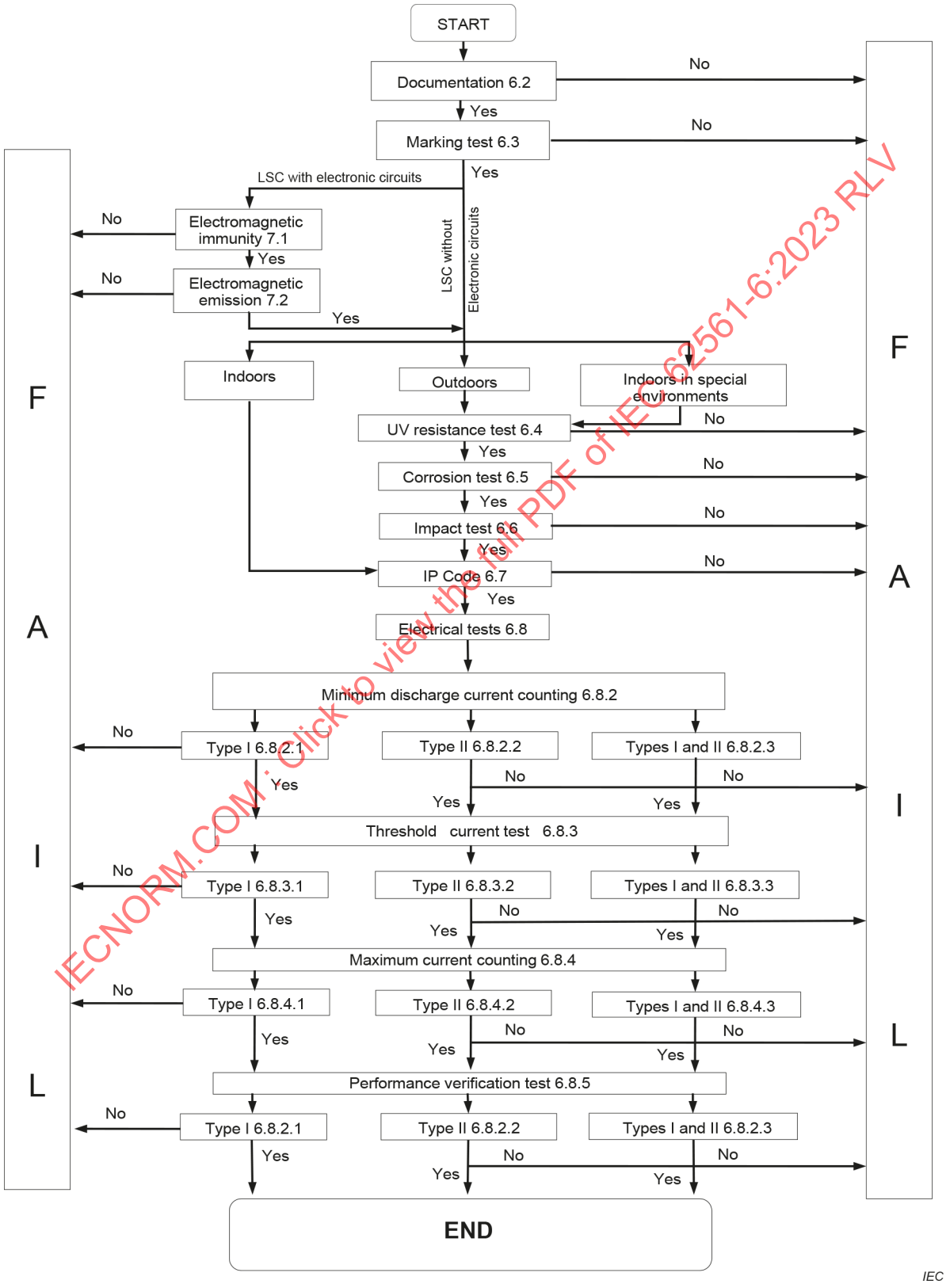


Figure C.1 – Flowchart for testing of LSCs

Annex D
(normative)

Applicability of previous tests

For LSCs already successfully tested according to IEC 62561-6:2011[2] or IEC 62561-6:2018, differences between versions in the test procedures identified in Table D.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of this third edition of IEC 62561-6:2023.

It is not necessary to repeat tests when the manufacturer of that product clearly states that their product meets all the following requirements.

- There is no change in the classification of the product since it was successfully tested.
- There is no change in the method of manufacture of the product since it was successfully tested.
- There is no change in the design of the product since it was successfully tested.
- There is no change in the materials used in the product since it was successfully tested.

For new products, complete type tests in accordance with this document are required.

Table D.1 – Differences in the requirements for LSCs complying with IEC 62561-6:2011 or IEC 62561-6:2018

Test description	IEC 62561-6:2011	IEC 62561-6:2018	Testing required
Preferred parameters for impulse nominal discharge currents counted	Table 1	Table 1, Table 2	No
Resistance to UV light	6.2, Annex A	6.2, Annex A	No
Impact (mechanical) test	6.4	6.4	No
Resistance to corrosion tests	6.3, Annex B	6.3, Annex B	No

2 Withdrawn.

Bibliography

~~IEC 60050-426:2008, *International Electrotechnical Vocabulary – Part 426: Equipment for explosive atmospheres* (available at http://www.electropedia.org)~~

~~IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*~~

~~IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*~~

~~IEC 61180-1, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*[3]~~

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres,* available at http://www.electropedia.org

IEC 61180, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements, test equipment*

IEC 62305 (all parts), *Protection against lightning*

IEC 62305-1:2010, *Protection against lightning – Part 1: General principles*

IEC 62475, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

~~ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*~~

~~ISO 4892-4, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame carbon-arc lamps*~~

~~ISO 6957:1988, *Copper alloys – Ammonia test for stress corrosion resistance*~~

ASTM D 785-65, *Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials*

CLC/TS 50703-2, *Lightning Protection System Components (LPSC) – Part 2: Specific testing requirements for LPS components used in explosive atmospheres*

---

[3] ~~Withdrawn.~~

IEC 62561-6

Edition 3.0 2023-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Lightning protection system components (LPSC) – Part 6: Requirements for lightning strike counters (LSCs)

Composants des systèmes de protection contre la foudre (CSPF) – Partie 6: Exigences pour les compteurs de coups de foudre (LSC)

IEC 62561-6:2023-05(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 6: Requirements for lightning strike counters (LSCs)

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62561-6 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2018. This edition constitutes a technical revision.

