भारतीय मानक

Indian Standard

IS 18925 (Part 4) : 2024
IEC 62561-4 : 2023

विद्युत संरक्षण प्रणाली कम्पोनेंट्स (एलपीएससी)

भाग 4 चालक फास्टनरों के लिए अपेक्षाएँ

Lightning Protection System Components (LPSC)

Part 4 Requirements for Conductor Fasteners

ICS 29.020; 91.120.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

September 2024 **Price Group 10**

Electrical Installation Sectional Committee, ETD 20

NATIONAL FOREWORD

This Standard (Part 4) which is identical to IEC 62561-4 : 2023 'Lightning protection system components (LPSC) — Part 4: Requirements for conductor fasteners' issued by the International Electrotechnical Commission (IEC) is proposed to be adopted by the Bureau of Indian Standards on the recommendation of the Electrical Installation Sectional Committee and approval of the Electrotechnical Division Council.

This Indian Standard is published in several parts. The other parts in this series are:

Part 1	Requirements for connection components
Part 2	Requirements for conductors and earth electrodes
Part 3	Requirements for isolating spark gaps ISGs
Part 5	Requirements for earth electrode inspection housings and earth electrode seals
Part 6	Requirements for lightning strike counters LSCs
Part 7	Requirements for earthing enhancing compounds
Part 8	Requirements for components for isolated LPS

The text of the IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to International Standards for which Indian Standards also exists. The corresponding Indian Standards, which are to be substituted, are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60068-2-75 : 2014 Environmental testing — Part 2: Tests–test Eh: Hammer tests	IS 9000 (Part 7/Sec 7) : 2020 Environmental testing: Part 7 Tests, Section 7 Test Eh: Hammer tests (*first revision*)	Identical
IEC 62305-3 : 2010 Protection against lightning — Part 3: Physical damage to structures and life Hazard	IS/IEC 62305-3 : 2010 Protection against lightning: Part 3 physical damage to structures and life hazard	Identical

(*Continued on third cover*)

CONTENTS

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.

Indian Standard

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

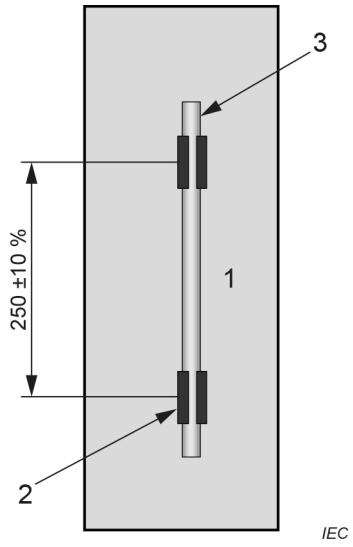
Two sets, each one consisting of three arrangements, shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene (PTFE)) as shown in Figure 1 in accordance with the manufacturer's installation instructions, for example with the recommended conductors and the tightening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

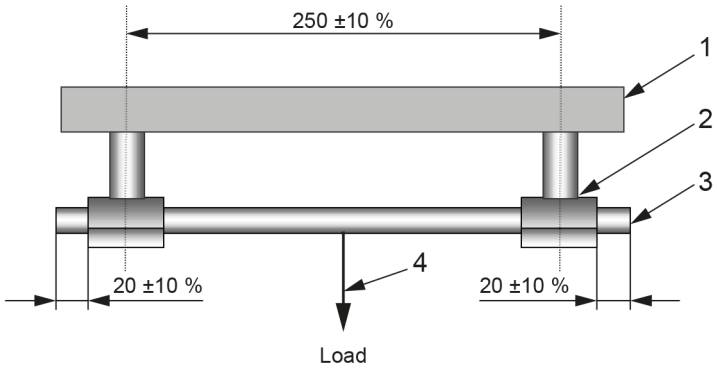
The test shall be performed using a stainless steel conductor with the appropriate dimensions.

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.

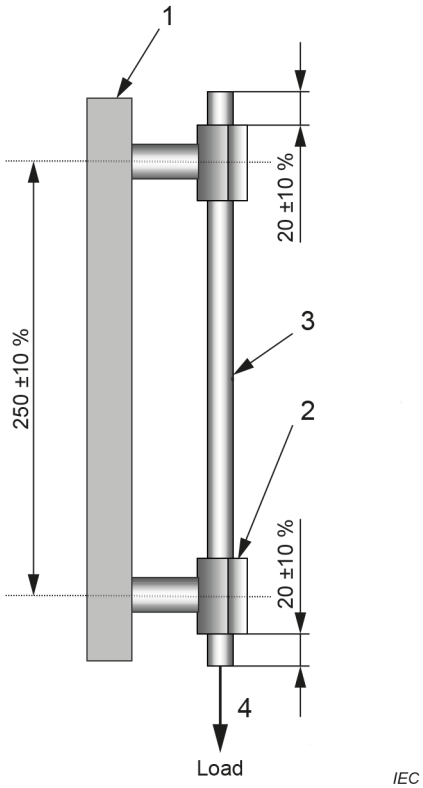
The test shall be performed using the conductors designated by the manufacturer for the conductor fastener.

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 $W \times m^{-2} \times nm^{-1}$ 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 $W \times m^{-2} \times nm^{-1}$ 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.

