IEC 62561-4

Edition 3.0 2023-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners

IEC 62561-4:2023-10 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 It also gives information on projects, replaced and withdrawn publications.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 62561-4

Edition 3.0 2023-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.020, 91.120.40

ISBN 978-2-8322-7690-7

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

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 4: Requirements for conductor fasteners

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. 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 62561-4:2017. 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 62561-4 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 2017. This edition constitutes a technical revision.

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

a) alignment with the latest edition of ISO IEC 60068-2-52:2017 relating to salt mist atmosphere treatment;
b) alignment with the new edition of ISO 22479:2019 relating to humid sulphurous atmosphere treatment;
c) new normative annex for the applicability of previous tests.

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

Draft	Report on voting
81/734/FDIS	81/740/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/publications.

A list of all the 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, or
- revised.

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), specifically conductor fasteners used for the installation of a lightning protection system (LPS) designed and implemented in accordance with the IEC 62305 series.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 4: Requirements for conductor fasteners

1 Scope

This part of IEC 62561 deals with the requirements and tests for metallic and non-metallic conductor fasteners that are used to retain and support the air-termination, down-conductor and earth-termination systems.

This document does not cover the fixing of conductor fasteners to the fabric of structures due to the vast number and types used in modern day construction.

~~LPSC can also be suitable for use in hazardous atmospheres. There are therefore additional requirements when installing the components in such conditions.~~

Testing of components for an explosive atmosphere is not covered by this document. 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 60068-2-75:2014, *Environmental testing – Part 2: Tests – Test Eh: Hammer tests*

IEC 62305-3:2010, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62561-1:~~2017~~, *Lightning protection system components (LPSC) – Part 1: Requirements for connection components*

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

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

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

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

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 https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
conductor fastener
metallic, non-metallic or composite component designed to retain and support the air-termination, down-conductor and earth-termination systems, installed at intervals along the length of the conductors

3.2
composite fastener
mixture of metallic and non-metallic materials, for example plastic

3.3
type test
test made before supplying a type of material covered by IEC 62561-4 on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application

4 Classification

4.1 According to the material of the conductor fastener

a) metallic (e.g. hot dip galvanized steel, copper, aluminium, stainless steel);

b) non-metallic (e.g. PVC, plastics);

c) composite (combination of metal and ~~plastic~~ non-metallic).

If a metallic conductor fastener is used for bonding of two metallic parts of the external LPS it becomes a connection component and shall comply with testing requirements in accordance with IEC 62561-1.

4.2 According to the fixing arrangement of the conductor within the conductor fastener

a) with screws;

b) without screws (e.g. clips, springs).

4.3 According to the conductor clamping arrangement

a) conductor fasteners that are designed to clamp the conductor;

b) conductor fasteners that are designed to clamp but allow axial movement of the conductor.

5 Requirements

5.1 General

The conductor fastener shall carry out its function of clamping the conductor in an acceptable and safe manner when subjected to mechanical influences, lightning discharge stress and environmental influences.

Conductor fasteners shall comply with the tests given in Clause 6. The material of the conductor fastener shall be compatible with the conductor it is fastening and the surface material onto which it is mounted.

NOTE 1 Certain extreme environmental conditions make the choice of non-metallic conductor fasteners unsuitable. Specific recommendations are provided by manufacturers as to their suitability in varying environments.

NOTE 2 Conductor fasteners are so designed and constructed that safe handling is ensured, that retention and support for the conductor is provided, and that in normal use their performance is reliable and without danger to persons and the surroundings.

5.2 Environmental requirements

5.2.1 Corrosion resistance

Metallic or composite conductor fasteners shall withstand corrosion effects.

Compliance is checked for metallic fasteners by the test specified in 6.3.2 or for composite fasteners by the tests described in 6.3.4.

5.2.2 Ultraviolet (UV) light resistance

Non-metallic and composite conductor fasteners shall withstand UV light effects.

Compliance is checked for non-metallic fasteners by the tests specified in 6.3.3 or for composite fasteners by the tests specified in 6.3.4.

5.3 Mechanical strength

5.3.1 Perpendicular and axial loads

The design of the conductor fastener shall be such that it carries the perpendicular loads caused by the weight of the conductor, snow, ice and wind and axial loads caused by the thermal expansion–contraction of the conductor and its weight.

Compliance is checked following the manufacturer's declaration for the classification of the conductor fastener in accordance with Clause 4 and by the tests specified in 6.4.1 and 6.4.2.

5.3.2 Impact tests

Conductor fasteners shall be so designed and constructed to withstand impact stresses caused accidentally.

Compliance is checked by the tests specified in 6.4.3.

5.4 Installation instructions

The manufacturer or supplier of the conductor fastener shall provide adequate information in its literature to ensure that the installer ~~can~~ shall select and install the component in ~~a suitable and safe manner, in accordance with IEC 62305-3~~ accordance with 62305-3:2010, 5.5.2 and manufacturer's instructions, containing at least the following information:

a) classifications according to Clause 4;

b) maximum and minimum conductor diameter;

c) materials of conductors to be used;

d) type of mounting surface to be used;

e) recommended method of assembly, installation and fixing to the mounting surface;

f) lateral load;

g) axial movement load.

Compliance is checked by inspection in accordance with 6.5.

5.5 Marking

5.5.1 Content of marking

Each conductor fastener shall be marked with:

a) the manufacturer's or responsible vendor's name, logo or trademark,

b) product identification or type.

Where it is not possible to make these marks directly onto the product, they shall be made on the smallest supplied packaging.

Compliance is checked in accordance with 6.6.

Where this proves to be impractical, the marking in accordance with a) and b) may be given on the smallest packing unit label or on the accompanying documentation.

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

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

5.5.2 Durability and legibility

The marking shall be durable and legible.

Compliance is checked in accordance with 6.6.

6 Tests

6.1 General test conditions

~~Tests specified in this document are type tests.~~ The tests in accordance with this document are type tests (see 3.3), performed in a sequence according to Annex D. These tests are of such a nature that, after they have been performed, ~~they need not be repeated~~ unless changes are made to the accessory materials, design or type of manufacturing process~~,~~ which ~~might~~ can change the performance characteristics ~~of the product~~, repeated testing is not required.

The present document cannot cover all possible types of conductor fasteners and the way of fixing them on various surfaces of different materials. When required for these applications, agreement should be obtained between the test engineer and manufacturer on the specific testing regime.

Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use as specified in the manufacturer's or supplier's instructions, with the recommended conductor materials, sizes and the tightening torque.

The tests shall be carried out in the sequence given after environmental tests of the specimen in accordance with 6.3.

Unless otherwise specified, 12 metallic or 18 composite/non-metallic specimens are subjected to the tests and the requirements are satisfied if all the tests criteria are met.

If only one of the specimens fails to satisfy a test due to a manufacturing fault, that test and any preceding one which ~~may~~ can have influenced the results of the test shall be repeated. The tests which follow shall be made in the same required sequence on another full set of samples, all of which shall comply with the requirements.

The applicant, when submitting the first set of samples, may also submit an additional set of samples that ~~may~~ can be necessary should one sample fail. The testing laboratory shall then, without further request, test the additional set of samples, and shall only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample shall entail rejection.

Tests for non-metallic conductor fasteners shall not commence earlier than 168 h from the time of their manufacturing.

A torque meter shall be used for all tightening operations. It shall have a resolution of at least 0,5 Nm with an accuracy of ±4 % or less. The applicable tolerance for any applied mechanical load shall be within ±5 %.

For products already successfully tested in accordance with IEC 62561-4:2010 or IEC 62561-4:2017 the applicability of previous tests according to Annex C, Table C.1, may be applied.

For new products, complete type tests and samples according to Clause 6 are required.

6.2 Preparation of the specimen

If not otherwise specified by the manufacturer, the conductors and specimens shall be cleaned by using a suitable degreasing agent followed by cleaning in demineralized water and drying. They shall then be assembled in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques.

The tightening torque should be applied in a steady and uniform manner.

Any conductor fastener accommodating conductors with differences in size (diameter, thickness and width) equal to or less than 2 mm shall be tested using the minimum conductor size recommended. If the range is greater than 2 mm, the conductor fastener shall be tested using the minimum and maximum of conductor sizes.

6.3 Environmental influence test

6.3.1 General

In order for a conductor fastener to meet the requirements of this document, environmental tests shall be carried out in accordance with ~~to Annex A and/or Annex B~~ Annex A for metallic and composite conductor fasteners or Annex B for non-metallic and composite conductor fasteners.