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

a) a new classification according to the internal circuit of LSCs has been added;
b) the tests flowchart in Annex C has been updated to reflect this new classification;
c) the applicability of previous tests has been added (Annex D).

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

FDIS	Report on voting
81/723/FDIS	81/726/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 62561 series, published under the general title *Lightning protection system components (LPSC)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC) used to determine the number of impulses or nominal currents on specific conductors associated with a lightning protection system (LPS) designed and implemented according to the IEC 62305 series.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 6: Requirements for lightning strike counters (LSCs)

1 Scope

This part of IEC 62561 specifies the requirements and tests for devices intended to count the number of lightning strikes based on the current flowing in a conductor. This conductor can be part of a lightning protection system (LPS) or connected to an SPD installation or other conductors, which are not intended to conduct a significant portion of lightning currents.

Extra requirements for the components can be necessary for LSCs intended for use in hazardous atmospheres.

NOTE In CENELEC member countries, testing requirements of components for explosive atmospheres are specified in CLC/TS 50703-2.

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 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

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

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

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-3:2016, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

ISO 4892-4:2013, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame, carbon-arc lamps*

ISO 22479:2019, *Corrosion of metals and alloys – Sulphur dioxide test in a humid atmosphere (fixed gas method)*

ISO 6957:1988, *Copper alloys – Ammonia test for stress corrosion resistance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology 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
LSC
lightning strike counter
device intended to count the number of lightning strikes based on current flowing in a conductor

3.2
lightning strike counter Type I
LSC Type I
LSC classified by its design to count impulse discharge currents

3.3
lightning surge counter Type II
LSC Type II
LSC classified by its design to count nominal discharge currents

3.4
impulse discharge current
I_{imp}
crest value of an impulse current 10/350 through the LSC with specified charge transfer Q and specified energy W/R in the specified time

3.5
minimum impulse discharge current counted
$I_{imp\ min}$
minimum crest value of the impulse counting discharge current that the LSC will count

3.6
maximum impulse discharge current counted
$I_{imp\ max}$
maximum crest value of the impulse counting discharge current that the LSC will count and withstand

3.7
nominal discharge current
I_n
crest value of a surge current 8/20 through the LSC

3.8
minimum discharge current counted
$I_{n\ min}$
minimum crest value of the surge current that the LSC will count

3.9
maximum discharge current counted
$I_{n\ max}$
maximum crest value of the surge current that the LSC will count and withstand

3.10
IP code
degree of protection of enclosure
numerical classification according to IEC 60529, preceded by the symbol IP, applied to the enclosure of electrical apparatus to provide:

– protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure,

– protection of the electrical apparatus against ingress of solid foreign objects, and

– protection of the electrical apparatus against harmful ingress of water where indicated by the classification

[SOURCE: IEC 60050-426:2020, 426-04-02, modified – In the term, "code" has been added, in the definition, "according to IEC 60529" has been added, "equipment" has been replaced with "electrical apparatus" and the Notes to entry have been deleted.]

3.11
point of strike
point where a lightning flash strikes the earth, or protruding structure

EXAMPLE: Structure, LPS, line, tree.

Note 1 to entry: A lightning flash can have more than one point of strike.

3.12
strike
all strokes from a single lightning flash that attach to a point of strike on a structure

3.13
impulse current
transient current created by direct lightning strike into the LPS

3.14
surge
transient created by lightning electromagnetic pulse (LEMP) that appears either as an overvoltage or as an overcurrent, or both

4 Classification

4.1 Type of LSC

LSCs are classified according to the discharge current count:

a) Type I to count impulse discharge current count as defined in 3.2;

b) Type II to count nominal discharge current count as defined in 3.3.

4.2 LSC Internal circuit

LSCs are classified according to their internal circuit:

a) LSCs without electronic circuit;

b) LSCs with electronic circuit.

4.3 LSC installation location

LSCs are classified according to their installation location:

a) indoor LSCs are intended for use in enclosures or inside buildings or shelters;

b) outdoor LSCs are intended for use without enclosures and outside of buildings or shelters;

c) LSCs intended for use in special environments as specified by the manufacturer.

The degree of protection of enclosure (IP code) defined in IEC 60529 is particularly relevant to the intended location of an LSC but it is possible that they will not be applicable to an LSC integral with an SPD.

NOTE LSCs installed in outdoor enclosures or shelters are suitable for indoor use.

5 Requirements

5.1 General

LSCs shall be designed in such a manner that when they are installed in accordance with manufacturer's instructions, their performance shall be reliable, stable and safe to persons and surrounding equipment.

NOTE The choice of a material depends on its ability to match the particular application's requirements.

5.2 Documentation

The manufacturer or supplier of the LSC shall provide adequate information in their literature to ensure that the installer can select and install the counter in a suitable and safe manner.

The ranges for operating temperature, humidity, altitude, IP code and the classifications according to Clause 4 shall be declared by the manufacturer.

The following information shall also be provided (as applicable):

$$I_{\text{imp min}};\ I_{\text{imp max}};\ I_{\text{imp}};\ I_{\text{n}};\ I_{\text{n min}};\ I_{\text{n max}}.$$

where

$I_{\text{imp min}}$ is the minimum impulse discharge current counted;

$I_{\text{imp max}}$ is the maximum impulse discharge current counted;

I_{imp} is the impulse discharge current;

I_{n} is the nominal discharge current;

$I_{\text{n min}}$ is the minimum discharge current counted;

$I_{\text{n max}}$ is the maximum discharge current counted.

Compliance is checked by inspection in accordance with 6.2.

5.3 Marking

5.3.1 Content of marking

All products complying with this document shall be marked at least with the following:

a) the name of the manufacturer or his trademark;

b) the reference of the type or the serial number;

c) the classification;

d) $I_{\text{imp min}}$; $I_{\text{imp max}}$; $I_{\text{n min}}$; $I_{\text{n max}}$;

e) the degree of protection (IP code);

f) conformity to this document.

If the device is small and sufficient space is not available for all the markings to appear, the indications cited in a) and b) above shall at least be reproduced on the apparatus and still be visible after installation. The indications cited in c), d), e) and f) can be given on the packaging or in the installation data sheet (documentation), or in the catalogue of the manufacturer.

Compliance is checked in accordance with 6.3.1 a).

NOTE 1 Marking can be applied, for example, by moulding, pressing, engraving, printing adhesive labels.

NOTE 2 Marking can be applied with water slide transfers for only components installed indoors.

5.3.2 Durability and legibility

The marking shall be durable and legible.

Compliance is checked by test in accordance with 6.3.1 b).

5.4 Design

The lightning strike counter shall be designed to carry out its function of counting the number of lightning strikes causing a current to flow in a conductor.

These devices shall detect and record lightning strikes regardless of the polarity of the current.

LSCs intended to be used outdoors shall be able to withstand environmental conditions including temperature, dust and humidity. The minimum degree of protection is IP 43 obtained by itself or in combination with a box in accordance with IEC 60529.

This test is necessary for LSCs designed to be installed outdoors or in specific environments.

Non-metallic LSC housings for outdoor application shall withstand ultraviolet (UV) effects.

Compliance is checked in accordance with 6.4, 6.5, 6.6.

The manufacturer shall provide information regarding the range of environmental operating conditions, such as temperature, altitude and humidity which the strike counter is designed to operate within.

LSCs shall be capable of counting and withstanding specified currents without unacceptable changes in their characteristics.

Compliance is checked in accordance with 6.7, 6.8.2, 6.8.3, 6.8.4 and 6.8.5.

The size of the characters in the display, if any, shall allow a normal reading, i.e. by normal or corrected vision without magnification, of the number of lightning strikes recorded, when the LSC is installed in accordance with the instructions of the manufacturer.

Compliance is checked by visual inspection.

The fixing system of the LSC should not apply an unacceptable stress or damage to the conductor.

The materials of the LSC shall be compatible with that of the lightning conductor, so that corrosion due to galvanic coupling may be avoided.

Compliance is checked by visual inspection.

6 Tests

6.1 General test conditions

6.1.1 General

The tests in accordance with this document are type tests, performed in a sequence according to Annex C. Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use according to the manufacturer's or supplier's instructions.

All tests are carried out on new specimens.

Unless otherwise specified, three specimens are subjected to the tests and the requirements are satisfied if all the tests are met. If only one of the specimens does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which could have influenced the results of the test shall be repeated and also the tests which follow shall be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements.

NOTE 1 One set of three specimens can be used for more than one test, subject to agreement by the manufacturer.

NOTE 2 The applicant can also submit an additional set of specimens which can be used should one specimen fail. The testing laboratory will then, without further request, test the additional set of specimens and will reject the set only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will entail rejection.

Unless otherwise specified, the tests are carried out at an ambient temperature ranging between 5 °C and 35 °C and the ambient temperature shall not vary during the duration of the test by more than 3 °C. The LSC shall be protected from excessive heating or excessive external cooling.

See Annex C, Figure C.1 for a flowchart for testing LSCs.

For products already tested according to IEC 62561-6:2011 and IEC 62561-6:2018, the applicability of previous tests according to Annex D, Table D.1 may be applied.

For new products, complete type tests and samples according to clauses specified in Annex A and Annex B are required.

6.1.2 Impulse discharge current count for LSC Type I

The impulse discharge current passing through the device under test is defined by the crest value I_{imp}, the charge Q and the specific energy W/R. The impulse current shall show no polarity reversal and shall reach I_{imp} within 50 µs.

The transfer of the charge Q shall occur within 5 ms and the specific energy W/R shall be dissipated within 5 ms.

The impulse duration shall not exceed 5 ms.

Table 1 gives values of Q (As) and W/R (kJ/Ω) for example values of I_{imp} (kA).

The relationships between I_{imp}, Q and W/R are as follows:

$$Q = I_{imp} \times a$$

where a = 5 × 10^{-4} s.

$$W/R = I_{imp}^2 \times b$$

where b = 2,5 × 10^{-4} s.

Table 1 – Preferred parameters for impulse discharge currents counted (I_{imp})

I_{imp} (crest value) kA ± 10 % within 50 µs	Q As $^{+20}_{-10}$ % within 5 ms	W/R kJ/Ω $^{+45}_{-10}$ % within 5 ms
100	50	2 500
50	25	625
25	12,5	156
10	5	25
5	2,5	6,25
2	1	1
1	0,5	0,25
NOTE One of the possible test impulses which meet the above parameters is the 10/350 wave shape proposed in IEC 62305-1.		

6.1.3 Nominal discharge current count for LSC Type II

The nominal discharge current passing through the device under test is defined by the crest value I_n (see Table 2) and has the wave shape 8/20 according to IEC 62475.

Table 2 – Preferred parameters for nominal discharge currents counted (I_n)

I_n (8/20), crest value kA ±10 %
100
80
60
40
20
1
0,5

The tolerances on the current wave shape passing through the device under test are as follows:

front time T_1 ±20 %;

time to half value T_2 ±20 %.

A small overshoot or oscillation is tolerable provided that the amplitude of any oscillation is not more than 5 % of the crest value. Any polarity reversal after the current has fallen to zero shall not be more than 30 % of the crest value.

NOTE For T_1 and T_2, see IEC 62305-1:2010, Figure A.1.

6.2 Documentation and installation instructions

6.2.1 General conditions

The content of the installation instructions is checked as per its completeness by review.

6.2.2 Acceptance criteria

Documentation and installation instructions are deemed to be acceptable if they contain the information given in 5.2.

6.3 Marking test

6.3.1 General test conditions

All three specimens used and complying with tests described in 6.2 shall be subjected to the marking test:

a) as per its completeness by review, in accordance with 5.3.1 and

b) as per its durability and legibility by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with white spirit.

NOTE Marking made by moulding, pressing or engraving is not subjected to the test b).

6.3.2 Acceptance criteria

The specimen is deemed to have passed the test if:

a) the marking contains all the information given in 5.3.1;

b) after the test of 5.3.2, the marking remains fixed and legible.

6.4 Ultraviolet (UV) light resistance

6.4.1 General test conditions

One set of three new specimens shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene [PTFE]) in accordance with the manufacturer's installation instructions.

Ensure that the surface of the mounting plate is suitable to resist UV radiation.

The specimens shall be subjected to an environmental test consisting of an UV light test as specified in Annex A.

6.4.2 Acceptance criteria

The specimens are deemed to have passed this part of the test if there are no signs of disintegration and no cracks visible to normal or corrected vision.

6.5 Resistance tests to corrosion (for metallic parts)

6.5.1 General test conditions

This test is necessary for LSCs having metallic housings or parts designed to be installed outdoors or in specific environments.

The specimens used and compliant with the test in 6.4 shall be subjected to corrosion tests as per Annex B.

This only applies to LSCs having housings with metallic parts. For LSCs with metal housings three new samples are required.

6.5.2 Acceptance criteria

After the parts have been dried during 10 min in a drying oven at a temperature of 100 °C ± 5 °C, they shall not present any trace of rust on surfaces.

Traces of rust on the edges or a yellowish stain removed by rubbing are not taken into account. White rust is not considered as corrosive deterioration.

6.6 Impact test

6.6.1 General test conditions

All specimens complying with 6.4 or 6.5 shall be stressed three times by a mechanical test.

All specimens are subjected to a mechanical test by applying mechanical impacts.

The impacts are carried out on the LSC's accessible parts which in use can be mechanically stressed accidentally.

The specimens are assembled under their normal operating conditions specified in the manufacturer's documentation.

The LSC is mounted on a pendulum hammer test apparatus according to IEC 60068-2-75:2014, Clause 4. The striking element material shall be polyamide as per IEC 60068-2-75:2014, Table 1 and its mass shall be 250 g as per IEC 60068-2-75:2014, Table 2, impact energy 0,35 J.

The hammer shall fall from a height of 140 mm so that one impact on each side is applied, as far as possible perpendicular to the length of the arrangement. The drop height is the vertical distance between the position of the point of control, when the pendulum is released, and the position of this point at the time of the impact.

The point of control as per IEC 60068-2-75:2014 is located on the surface of the striking part where the line passing by the point of intersection of the axes of the steel tube of the pendulum and the part of striking, perpendicular to the plane crossing the two axes, comes into contact with the surface.

The impacts are not applied to the display window or to the connectors.

NOTE In theory, the centre of gravity of the striking part will be the point of control but, in practice, as it is difficult to determine the centre of gravity, the point of control has been chosen as described above.

6.6.2 Acceptance criteria

After the test, the LSC shall show no cracks or similar damage visible to normal or corrected vision without magnification and shall not present damage which can potentially affect its later use.

After the test, the LSC shall not have increased nor decreased the count value in the display (especially for electromechanical LSCs).

6.7 Index of protection confirmation (IP Code)

IP code confirmation shall be performed in accordance with IEC 60529, on the used specimens and in compliance with the test of 6.6.

The specimens shall be in compliance with IEC 60529 requirements.

6.8 Electrical tests

6.8.1 General test conditions

After the test of 6.7, each specimen shall be tested with the following electrical tests.

LSCs classified as Type I and Type II according to 4.1 shall be tested with their listed impulse discharge currents and nominal discharge currents.

6.8.2 Minimum discharge current counting test

6.8.2.1 LSC Type I

6.8.2.1.1 General test conditions

For an LSC Type I, an impulse discharge current 10/350 with a crest value equal to $I_{\text{imp min}}$ is applied with positive and negative polarity.

6.8.2.1.2 Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.2.2 LSC Type II

6.8.2.2.1 General test conditions

For an LSC Type II, a nominal discharge current 8/20 with a crest value equal to $I_{\text{n min}}$ is applied with positive and negative polarity.

6.8.2.2.2 Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.2.3 LSC Type I and Type II

6.8.2.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents $I_{imp\ min}$ 10/350 and the corresponding nominal discharge currents $I_{n\ min}$ 8/20 are applied with positive and negative polarity.

6.8.2.3.2 Acceptance criteria

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by four.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3 Threshold current test

6.8.3.1 LSC Type I

6.8.3.1.1 General test conditions

For an LSC Type I, an impulse discharge current with a crest value equal to 0,5 $I_{imp\ min}$ 10/350 is applied with positive polarity and with negative polarity.

6.8.3.1.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3.2 LSC Type II

6.8.3.2.1 General test conditions

For an LSC Type II, a nominal discharge current with a crest value equal to 0,5 $I_{n\ min}$ 8/20 is applied with positive polarity and with negative polarity.

6.8.3.2.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.3.3 LSC Type I and Type II

6.8.3.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge current 0,5 $I_{imp\ min}$ 10/350 and the corresponding nominal discharge current 0,5 $I_{n\ min}$ 8/20 are applied with positive and negative polarity.

6.8.3.3.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4 Maximum impulse current counting test

6.8.4.1 LSC Type I

6.8.4.1.1 General test conditions

For an LSC Type I, three impulse discharge currents with a crest value equal to $I_{\text{imp max}}$ 10/350 are applied with positive and negative polarity.

6.8.4.1.2 Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4.2 LSC Type II

6.8.4.2.1 General test conditions

For an LSC Type II, three nominal discharge currents with a crest value equal to $I_{\text{n max}}$ 8/20 are applied with positive and negative polarity.

6.8.4.2.2 Acceptance criteria

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.4.3 LSC Type I and Type II

6.8.4.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents $I_{\text{imp max}}$ 10/350 and the corresponding nominal discharge currents $I_{\text{n max}}$ 8/20 are applied three times with positive and negative polarity.

6.8.4.3.2 Acceptance criteria

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by twelve.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

6.8.5 Performance verification test

This test shall be performed after the maximum current counting test of 6.8.4.

For this purpose, the test described in 6.8.2 shall be repeated once.

7 Electromagnetic compatibility (EMC)

7.1 Electromagnetic immunity

LSCs containing electronic circuits shall fulfil the requirements of IEC 61000-6-2.

7.2 Electromagnetic emission

LSCs shall fulfil the requirements of IEC 61000-6-4.

8 Structure and content of the test report

8.1 General

The purpose of Clause 8 is to provide general requirements for test reports. It is intended to promote clear, complete reporting procedures for laboratories submitting test reports.

The results of each test carried out by the laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be given in a test report and shall include all the information necessary for the interpretation of the test results and all information required by the method used.

The report shall be arranged and presented in such a way that it is easily assimilated by the reader, especially with regards to presentation of the test data. The format shall be specifically designed for each type of test carried out, but the headings shall be standardized as indicated below.

The structure of each report shall include at least the information given in 8.2 to 8.9.

8.2 Report identification

The following information shall be included:

a) a title or subject of the report;

b) name, address and telephone number of the test laboratory;

c) name, address and telephone number of the sub-testing laboratory where the test was carried out, if different from the company which has been assigned to perform the test;

d) unique identification number (or serial number) of the test report;

e) name and address of the vendor;

f) paginated report and indication of the total number of pages on each page, including appendices or annexes;

g) date of issue of the report;

h) date(s) test(s) was (were)performed;

i) signature and title, or an equivalent identification of the person(s) authorized to sign by the testing laboratory for the content of the report;

j) signature and title of person(s) conducting the test;

k) the following declaration report in order to avoid misuse: "This type test report shall not be reproduced other than in full, except with the prior written approval of the issuing testing laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production".

8.3 Specimen description

a) sample description;

b) detailed description and unambiguous identification of the test sample and test assembly;

c) characterization and condition of the test sample and test assembly;

d) sampling procedure, where relevant;

e) date of receipt of test samples;

f) photographs, drawings or any other visual documentation, if available.

8.4 Standards and references

a) identification of the test standard used and the date of issue of the standard;

b) other relevant documentation with the documentation date.

8.5 Test procedure

a) description of the test procedure;

b) justification for any deviations from, additions to or exclusions from the referenced standard;

c) any other information relevant to a specific test such as environmental conditions;

d) configuration of testing assembly and measuring set-up;

e) location of the arrangement in the testing area and measuring techniques.

8.6 Testing equipment description

Description of equipment used for every test conducted, e.g. conditioning or ageing device.

8.7 Measuring instruments description

Characteristics and calibration dates of all instruments used for measuring the values specified in this document, e.g. meters.

8.8 Results and parameters recorded

The measured, observed or derived results shall be clearly identified at least for:

a) impulse discharge current (10/350);

b) crest value I_{imp};

c) charge Q;

d) specific energy W/R;

e) nominal discharge current (8/20);

f) crest value;

g) front time;

h) time to half value;

i) current reversal;

j) IP code test;

k) impact test;

l) corrosion test;

m) UV test;

n) marking test;

o) minimum discharge current counting test.

The above shall be presented by means of tables, graphs, drawings, photographs or other documentation of visual observations as appropriate.

8.9 Statement of pass/fail

A statement of pass/fail is necessary, identifying the part of the test for which the specimen has failed and also a description of the failure.

Annex A
(normative)

Resistance to UV light

A.1 General

For non-metallic LSC housings, one sample shall be subjected to UV light conditioning specified in Clauses A.2, A.3 or A.4. The tested sample is considered representative of the material's entire colour range.

The sample shall be mounted on the inside of the cylinder in the UV light apparatus and shall be positioned in such a way that the fixation surface for the rod is perpendicular to the light source.

Passing criteria: after the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

A.2 Test

The specimens shall be exposed for (1 000 ± 1) h to a xenon-arc, in accordance with ISO 4892-2:2013, Method A. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (120 ± 1) min consisting of a (102 ± 1) min light exposure and a (18 ± 1) min exposure to water spray with light, shall be used. The apparatus shall operate with a water-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0,35 W × m^{-2} × nm^{-1} at 340 nm and a black panel temperature of (65 ± 3) °C. The temperature of the chamber shall be (45 ± 5) °C. The relative humidity in the chamber shall be (50 ± 5) %.

A.3 First alternative test to Clause A.2

The specimens shall be exposed for (720 ± 1) h to an open-flame sunshine carbon-arc, in accordance with ISO 4892-4:2013. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (120 ± 1) min consisting of a (102 ± 1) min light exposure and a 18 min exposure to water spray with light, shall be used. The apparatus shall operate with an open-flame sunshine carbon-arc lamp, borosilicate glass Type 1 inner and outer optical filters, a spectral irradiance of 0,35 W × m^{-2} × nm^{-1} at 340 nm and a black panel temperature of (65 ± 3) °C. The temperature of the chamber shall be (45 ± 5) °C with a relative humidity of (50 ± 5) %.

A.4 Second alternative test to Clause A.2

The specimens shall be exposed to total irradiation energy equal to the values given in Clause A.2, and to fluorescent UV in accordance with ISO 4892-3:2016. The exposure conditions shall be by continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of (360 ± 1) min light exposure and (60 ± 1) min exposure to water spray with light as described in ISO 4892-3:2016, Table 4, Method A, cycle 3.

Annex B
(normative)

Resistance to corrosion tests for LSCs

B.1 General

The resistance to corrosion test consists of a salt mist treatment as specified in Clause B.2 followed by a humid sulphurous atmosphere treatment as specified in Clause B.3 and an additional ammonia atmosphere treatment for specimens where any component part is made of copper alloy with a copper content less than 80 %, as specified in Clause B.4.

The manufacturer or supplier shall provide proof of the copper content of any part of the assembly made from a copper alloy.

B.2 Salt mist test

The salt mist treatment shall be in accordance with IEC 60068-2-52:2017 except for Clauses 7, 10 and 11 which are not applicable. The test is carried out using test method (2).

If the salt mist chamber can maintain the temperature conditions as specified in IEC 60068-2-52:2017, 9.3 and a relative humidity of not less than 90 % then the specimen can remain in the chamber for the humidity storage period.

B.3 Humid sulphurous atmosphere test

The humid sulphurous atmosphere treatment shall be in accordance with ISO 22479:2019, Method B with 7 cycles with a sulphur dioxide content 0,2 L (at 300 ± 10) L of capacity, except for Clauses 9 and 10 which are not applicable.

Each cycle which has a duration of 24 h is composed of a heating period of 8 h at a temperature of 40 °C ± 3 °C in the humid saturated atmosphere which is followed by a rest period of 16 h. After that, the humid sulphurous atmosphere is replaced.

If the test chamber maintains the temperature conditions as specified in ISO 22479:2019, 8.5, then the specimen can remain in the chamber for the storage period.

B.4 Ammonia atmosphere treatment

The ammonia atmosphere treatment shall be in accordance with ISO 6957:1988 for a moderate atmosphere with the pH value 10, except for 8.4 and Clause 9, which are not applicable.

Annex C
(normative)

Flowchart for testing LSCs

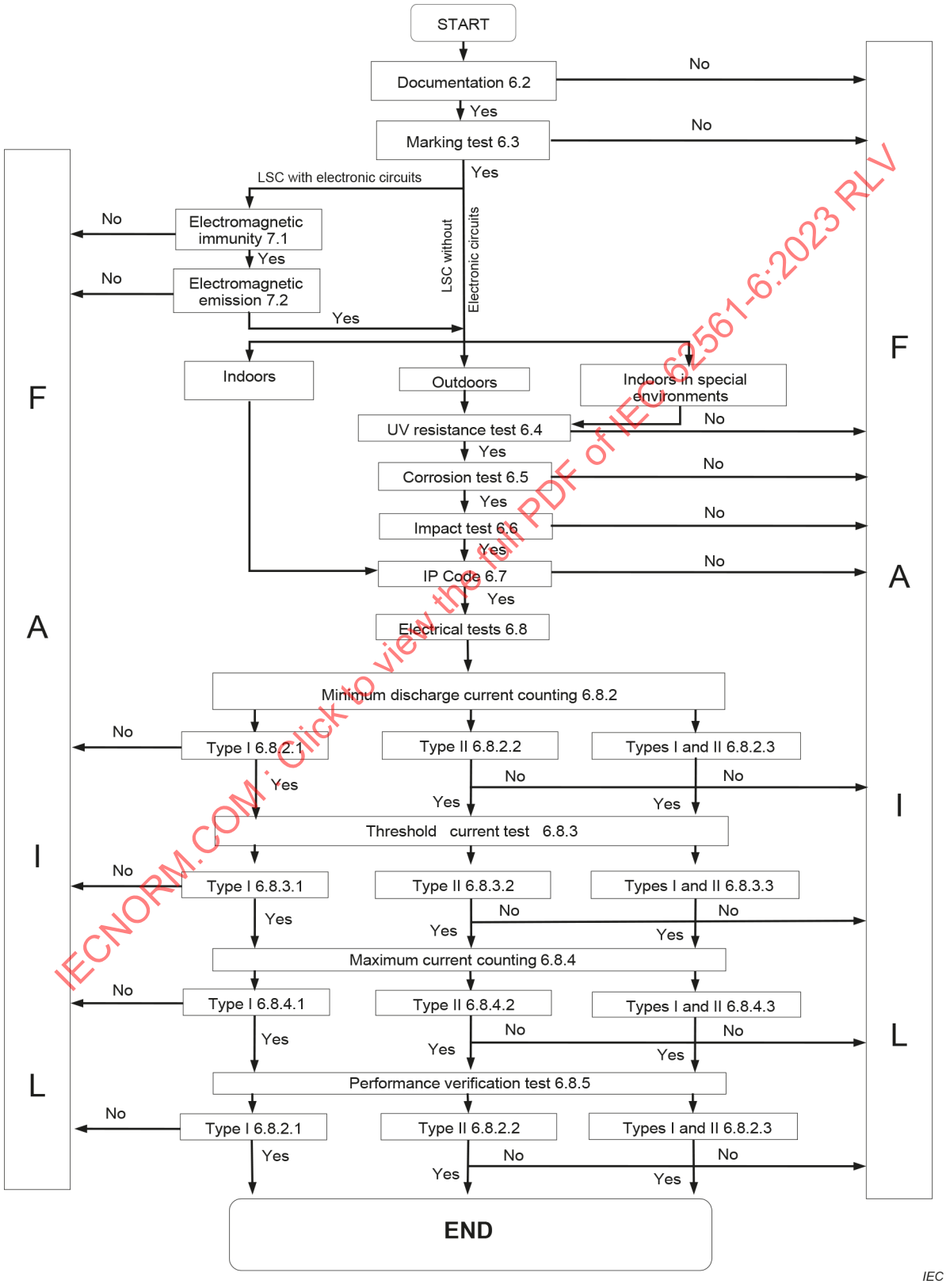


Figure C.1 – Flowchart for testing of LSCs

Annex D
(normative)

Applicability of previous tests

For LSCs already successfully tested according to IEC 62561-6:2011[1] or IEC 62561-6:2018, differences between versions in the test procedures identified in Table D.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of this third edition of IEC 62561-6:2023.

It is not necessary to repeat tests when the manufacturer of that product clearly states that their product meets all the following requirements.

- There is no change in the classification of the product since it was successfully tested.
- There is no change in the method of manufacture of the product since it was successfully tested.
- There is no change in the design of the product since it was successfully tested.
- There is no change in the materials used in the product since it was successfully tested.

For new products, complete type tests in accordance with this document are required.

Table D.1 – Differences in the requirements for LSCs complying with IEC 62561-6:2011 or IEC 62561-6:2018

Test description	IEC 62561-6:2011	IEC 62561-6:2018	Testing required
Preferred parameters for impulse nominal discharge currents counted	Table 1	Table 1, Table 2	No
Resistance to UV light	6.2, Annex A	6.2, Annex A	No
Impact (mechanical) test	6.4	6.4	No
Resistance to corrosion tests	6.3, Annex B	6.3, Annex B	No

[1] Withdrawn.

Bibliography

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres,* available at http://www.electropedia.org

IEC 61180, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements, test equipment*

IEC 62305 (all parts), *Protection against lightning*

IEC 62305-1:2010, *Protection against lightning – Part 1: General principles*

IEC 62475, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

ASTM D 785-65, *Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials*

CLC/TS 50703-2, *Lightning Protection System Components (LPSC) – Part 2: Specific testing requirements for LPS components used in explosive atmospheres*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

COMPOSANTS DES SYSTÈMES DE PROTECTION CONTRE LA FOUDRE (CSPF) –

Partie 6: Exigences pour les compteurs de coups de foudre (LSC)

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 62561-6 a été établie par le comité d'études 81: Protection contre la foudre. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2018. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout d'une nouvelle classification en fonction du circuit interne des LSC;
b) mise à jour du logigramme des essais de l'Annexe C pour refléter la nouvelle classification;

c) ajout de l'applicabilité d'essais précédents (Annexe D).

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
81/723/FDIS	81/726/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Une liste de toutes les parties de la série IEC 62561, publiée sous le titre général *Composants des systèmes de protection contre la foudre (CSPF)*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

INTRODUCTION

La présente partie de l'IEC 62561 traite des exigences et des essais pour les composants des systèmes de protection contre la foudre (CSPF) utilisés pour déterminer le nombre de chocs ou de courants nominaux sur des conducteurs spécifiques associés à un système de protection contre la foudre (SPF) conçu et mis en œuvre conformément à la série IEC 62305.

COMPOSANTS DES SYSTÈMES DE PROTECTION CONTRE LA FOUDRE (CSPF) –

Partie 6: Exigences pour les compteurs de coups de foudre (LSC)

1 Domaine d'application

La présente partie de l'IEC 62561 spécifie les exigences et les essais applicables aux dispositifs destinés à compter le nombre de coups de foudre à partir du courant qui circule dans un conducteur. Ce conducteur peut faire partie d'un système de protection contre la foudre (SPF) ou être relié à une installation de parafoudre ou à d'autres conducteurs, qui ne sont pas destinés à conduire une partie significative des courants de foudre.

Des exigences supplémentaires peuvent être nécessaires pour les composants des LSC destinés à être utilisés dans des atmosphères dangereuses.

NOTE Dans les pays membres du CENELEC, les exigences d'essai des composants pour atmosphères explosives sont spécifiées dans la CLC/TS 50703-2.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-2-52:2017, *Essais d'environnement – Partie 2-52: Essais – Essai Kb: Brouillard salin, essai cyclique (solution de chlorure de sodium)*

IEC 60068-2-75:2014, *Essais d'environnement – Partie 2-75: Essais – Essai Eh: Essais au marteau*

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 61000-6-2, *Compatibilité électromagnétique (CEM) – Partie 6-2: Normes génériques – Norme d'immunité pour les environnements industriels*

IEC 61000-6-4, *Compatibilité électromagnétique (CEM) – Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels*

ISO 4892-2:2013, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 2: Lampes à arc au xénon*

ISO 4892-3:2016, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 3: Lampes fluorescentes UV*

ISO 4892-4:2013, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 4: Lampes à arc au carbone*

ISO 22479:2019, *Corrosion des métaux et alliages – Essai au dioxyde de soufre en atmosphère humide (méthode avec volume fixe de gaz)*

ISO 6957:1988, *Alliages de cuivre – Essai à l'ammoniaque pour la résistance à la corrosion sous contrainte*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.1
LSC
compteur de coups de foudre
dispositif destiné à compter le nombre de coups de foudre à partir du courant qui circule dans un conducteur.

Note 1 à l'article: L'abréviation "LSC" est dérivée du terme anglais développé correspondant "lightning strike counter".

3.2
compteur de coups de foudre de type I
LSC de type I
LSC classé selon sa conception destinée à compter les courants de choc

3.3
compteur de chocs de foudre de type II
LSC de type II
LSC classé selon sa conception destinée à compter les courants nominaux de décharge

3.4
courant de choc
I_{imp}
valeur de crête d'un courant de choc de forme d'onde 10/350 qui circule dans le LSC avec un transfert de la charge spécifié Q et une énergie spécifiée W/R pendant la durée spécifiée

3.5
courant de choc minimal compté
$I_{imp\ min}$
valeur de crête minimale du courant de comptage de choc que le LSC compte

3.6
courant de choc maximal compté
$I_{imp\ max}$
valeur de crête maximale du courant de comptage de choc que le LSC compte et à laquelle il résiste

3.7
courant nominal de décharge
I_n
valeur de crête d'une surintensité de forme d'onde 8/20 qui circule dans le LSC

3.8
courant de décharge minimal compté
$I_{n\ min}$
valeur de crête minimale de la surintensité que le LSC compte

3.9
courant de décharge maximal compté
$I_{n\ max}$
valeur de crête maximale de la surintensité que le LSC compte et à laquelle il résiste

3.10
code IP
degré de protection procuré par une enveloppe
classification numérique selon l'IEC 60529, précédée du symbole IP, appliquée à une enveloppe de matériel électrique pour apporter:

– une protection des personnes contre tout contact ou proximité avec des parties actives et contre tout contact avec une pièce mobile (autre que les arbres lisses en rotation et analogues) à l'intérieur d'une enveloppe;

– une protection du matériel électrique contre la pénétration de corps solides étrangers; et

– selon l'indication donnée par la classification, une protection du matériel électrique contre la pénétration dangereuse de l'eau.

[SOURCE: IEC 60050-426:2020, 426-04-02, modifié – Dans le terme, "code" a été ajouté; dans la définition "selon l'IEC 60529," a été ajouté, "matériel" a été remplacé par "matériel électrique" et les Notes à l'article ont été supprimées.]

3.11
point d'impact
point où un coup de foudre frappe la terre ou un objet saillant

EXEMPLE: Une structure, un système de protection contre la foudre (SPF), une ligne, un arbre.

Note 1 à l'article: Un coup de foudre peut avoir plusieurs points d'impact.

3.12
coup de foudre
tous les impacts dus à un éclair unique et qui se connectent à un point d'impact sur une structure

3.13
courant de choc
courant en régime transitoire créé par un impact de foudre direct dans le SPF

3.14
choc
onde transitoire qui crée une surtension et/ou une surintensité, due à une impulsion électromagnétique de foudre (IEMF)

4 Classification

4.1 Type de LSC

Les LSC sont classés selon le comptage du courant de décharge:

a) type I pour le comptage du courant de choc, comme cela est défini en 3.2;

b) type II pour le comptage du courant nominal de décharge, comme cela est défini en 3.3.

4.2 Circuit interne des LSC

Les LSC sont classés selon leur circuit interne:

a) LSC sans circuit électronique;

b) LSC avec circuit électronique.

4.3 Emplacement d'installation des LSC

Les LSC sont classés selon leur emplacement d'installation:

a) les LSC intérieurs sont destinés à être utilisés dans des enveloppes ou à l'intérieur de bâtiments ou d'abris;

b) les LSC extérieurs sont destinés à être utilisés sans enveloppe et à l'extérieur de tout bâtiment ou abri;

c) les LSC destinés à être utilisés dans des environnements spéciaux spécifiés par le fabricant.

Les degré de protection procuré par une enveloppe code IP définis dans l'IEC 60529 présentent une pertinence toute particulière quant à l'emplacement prévu d'un LSC, mais il est possible qu'ils ne s'appliquent pas à un LSC intégré avec un parafoudre.

NOTE Les LSC installés à l'extérieur dans des enveloppes ou des abris conviennent à une utilisation en intérieur.

5 Exigences

5.1 Généralités

Les LSC doivent être conçus de telle manière que, lorsqu'ils sont installés conformément aux instructions du fabricant, leurs performances doivent être fiables, stables et sûres pour les personnes et les matériels environnants.

NOTE Le choix d'un matériau dépend de sa capacité à satisfaire aux exigences de l'application particulière.

5.2 Documentation

Le fabricant ou le fournisseur du LSC doit fournir les informations adéquates dans la notice, afin de s'assurer que l'installateur puisse choisir et installer le compteur de manière sûre et appropriée.

Les plages de températures, d'humidités et d'altitudes de fonctionnement, le code IP et les classifications selon l'Article 4 doivent être déclarées par le fabricant.

Les informations suivantes doivent également être fournies (le cas échéant):

$$I_{\text{imp min}};\ I_{\text{imp max}};\ I_{\text{imp}};\ I_{\text{n}};\ I_{\text{n min}};\ I_{\text{n max}}.$$

où

$I_{\text{imp min}}$ est le courant de choc minimal compté;

$I_{\text{imp max}}$ est le courant de choc maximal compté;

I_{imp} est le courant de choc;

I_{n} est le courant nominal de décharge;

$I_{\text{n min}}$ est le courant de décharge minimal compté;

$I_{\text{n max}}$ est le courant de décharge maximal compté.

La conformité est vérifiée par examen selon 6.2.

5.3 Marquage

5.3.1 Contenu du marquage

Tous les produits conformes au présent document doivent au moins avoir les marquages suivants:

a) le nom du fabricant ou sa marque commerciale;

b) la référence de type ou le numéro de série;

c) la classification;

d) $I_{imp\ min}$; $I_{imp\ max}$; $I_{n\ min}$; $I_{n\ max}$;

e) le degré de protection (code IP);

f) la conformité au présent document.

Si le dispositif est de faibles dimensions et que la place disponible n'est pas suffisante pour que tous les marquages soient visibles, les indications citées en a) et b) ci-dessus doivent au moins être reproduites sur le matériel et être toujours visibles après l'installation de ce dernier. Les indications citées en c), d), e) et f)peuvent être données sur l'emballage ou dans les instructions d'installation (la documentation), ou dans le catalogue du fabricant.

La conformité est vérifiée selon 6.3.1 a).

NOTE 1 Le marquage peut être réalisé, par exemple, par moulage, par emboutissage, par gravure ou par impression d'étiquettes adhésives.

NOTE 2 Le marquage peut être réalisé à l'aide de décalcomanies uniquement pour les composants installés en intérieur.

5.3.2 Durabilité et lisibilité

Le marquage doit être lisible et ne doit pas se dégrader dans le temps.

La conformité est vérifiée par essai selon 6.3.1 b).

5.4 Conception

Les compteurs de coups de foudre doivent être conçus de telle manière qu'ils remplissent leur fonction de comptage du nombre de coups de foudre qui provoquent le passage du courant à travers un conducteur.

Ces dispositifs doivent détecter et comptabiliser les coups de foudre, quelle que soit la polarité du courant.

Les LSC destinés à être utilisés à l'extérieur doivent pouvoir résister aux conditions d'environnement, y compris la température, la poussière et l'humidité. Le degré de protection minimal est IP 43, obtenu par le dispositif lui-même ou en combinaison avec un coffret, conformément à l'IEC 60529.

Cet essai est nécessaire pour les LSC conçus pour être installés à l'extérieur ou dans un environnement spécifique.

Les enveloppes de LSC non métalliques pour application extérieure doivent résister aux effets des ultraviolets (UV).

La conformité est vérifiée selon 6.4, 6.5 et 6.6.