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)

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 It also gives information on projects, replaced and withdrawn publications.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.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

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)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.020, 91.120.40

ISBN 978-2-8322-6861-2

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, C*opper 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