The selection of the tests to be performed depends upon the conductor fastener material.

Annex D provides a flow chart relating the tests identified in 6.3.2, 6.3.3 and 6.3.4 to the conductor fastener material.

NOTE The sequence of performing the UV test prior to the salt mist test for composite fasteners is due to the fact that during the salt mist test the specimen is covered by a salt layer. This would inhibit the UV exposure test.

6.3.2 Metallic

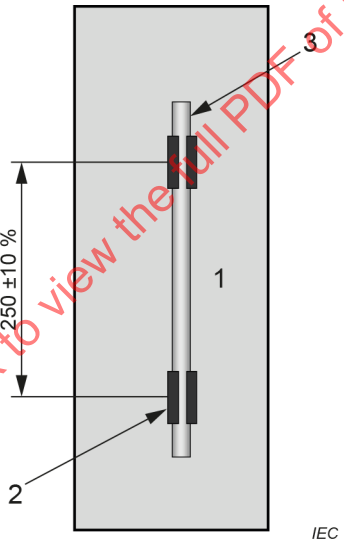
Two sets, each one consisting of three arrangements, shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangements of specimens shall be subjected to environmental influence tests consisting of a salt mist test as specified in Clause A.2 followed by a humid sulphurous atmosphere test as specified in Clause A.3. An additional test by an ammonia atmosphere as specified in Clause A.4, shall be carried out for conductor fasteners made of copper alloys with copper content of less than 80 %. ~~This is also valid for conductor fasteners having parts made of copper alloys with a copper content of less than 80 %.~~

The specimens are deemed to have passed the tests if there are no signs of corrosive deterioration of the conductor or conductor fastener visible to normal or corrected vision.

NOTE White rust, patina and surface oxidation are not considered to be corrosive deterioration.

Dimensions in millimetres



Key

1 mounting plate
2 fastener
3 conductor

Figure 1 – Basic arrangement of specimens

6.3.3 Non-metallic

Three sets, each one consisting of three arrangements, shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangements of specimens shall be subjected to an environmental test consisting of an ultraviolet light test as specified in Annex B.

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.

6.3.4 Composite

Three sets, each one consisting of three arrangements, shall be assembled and mounted on a rigid surface (e.g., brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangement of specimens shall be subjected to the environmental tests in the following sequence:

– test in accordance with 6.3.3, and
– test in accordance with 6.3.2.

The specimens are deemed to have passed this part of the test if the base metal of their metal parts does not exhibit any corrosive deterioration and if their ~~plastic~~ non-metallic parts show no sign 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.

NOTE White rust, patina and surface oxidation are not considered to be corrosive deterioration.

6.4 Resistance to mechanical effects

6.4.1 Lateral load test

After the test of 6.3 a first set of three arrangements of specimens is subjected to a load test of 200 N applied in the mid-distance between the conductor fasteners as illustrated in Figure 2.

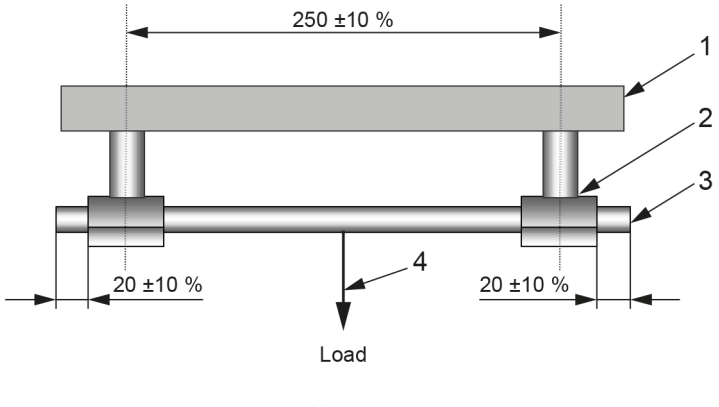
The test shall be performed using a stainless steel conductor with the appropriate dimensions.

For metallic conductor fasteners, the full test load is applied for minimum of 5 min and for composite and non-metallic conductor fasteners, the full test load is applied for a minimum period of 60 min.

All tests are carried out at a temperature of –10 °C ~~(± 1 °C)~~ ± 1 K and repeated at a temperature of +40 °C ~~(± 4 °C)~~ ± 4 K.

The specimens are deemed to have passed the tests provided that the conductor fasteners remain intact and the conductor is still located within the conductor fasteners.

Dimensions in millimetres



Key

1 mounting plate

2 fastener

3 conductor

4 load

Figure 2 – Basic arrangement of lateral load test

6.4.2 Axial load test

This test is only applicable to conductor fasteners classified according to 4.3 a).

After the test of 6.3 the second set of three arrangements is subjected to a load test of 50 N applied as shown in Figure 3.

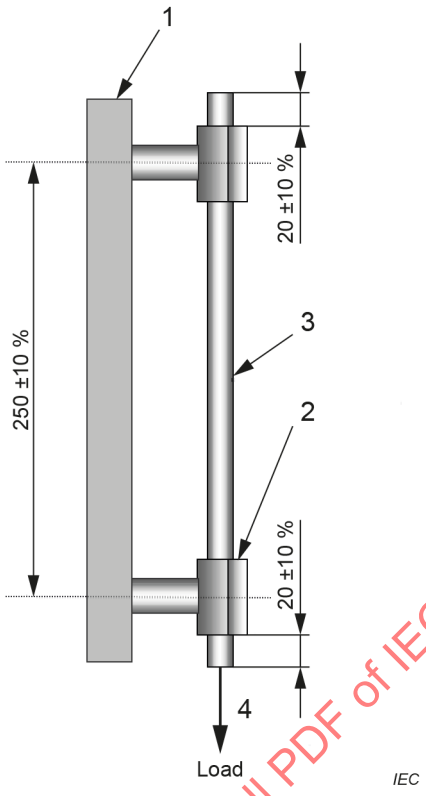
The test shall be performed using the conductors designated by the manufacturer for the conductor fastener.

For metallic conductor fasteners, the full test load is applied for minimum of 5 min, and for composite and non-metallic conductor fasteners, the full test load is applied for a minimum period of 60 min.

All tests are carried out at a temperature of –10 °C ~~(± 1 °C)~~ ± 1 K and repeated at a temperature of +40 °C ~~(± 4 °C)~~ ± 4 K.

The specimens are deemed to have passed the tests provided the conductor fasteners remain intact and the displacement of the conductor with respect to the conductor fasteners is not more than 3 mm.

Dimensions in millimetres



Key

1 mounting plate
2 fastener
3 conductor
4 load

Figure 3 – Typical arrangement for axial movement test

6.4.3 Impact test

This test is carried out on non-metallic and composite conductor fasteners.

After the test of 6.3 the third set of three arrangements is subjected to an impact test.

Each arrangement of specimens shall be mounted on an impact test apparatus as described in IEC 60068-2-75:2014, Clause 4, and shown in IEC 60068-2-75:2014, Figure D.1. The impact test apparatus shall be mounted on a solid wall or structure providing sufficient support for the test apparatus.

The arrangement of specimens is placed in a cabinet at a temperature of –5 °C ± 1 K. After 2 h, the arrangement is removed from the cabinet and immediately placed in position in the impact test apparatus.

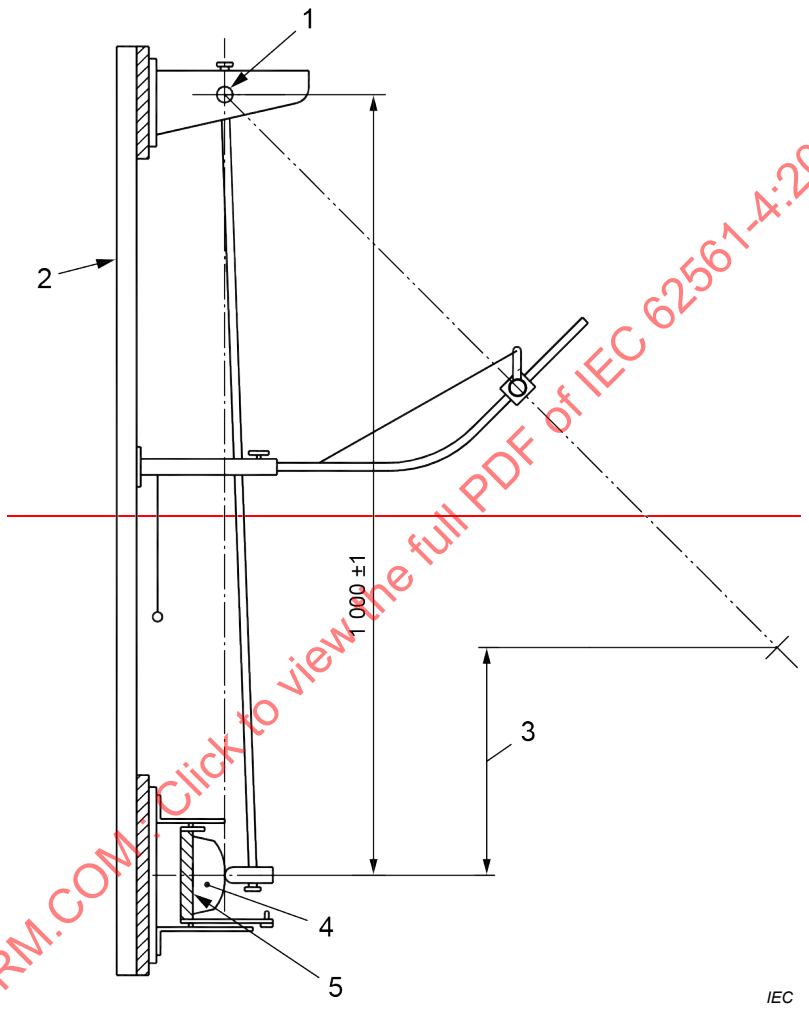
After removal of the arrangement from the cabinet, and after a period of 12 s ± 2 s, the hammer is allowed to fall (2 J, 0,5 kg, 400 mm as specified in IEC 60068-2-75:2014, Table 2) so that three impacts are applied as far as possible perpendicularly to the length of the arrangement.

The first impact should be to the left conductor fastener, the second to the other conductor fastener and the third to the middle length of the arrangement.

Instead of placing the arrangements in a cabinet and applying the impact at 12 s ± 2 s after the removal of the sample from the cabinet, ~~it is allowed to apply~~ the impact may be applied in a climatic chamber at a temperature of −5 °C ~~(± 1 °C)~~ ± 1 K on samples placed at this temperature for at least 2 h prior to testing. Compliance in the climatic chamber is sufficient.

After the test, the specimens shall show no cracks or similar damage visible to normal or corrected vision without magnification and the conductor shall remain located within the conductor fasteners.

~~Dimensions in millimetres~~



~~Key~~

~~1 pendulum~~

~~2 frame~~

~~3 height of fall~~

~~4 specimen~~

~~5 mounting fixture~~

~~Figure 4 – Impact test apparatus~~

6.5 Installation instructions

~~The manufacturer or responsible vendor shall provide in his literature:~~

~~– the classifications according to Clause 4;~~

~~– the maximum and minimum conductor diameter;~~

~~– the materials of conductors to be used;~~

~~– the type of mounting surface to be used;~~

~~– the recommended method of assembly, installation and fixing to the mounting surface;~~

~~– the lateral load;~~

~~– the axial movement load.~~

~~Compliance is checked by inspection.~~

6.5.1 General conditions

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

6.5.2 Acceptance criteria

Documentation and installation instructions are deemed to be acceptable if they contain the information given in 5.4.

6.6 Marking test

6.6.1 General test conditions ~~for tests~~

~~Marking on the conductor fastener shall be durable and easily legible.~~

~~Compliance is checked by inspection and by rubbing the marking 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.~~

The marking is checked:

a) according to its completeness by review;

b) according to its durability or 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 or mineral spirit.

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

6.6.2 Acceptance criteria

~~The specimen is deemed to have passed the test if the marking remains legible.~~

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

The specimen is deemed to have passed the test if:

a) the marking contains all the information of 5.5.1;

b) after the test in 6.6.1 the marking remains durable and legible to normal or correction vision without magnification.

6.7 Construction

The surface of the conductor fastener shall be free from burrs from any cutting process, flash, moulding joint deformation and similar inconsistencies which are likely to damage the conductors or inflict injury to the installer or user.

Compliance is checked by visual and manual inspection.

7 Electromagnetic compatibility (EMC)

Products covered by this document are, in normal use, passive with respect to electromagnetic influences (emission and immunity).

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 testing laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be reported 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 specified in 8.2 to 8.10.

8.2 Report identification

The following information shall be included[1] in the report:

a) a title or subject of the report;

b) name and e-mail address or telephone number of the testing 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~~ pagination and 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 by the testing laboratory to attest the content of the report;

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

k) the following declaration 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

[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.”~~

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, or both, for example part number, type, classification, material, dimensions;

c) functional parts and accessories description (e.g. screws, nuts, washers, quantity, material, etc.);

d) manufacturing method (e.g. cast, hot forged, cold deformed, pressing, die casting etc.);

e) characterization and condition of the test sample and~~/or~~ test assembly.

f) sampling procedure, where relevant;

g) date of receipt of test samples;

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

8.4 Conductor

a) conductor material;

b) nominal cross-sectional area, dimensions and shape. It is recommended that the actual cross-sectional area should also be given.

8.5 Standards and references

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

b) reference to this document ~~may~~ shall only be made if the full set of tests is performed and reported, except where the deviations are clearly justified in 8.6 b);

c) other relevant documentation with the documentation date.

8.6 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.

8.7 Testing equipment, description

Description of equipment used for every test conducted, for example generators, conditioning~~/~~ or ageing devices.

8.8 Measuring instruments description

Characteristics and calibration date of all instruments used for measuring the values specified in this document, for example ohmmeters, torque meters.

8.9 Results and parameters recorded

a) the required passing criteria for each test, defined in the standard;

b) the relevant measured, observed or derived results of the tests;

c) test results of fasteners operating as connection components, as per 4.1 (ohmic resistance, tightening and loosening torques).

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

8.10 Statement of pass~~/~~ and fail

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

Annex A
(normative)

~~Environmental test~~ Resistance to corrosion for metallic and composite conductor fasteners

A.1 General

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

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

A.2 Salt mist treatment

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

If the salt mist chamber 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.

A.3 Humid sulphurous atmosphere treatment

The humid sulphurous atmosphere treatment shall be in accordance with ~~ISO 6988:1985 with seven cycles with a volume concentration of sulphur dioxide of 667 x 10^{-6} ± 25 x 10^{-6}~~ ISO 22479:2019 Method B with 7 cycles with a sulphur dioxide content of 0,2 l (at 300 ± 10) l of capacity, except for Clause 9 and Clause 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~~K in the humid saturated atmosphere, which is followed by a rest period of 16 h. After that, the humid sulphurous atmosphere is replaced ~~and the next cycle is getting started~~.

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.

A.4 Ammonia atmosphere treatment

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

Annex B
(normative)

Environmental test for non-metallic and composite conductor fasteners – Resistance to ultraviolet light

B.1 General

A set of samples shall be subjected to ultraviolet light conditioning specified in Clause B.2, Clause B.3, or Clause B.4. All sets tested are considered representative of the material's entire colour range.

Samples shall be mounted on the inside of the cylinder in the ultraviolet light apparatus so that the samples do not touch each other and shall be positioned in such a way that their surface is exposed perpendicularly to the light source.

B.2 Test

The specimens shall be exposed for (1 000 ± 1) h to a xenon arc, Method A, in accordance with ISO 4892-2~~: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 ± 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~~ 65 °C ± 3 K. The temperature of the chamber shall be ~~(45 ± 5) °C~~ 45 °C ± 5 K. The relative humidity in the chamber shall be (50 ± 5) %.

B.3 First alternative test to Clause B.2

The specimens shall be exposed for (720 ± 1) h to open-flame sunshine carbon-arc, in accordance with ISO 4892-4. 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 an 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~~ 63 °C ± 3 K. The temperature of the chamber shall be ~~(45 ± 5) °C~~ 45 °C ± 5 K with a relative humidity of (50 ± 5) %.

B.4 Second alternative test to Clause B.2

The specimens shall be exposed for total irradiation energy equal to the values given in Clause B.2, to fluorescent UV light 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 Method A, cycle 3, of ISO 4892-3:2016, Table 4.

Annex C
(normative)

Applicability of previous tests

For conductor fasteners already successfully tested in accordance with IEC 62561-4:2010 or IEC 62561-4:2017, differences between versions in the test procedures identified in Table C.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of IEC 62561-4:2023.

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 according to this document shall be performed.

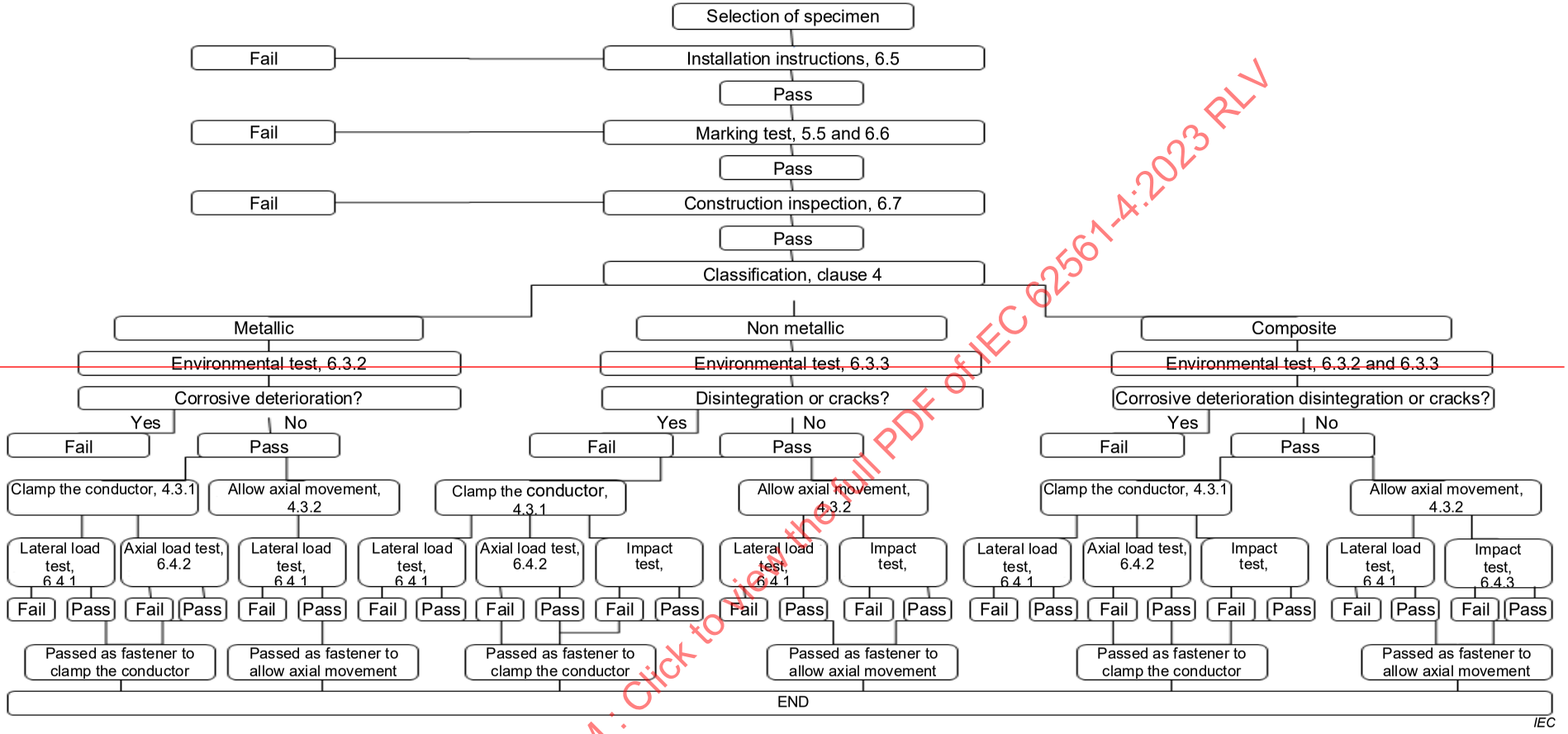
Table C.1 – Differences in the requirements for conductor fasteners complying with IEC 62561-4:2010 or 62561-4:2017

Test description	IEC 62561-4:2010	IEC 62561-4:2017	Re-testing required
Salt mist test or treatment	A.1	A.2	No
Humid sulphurous atmosphere test or treatment	A.2	A.3	No
Ammonia atmosphere test or treatment	A.3	A.4	No
Xenon arc UV light test	B.2	B.2	No
Open-flame sunshine carbon-arc	B.3	B.3	No
Fluorescent UV light test	B.4	B.4	No
Lateral load test	6.4.1	6.4.1	No
Axial load test	6.4.2	6.4.2	No
Impact load test	6.4.3	6.4.3	No

Annex D
(normative)

Flow chart of tests for conductor fastener

See Figure D.1.



Fasteners operating also as connection components (see 4.1) shall be subjected to the testing regime of IEC 62561-1

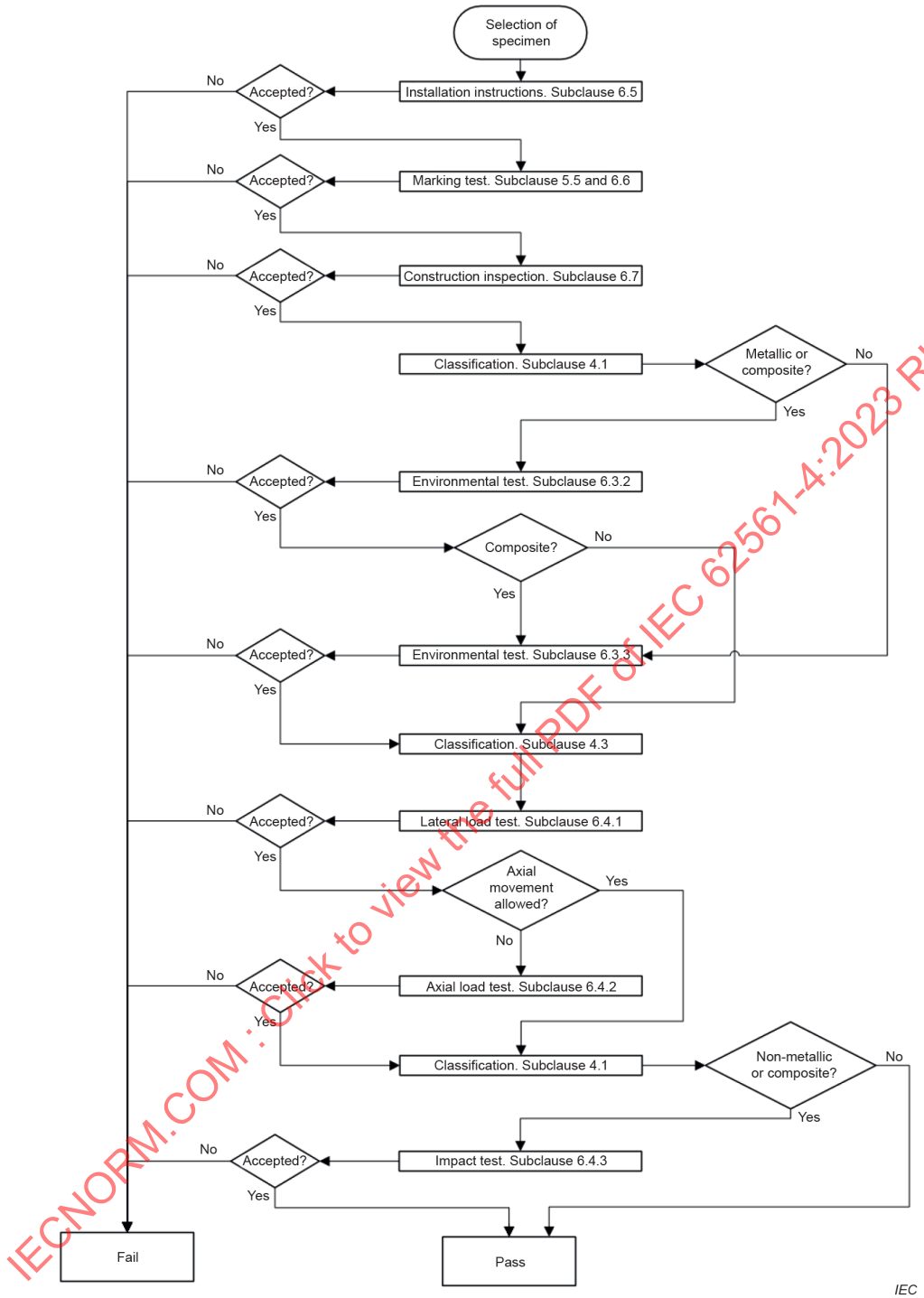


Figure D.1 – Flowchart of tests for conductor fastener

Bibliography

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

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

[3] IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

[4] IEC 62305 (all parts), *Protection against lightning*

[5] IEC 62561-4:2010, *Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners*

[6] IEC 62561-4:2017, *Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners*

IEC 62561-4

Edition 3.0 2023-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners

Composants des systèmes de protection contre la foudre (CSPF) – Partie 4: Exigences pour les fixations de conducteurs

IEC 62561-4:2023-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 4: Requirements for conductor fasteners

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62561-4 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 2017. This edition constitutes a technical revision.

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

a) alignment with the latest edition of ISO IEC 60068-2-52:2017 relating to salt mist atmosphere treatment;
b) alignment with the new edition of ISO 22479:2019 relating to humid sulphurous atmosphere treatment;
c) new normative annex for the applicability of previous tests.

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

Draft	Report on voting
81/734/FDIS	81/740/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/publications.

A list of all the 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, or
- revised.

INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC), specifically conductor fasteners used for the installation of a lightning protection system (LPS) designed and implemented in accordance with the IEC 62305 series.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 4: Requirements for conductor fasteners

1 Scope

This part of IEC 62561 deals with the requirements and tests for metallic and non-metallic conductor fasteners that are used to retain and support the air-termination, down-conductor and earth-termination systems.

This document does not cover the fixing of conductor fasteners to the fabric of structures due to the vast number and types used in modern day construction.

Testing of components for an explosive atmosphere is not covered by this document. 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: Tests – Test Eh: Hammer tests*

IEC 62305-3:2010, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62561-1, *Lightning protection system components (LPSC) – Part 1: Requirements for connection components*

ISO 4892-2, *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, *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*

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

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 https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
conductor fastener
metallic, non-metallic or composite component designed to retain and support the air-termination, down-conductor and earth-termination systems, installed at intervals along the length of the conductors

3.2
composite fastener
mixture of metallic and non-metallic materials, for example plastic

3.3
type test
test made before supplying a type of material covered by IEC 62561-4 on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application

4 Classification

4.1 According to the material of the conductor fastener

a) metallic (e.g. hot dip galvanized steel, copper, aluminium, stainless steel);

b) non-metallic (e.g. PVC, plastics);

c) composite (combination of metal and non-metallic).

If a metallic conductor fastener is used for bonding of two metallic parts of the external LPS it becomes a connection component and shall comply with testing requirements in accordance with IEC 62561-1.

4.2 According to the fixing arrangement of the conductor within the conductor fastener

a) with screws;

b) without screws (e.g. clips, springs).

4.3 According to the conductor clamping arrangement

a) conductor fasteners that are designed to clamp the conductor;

b) conductor fasteners that are designed to clamp but allow axial movement of the conductor.

5 Requirements

5.1 General

The conductor fastener shall carry out its function of clamping the conductor in an acceptable and safe manner when subjected to mechanical influences, lightning discharge stress and environmental influences.

Conductor fasteners shall comply with the tests given in Clause 6. The material of the conductor fastener shall be compatible with the conductor it is fastening and the surface material onto which it is mounted.

NOTE 1 Certain extreme environmental conditions make the choice of non-metallic conductor fasteners unsuitable. Specific recommendations are provided by manufacturers as to their suitability in varying environments.

NOTE 2 Conductor fasteners are so designed and constructed that safe handling is ensured, that retention and support for the conductor is provided, and that in normal use their performance is reliable and without danger to persons and the surroundings.

5.2 Environmental requirements

5.2.1 Corrosion resistance

Metallic or composite conductor fasteners shall withstand corrosion effects.

Compliance is checked for metallic fasteners by the test specified in 6.3.2 or for composite fasteners by the tests described in 6.3.4.

5.2.2 Ultraviolet (UV) light resistance

Non-metallic and composite conductor fasteners shall withstand UV light effects.

Compliance is checked for non-metallic fasteners by the tests specified in 6.3.3 or for composite fasteners by the tests specified in 6.3.4.

5.3 Mechanical strength

5.3.1 Perpendicular and axial loads

The design of the conductor fastener shall be such that it carries the perpendicular loads caused by the weight of the conductor, snow, ice and wind and axial loads caused by the thermal expansion–contraction of the conductor and its weight.

Compliance is checked following the manufacturer's declaration for the classification of the conductor fastener in accordance with Clause 4 and by the tests specified in 6.4.1 and 6.4.2.

5.3.2 Impact tests

Conductor fasteners shall be so designed and constructed to withstand impact stresses caused accidentally.

Compliance is checked by the tests specified in 6.4.3.

5.4 Installation instructions

The manufacturer or supplier of the conductor fastener shall provide adequate information in its literature to ensure that the installer shall select and install the component in accordance with 62305-3:2010, 5.5.2 and manufacturer's instructions, containing at least the following information:

a) classifications according to Clause 4;

b) maximum and minimum conductor diameter;

c) materials of conductors to be used;

d) type of mounting surface to be used;

e) recommended method of assembly, installation and fixing to the mounting surface;

f) lateral load;

g) axial movement load.

Compliance is checked by inspection in accordance with 6.5.

5.5 Marking

5.5.1 Content of marking

Each conductor fastener shall be marked with:

a) the manufacturer's or responsible vendor's name, logo or trademark,

b) product identification or type.

Where it is not possible to make these marks directly onto the product, they shall be made on the smallest supplied packaging.

Compliance is checked in accordance with 6.6.

Where this proves to be impractical, the marking in accordance with a) and b) may be given on the smallest packing unit label or on the accompanying documentation.

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

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

5.5.2 Durability and legibility

The marking shall be durable and legible.

Compliance is checked in accordance with 6.6.

6 Tests

6.1 General test conditions

The tests in accordance with this document are type tests (see 3.3), performed in a sequence according to Annex D. These tests are of such a nature that, after they have been performed, unless changes are made to the accessory materials, design or type of manufacturing process which can change the performance characteristics, repeated testing is not required.

The present document cannot cover all possible types of conductor fasteners and the way of fixing them on various surfaces of different materials. When required for these applications, agreement should be obtained between the test engineer and manufacturer on the specific testing regime.

Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use as specified in the manufacturer's or supplier's instructions, with the recommended conductor materials, sizes and the tightening torque.

The tests shall be carried out in the sequence given after environmental tests of the specimen in accordance with 6.3.

Unless otherwise specified, 12 metallic or 18 composite/non-metallic specimens are subjected to the tests and the requirements are satisfied if all the tests criteria are met.

If only one of the specimens fails to satisfy a test due to a manufacturing fault, that test and any preceding one which can have influenced the results of the test shall be repeated. The tests which follow shall be made in the same required sequence on another full set of samples, all of which shall comply with the requirements.

The applicant, when submitting the first set of samples, may also submit an additional set of samples that can be necessary should one sample fail. The testing laboratory shall then, without further request, test the additional set of samples, and shall only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample shall entail rejection.

Tests for non-metallic conductor fasteners shall not commence earlier than 168 h from the time of their manufacturing.

A torque meter shall be used for all tightening operations. It shall have a resolution of at least 0,5 Nm with an accuracy of ±4 % or less. The applicable tolerance for any applied mechanical load shall be within ±5 %.

For products already successfully tested in accordance with IEC 62561-4:2010 or IEC 62561-4:2017 the applicability of previous tests according to Annex C, Table C.1, may be applied.

For new products, complete type tests and samples according to Clause 6 are required.

6.2 Preparation of the specimen

If not otherwise specified by the manufacturer, the conductors and specimens shall be cleaned by using a suitable degreasing agent followed by cleaning in demineralized water and drying. They shall then be assembled in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques.

The tightening torque should be applied in a steady and uniform manner.

Any conductor fastener accommodating conductors with differences in size (diameter, thickness and width) equal to or less than 2 mm shall be tested using the minimum conductor size recommended. If the range is greater than 2 mm, the conductor fastener shall be tested using the minimum and maximum of conductor sizes.

6.3 Environmental influence test

6.3.1 General

In order for a conductor fastener to meet the requirements of this document, environmental tests shall be carried out in accordance with Annex A for metallic and composite conductor fasteners or Annex B for non-metallic and composite conductor fasteners.

The selection of the tests to be performed depends upon the conductor fastener material.

Annex D provides a flow chart relating the tests identified in 6.3.2, 6.3.3 and 6.3.4 to the conductor fastener material.

NOTE The sequence of performing the UV test prior to the salt mist test for composite fasteners is due to the fact that during the salt mist test the specimen is covered by a salt layer. This would inhibit the UV exposure test.

6.3.2 Metallic

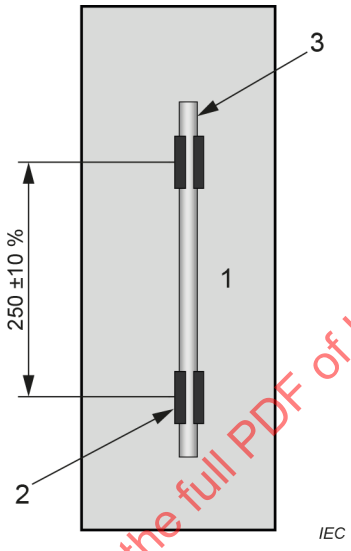
Two sets, each one consisting of three arrangements, shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangements of specimens shall be subjected to environmental influence tests consisting of a salt mist test as specified in Clause A.2 followed by a humid sulphurous atmosphere test as specified in Clause A.3. An additional test by an ammonia atmosphere as specified in Clause A.4, shall be carried out for conductor fasteners made of copper alloys with copper content of less than 80 %.

The specimens are deemed to have passed the tests if there are no signs of corrosive deterioration of the conductor or conductor fastener visible to normal or corrected vision.

NOTE White rust, patina and surface oxidation are not considered to be corrosive deterioration.

Dimensions in millimetres



Key

1 mounting plate

2 fastener

3 conductor

Figure 1 – Basic arrangement of specimens

6.3.3 Non-metallic

Three sets, each one consisting of three arrangements, shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangements of specimens shall be subjected to an environmental test consisting of an ultraviolet light test as specified in Annex B.

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.

6.3.4 Composite

Three sets, each one consisting of three arrangements, shall be assembled and mounted on a rigid surface (e.g., brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening torques for screwed fastening conductor fasteners.

The arrangement of specimens shall be subjected to the environmental tests in the following sequence:

– test in accordance with 6.3.3, and
– test in accordance with 6.3.2.

The specimens are deemed to have passed this part of the test if the base metal of their metal parts does not exhibit any corrosive deterioration and if their non-metallic parts show no sign 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.

NOTE White rust, patina and surface oxidation are not considered to be corrosive deterioration.

6.4 Resistance to mechanical effects

6.4.1 Lateral load test

After the test of 6.3 a first set of three arrangements of specimens is subjected to a load test of 200 N applied in the mid-distance between the conductor fasteners as illustrated in Figure 2.

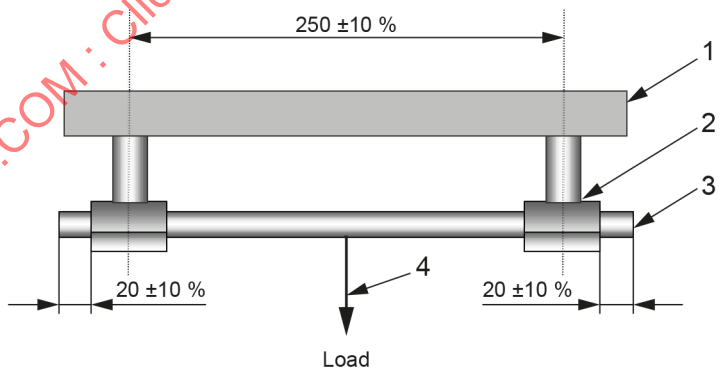
The test shall be performed using a stainless steel conductor with the appropriate dimensions.

For metallic conductor fasteners, the full test load is applied for minimum of 5 min and for composite and non-metallic conductor fasteners, the full test load is applied for a minimum period of 60 min.

All tests are carried out at a temperature of –10 °C ± 1 K and repeated at a temperature of +40 °C ± 4 K.

The specimens are deemed to have passed the tests provided that the conductor fasteners remain intact and the conductor is still located within the conductor fasteners.

Dimensions in millimetres



Key

1 mounting plate
2 fastener
3 conductor
4 load

Figure 2 – Basic arrangement of lateral load test

6.4.2 Axial load test

This test is only applicable to conductor fasteners classified according to 4.3 a).

After the test of 6.3 the second set of three arrangements is subjected to a load test of 50 N applied as shown in Figure 3.

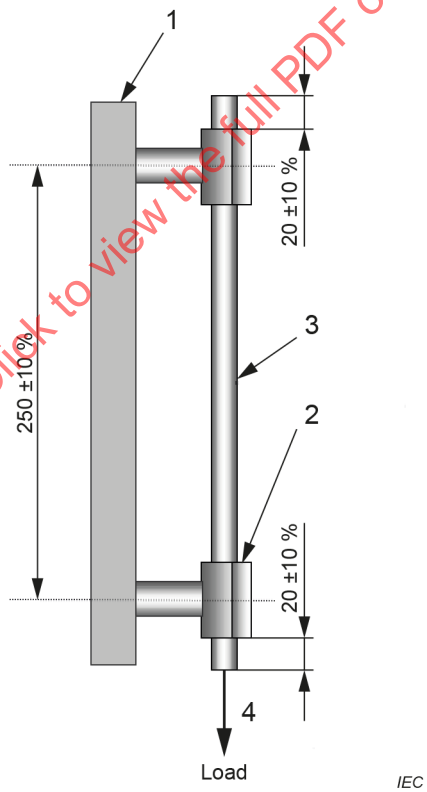
The test shall be performed using the conductors designated by the manufacturer for the conductor fastener.

For metallic conductor fasteners, the full test load is applied for minimum of 5 min, and for composite and non-metallic conductor fasteners, the full test load is applied for a minimum period of 60 min.

All tests are carried out at a temperature of –10 °C ± 1 K and repeated at a temperature of +40 °C ± 4 K.

The specimens are deemed to have passed the tests provided the conductor fasteners remain intact and the displacement of the conductor with respect to the conductor fasteners is not more than 3 mm.

Dimensions in millimetres



Key

1 mounting plate

2 fastener

3 conductor

4 load

Figure 3 – Typical arrangement for axial movement test

6.4.3 Impact test

This test is carried out on non-metallic and composite conductor fasteners.

After the test of 6.3 the third set of three arrangements is subjected to an impact test.

Each arrangement of specimens shall be mounted on an impact test apparatus as described in IEC 60068-2-75:2014, Clause 4, and shown in IEC 60068-2-75:2014, Figure D.1. The impact test apparatus shall be mounted on a solid wall or structure providing sufficient support for the test apparatus.

The arrangement of specimens is placed in a cabinet at a temperature of –5 °C ± 1 K. After 2 h, the arrangement is removed from the cabinet and immediately placed in position in the impact test apparatus.

After removal of the arrangement from the cabinet, and after a period of 12 s ± 2 s, the hammer is allowed to fall (2 J, 0,5 kg, 400 mm as specified in IEC 60068-2-75:2014, Table 2) so that three impacts are applied as far as possible perpendicularly to the length of the arrangement.

The first impact should be to the left conductor fastener, the second to the other conductor fastener and the third to the middle length of the arrangement.

Instead of placing the arrangements in a cabinet and applying the impact at 12 s ± 2 s after the removal of the sample from the cabinet, the impact may be applied in a climatic chamber at a temperature of −5 °C ± 1 K on samples placed at this temperature for at least 2 h prior to testing. Compliance in the climatic chamber is sufficient.

After the test, the specimens shall show no cracks or similar damage visible to normal or corrected vision without magnification and the conductor shall remain located within the conductor fasteners.

6.5 Installation instructions

6.5.1 General conditions

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

6.5.2 Acceptance criteria

Documentation and installation instructions are deemed to be acceptable if they contain the information given in 5.4.

6.6 Marking test

6.6.1 General test conditions

The marking is checked:

a) according to its completeness by review;

b) according to its durability or 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 or mineral spirit.

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

6.6.2 Acceptance criteria

The specimen is deemed to have passed the test if:

a) the marking contains all the information of 5.5.1;

b) after the test in 6.6.1 the marking remains durable and legible to normal or correction vision without magnification.

6.7 Construction

The surface of the conductor fastener shall be free from burrs from any cutting process, flash, moulding joint deformation and similar inconsistencies which are likely to damage the conductors or inflict injury to the installer or user.

Compliance is checked by visual and manual inspection.

7 Electromagnetic compatibility (EMC)

Products covered by this document are, in normal use, passive with respect to electromagnetic influences (emission and immunity).

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 testing laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be reported 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 specified in 8.2 to 8.10.

8.2 Report identification

The following information shall be included in the report:

a) a title or subject of the report;

b) name and e-mail address or telephone number of the testing 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) pagination and 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 by the testing laboratory to attest the content of the report;

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

k) the following declaration 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 or test assembly, or both, for example part number, type, classification, material, dimensions;

c) functional parts and accessories description (e.g. screws, nuts, washers, quantity, material, etc.);

d) manufacturing method (e.g. cast, hot forged, cold deformed, pressing, die casting etc.);

e) characterization and condition of the test sample and test assembly.

f) sampling procedure, where relevant;

g) date of receipt of test samples;

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

8.4 Conductor

a) conductor material;

b) nominal cross-sectional area, dimensions and shape. It is recommended that the actual cross-sectional area should also be given.

8.5 Standards and references

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

b) reference to this document shall only be made if the full set of tests is performed and reported, except where the deviations are clearly justified in 8.6 b);

c) other relevant documentation with the documentation date.

8.6 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.

8.7 Testing equipment, description

Description of equipment used for every test conducted, for example generators, conditioning or ageing devices.

8.8 Measuring instruments description

Characteristics and calibration date of all instruments used for measuring the values specified in this document, for example ohmmeters, torque meters.

8.9 Results and parameters recorded

a) the required passing criteria for each test, defined in the standard;

b) the relevant measured, observed or derived results of the tests;

c) test results of fasteners operating as connection components, as per 4.1 (ohmic resistance, tightening and loosening torques).

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

8.10 Statement of pass and fail

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

Annex A
(normative)

Resistance to corrosion for metallic and composite conductor fasteners

A.1 General

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

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

A.2 Salt mist treatment

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

A.3 Humid sulphurous atmosphere treatment

The humid sulphurous atmosphere treatment shall be in accordance with ISO 22479:2019 Method B with 7 cycles with a sulphur dioxide content of 0,2 l (at 300 ± 10) l of capacity, except for Clause 9 and Clause 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 K 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.

A.4 Ammonia atmosphere treatment

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

Annex B
(normative)

Environmental test for non-metallic and composite conductor fasteners – Resistance to ultraviolet light

B.1 General

A set of samples shall be subjected to ultraviolet light conditioning specified in Clause B.2, Clause B.3, or Clause B.4. All sets tested are considered representative of the material's entire colour range.

Samples shall be mounted on the inside of the cylinder in the ultraviolet light apparatus so that the samples do not touch each other and shall be positioned in such a way that their surface is exposed perpendicularly to the light source.

B.2 Test

The specimens shall be exposed for (1 000 ± 1) h to a xenon arc, Method A, in accordance with ISO 4892-2. 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 °C ± 3 K. The temperature of the chamber shall be 45 °C ± 5 K. The relative humidity in the chamber shall be (50 ± 5) %.

B.3 First alternative test to Clause B.2

The specimens shall be exposed for (720 ± 1) h to open-flame sunshine carbon-arc, in accordance with ISO 4892-4. 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 an 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 63 °C ± 3 K. The temperature of the chamber shall be 45 °C ± 5 K with a relative humidity of (50 ± 5) %.

B.4 Second alternative test to Clause B.2

The specimens shall be exposed for total irradiation energy equal to the values given in Clause B.2, to fluorescent UV light in accordance with ISO 4892-3. 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 Method A, cycle 3, of ISO 4892-3:2016, Table 4.

Annex C
(normative)

Applicability of previous tests

For conductor fasteners already successfully tested in accordance with IEC 62561-4:2010 or IEC 62561-4:2017, differences between versions in the test procedures identified in Table C.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of IEC 62561-4:2023.

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 according to this document shall be performed.

Table C.1 – Differences in the requirements for conductor fasteners complying with IEC 62561-4:2010 or 62561-4:2017

Test description	IEC 62561-4:2010	IEC 62561-4:2017	Re-testing required
Salt mist test or treatment	A.1	A.2	No
Humid sulphurous atmosphere test or treatment	A.2	A.3	No
Ammonia atmosphere test or treatment	A.3	A.4	No
Xenon arc UV light test	B.2	B.2	No
Open-flame sunshine carbon-arc	B.3	B.3	No
Fluorescent UV light test	B.4	B.4	No
Lateral load test	6.4.1	6.4.1	No
Axial load test	6.4.2	6.4.2	No
Impact load test	6.4.3	6.4.3	No

Annex D
(normative)

Flow chart of tests for conductor fastener

See Figure D.1.

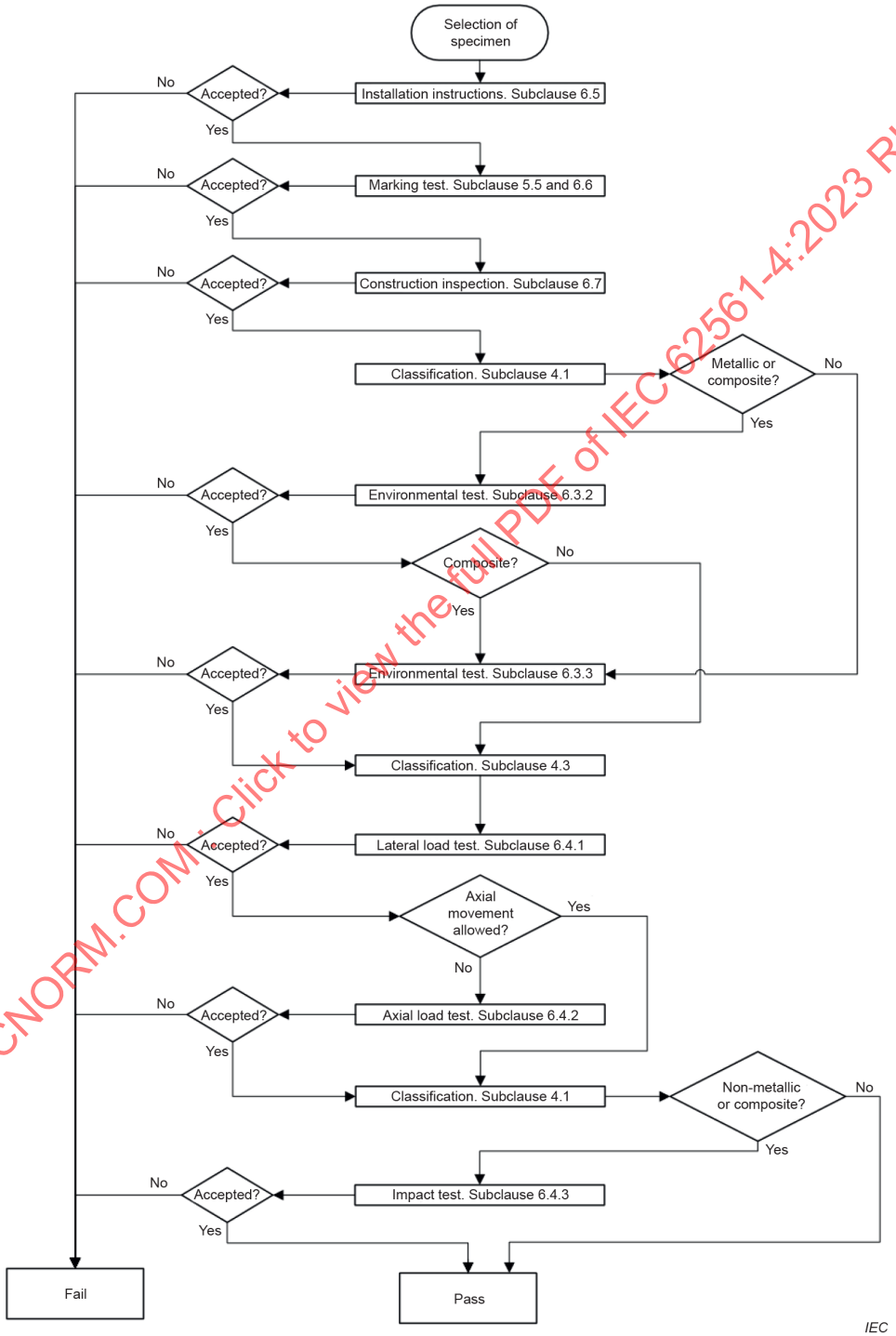


Figure D.1 – Flowchart of tests for conductor fastener

Bibliography

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

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

[3] IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

[4] IEC 62305 (all parts), *Protection against lightning*

[5] IEC 62561-4:2010, *Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners*

[6] IEC 62561-4:2017, *Lightning protection system components (LPSC) – Part 4: Requirements for conductor fasteners*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

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

Partie 4: Exigences pour les fixations de conducteurs

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'IEC attire l'attention sur le fait que la mise en application du présent document peut entraîner l'utilisation d'un ou de plusieurs brevets. L'IEC ne prend pas position quant à la preuve, à la validité et à l'applicabilité de tout droit de brevet revendiqué à cet égard. À la date de publication du présent document, l'IEC n'avait pas reçu notification qu'un ou plusieurs brevets pouvaient être nécessaires à sa mise en application. Toutefois, il y a lieu d'avertir les responsables de la mise en application du présent document que des informations plus récentes sont susceptibles de figurer dans la base de données de brevets, disponible à l'adresse https://patents.iec.ch. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 62561-4 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 2017. Cette édition constitue une révision technique.

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

a) alignement sur la dernière édition de l'ISO IEC 60068-2-52:2017 concernant le traitement en atmosphère au brouillard salin;
b) alignement sur la nouvelle édition de l'ISO 22479:2019 concernant le traitement en atmosphère sulfureuse humide;
c) nouvelle annexe normative concernant l'applicabilité d'essais précédents.

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

Projet	Rapport de vote
81/734/FDIS	81/740/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.

Le présent 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/publications.

Une liste de toutes les parties de la série IEC 62561, publiées 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, ou
- révisé.

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), en particulier des fixations de conducteurs utilisées pour l'installation d'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 4: Exigences pour les fixations de conducteurs

1 Domaine d'application

La présente partie de l'IEC 62561 traite des exigences et des essais pour les fixations métalliques et non métalliques de conducteurs utilisées pour maintenir et supporter les dispositifs de capture, les conducteurs de descente et les prises de terre.

Le présent document ne traite pas de la fixation de ces supports sur les structures d'édifice en raison du grand nombre de types de solutions modernes de construction.

Les essais de composants pour atmosphère explosive ne sont pas concernés par le présent document. 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 sont cités dans le texte de sorte qu'ils 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 62305-3:2010, *Protection contre la foudre – Partie 3: Dommages physiques sur les structures et risques humains*

IEC 62561-1, *Composants des systèmes de protection contre la foudre (CSPF) – Partie 1: Exigences pour les composants de connexion*

ISO 4892-2, *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, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 4: Lampes à arc au carbone*

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

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

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

3.1
fixation de conducteur
composant métallique, non métallique ou composite, utilisé pour fixer et supporter les dispositifs de capture, les conducteurs de descente et les prises de terre, installé à intervalle régulier le long des conducteurs

3.2
fixation composite
mélange de matériaux métalliques et non métalliques, par exemple plastiques

3.3
essai de type
essai réalisé avant la livraison d'un type de matériau concerné par l'IEC 62561-4, sur une base commerciale générale, afin de démontrer que ses caractéristiques de performance satisfont à l'application prévue

4 Classification

4.1 Selon le matériau de la fixation de conducteur

a) Métallique (acier galvanisé à chaud, cuivre, aluminium, acier inoxydable, par exemple).

b) Non métallique (PVC, plastique, par exemple).

c) Composite (combinaison de métalliques et non métalliques).

Si une fixation de conducteur métallique est utilisée pour fixer deux pièces métalliques d'un SPF externe, elle est considérée comme un composant de connexion et doit satisfaire aux exigences d'essai de l'IEC 62561-1.

4.2 Selon le moyen de fixation du conducteur à son support

a) Par boulons.

b) Sans boulons (clips, colliers, par exemple).

4.3 Selon le type de maintien du conducteur

a) Fixations de conducteurs conçues pour emprisonner le conducteur.

b) Fixations de conducteurs conçues pour emprisonner le conducteur, mais permettre un déplacement axial de ce conducteur.

5 Exigences

5.1 Généralités

La fixation de conducteur doit assurer sa fonction de maintien du conducteur de manière sûre et acceptable lorsque celui-ci est soumis à des contraintes mécaniques, des décharges de courant de foudre et des contraintes environnementales.

Les fixations de conducteurs doivent satisfaire aux essais de l'Article 6. Les matériaux des fixations de conducteurs doivent être compatibles avec ceux des conducteurs à fixer et ceux de la surface de montage.

NOTE 1 Dans certaines conditions environnementales extrêmes, le choix des fixations de conducteurs non métalliques n'est pas adapté. Les fabricants fournissent des recommandations spécifiques quant à leur utilisation dans des environnements variables.

NOTE 2 Les fixations de conducteurs sont conçues et construites de façon à assurer une manipulation sans danger, un maintien et un support corrects pour le conducteur, et des performances fiables et sans danger pour les personnes et l'environnement dans des conditions normales d'utilisation.

5.2 Exigences environnementales

5.2.1 Résistance à la corrosion

Les fixations de conducteurs métalliques ou composites doivent résister aux effets de la corrosion.

La conformité des fixations métalliques est vérifiée par l'essai spécifié en 6.3.2, et la conformité des fixations composites est vérifiée par les essais spécifiés en 6.3.4.

5.2.2 Résistance aux rayonnements ultraviolets (UV)

Les fixations de conducteurs non métalliques et composites doivent résister aux effets des rayonnements ultraviolets (UV).

La conformité des fixations non métalliques est vérifiée par les essais spécifiés en 6.3.3, et la conformité des fixations composites est vérifiée par les essais spécifiés ens6.3.4.

5.3 Résistance mécanique

5.3.1 Charges perpendiculaires et axiales

La conception de la fixation de conducteur doit prendre en compte les charges perpendiculaires dues au poids du conducteur, de la neige, de la glace et du vent, ainsi que les charges axiales dues à la dilatation et à la contraction thermique du conducteur et à son poids.

La conformité est vérifiée selon la classification de la fixation de conducteur déclarée par le fabricant, conformément à l'Article 4, et par les essais spécifiés en 6.4.1 et en 6.4.2.

5.3.2 Essais d'impact

Les fixations de conducteurs doivent être conçues et construites pour résister aux contraintes d'impacts accidentelles.

La conformité est vérifiée par les essais spécifiés en 6.4.3.

5.4 Instructions d'installation

Le fabricant ou le fournisseur de la fixation de conducteur doit fournir dans sa documentation les informations pertinentes afin de s'assurer que l'installateur peut choisir et installer le composant conformément au 5.5.2 de l'IEC 62305-3:2010 et aux instructions du fabricant, qui comportent au moins les informations suivantes:

a) classifications conformément à l'Article 4;
b) diamètre maximal et minimal du conducteur;
c) matériaux de conducteur à employer;
d) type de surface de montage à employer;
e) méthode recommandée de montage, d'installation et de fixation sur la surface de montage;
f) charge latérale;
g) charge de déplacement axial.

La conformité est vérifiée par examen conformément au 6.5.

5.5 Marquage

5.5.1 Contenu du marquage

Chaque fixation de conducteur doit comporter les marquages suivants:

a) le nom, le logo ou la marque du fabricant ou du fournisseur responsable;
b) le type ou l'identification du produit.

Lorsque ces marquages ne peuvent pas être apposés directement sur le produit, ils doivent être réalisés sur l'emballage le plus petit.

La conformité est vérifiée conformément au 6.6.

Lorsque cela n'est pas possible, les marquages a) et b) peuvent être réalisés sur l'étiquette de l'emballage le plus petit ou indiqués dans la documentation jointe.

NOTE 1 Le marquage peut être réalisé, par exemple, par moulage, emboutissage, gravure, impression et au moyen d'étiquettes adhésives adaptées aux contraintes environnementales.

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

5.5.2 Durabilité et lisibilité

Le marquage doit être durable et lisible.

La conformité est vérifiée conformément au 6.6.

6 Essais

6.1 Conditions générales d'essais

Les essais conformes au présent document sont des essais de type (voir 3.3), réalisés dans l'ordre indiqué à l'Annexe D. Ces essais sont de telle nature qu'après avoir été effectués, à moins que des modifications n'aient été introduites dans les matériaux des accessoires, dans la conception ou dans le type de procédé de fabrication, qui peuvent en modifier les caractéristiques de performance, il n'est pas nécessaire de procéder à des répétitions d'essais.

Le présent document ne peut pas couvrir tous les types de fixations de conducteurs et toutes les façons de les fixer sur les surfaces des différents matériaux. Lorsque cela est exigé pour