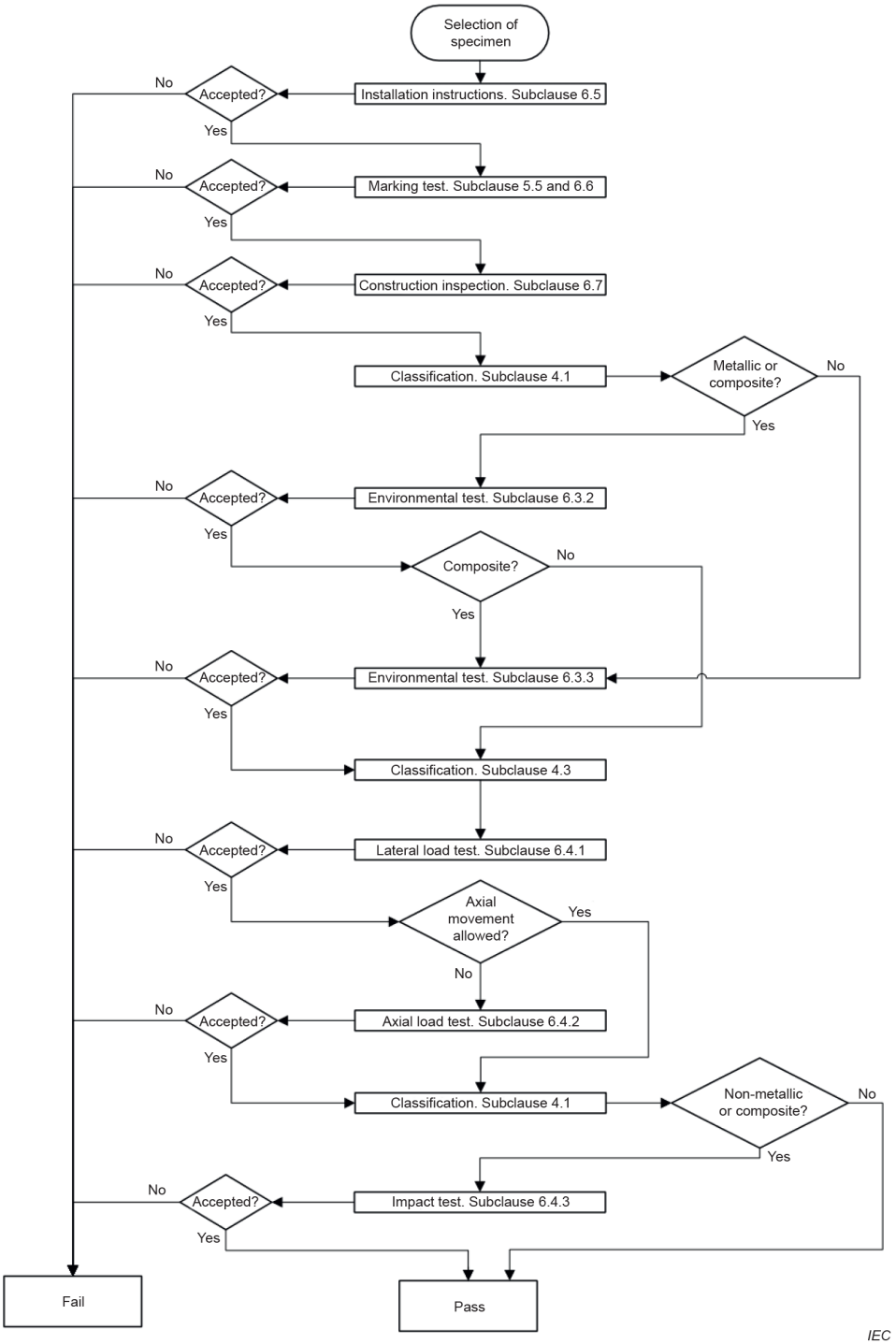


Figure D.1 – Flowchart of tests for conductor fastener

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*

_____

NATIONAL ANNEX A

(*National Foreword*)

A-1 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

(*Continued from second cover*)

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6957 : 1988 Copper alloys — Ammonia test for stress corrosion resistance	IS 16872 : 2019 Copper alloys — Ammonia test for stress corrosion resistance	Identical

The Committee has reviewed the provisions of the following international standards referred in this adopted standard and decided that they are acceptable for use in conjunction with this standard.

International Standard	*Title*
IEC 60068-2-52 : 2017	Environmental testing — Part 2-52: Tests — Test Kb: Salt mist, cyclic (sodium chloride solution)
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: Openflame, carbon-arc lamps
ISO 22479 : 2019	Corrosion of metals and alloys — Sulfur dioxide test in a humid atmosphere (fixed gas method)

Only the English language text has been retained while adopting it in this Indian Standard, and as such, the page number given here are not the same as in the IEC Publication.

India specific changes have been made to the adopted IEC 62561-1 as outlined in National Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: ETD 20 (24501).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Manakalya, 5th Floor/MTNL CETTM, Technology Street, Hiranandani Gardens, Powai Mumbai 400076	25700030 25702715

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYANA (CHANDIGARH), HUBLI, HYDERABAD, JAIPUR, JAMMU, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi