

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Composants de système de protection contre la foudre (CSPF) –
Partie 4: Exigences pour les fixations de conducteur**

<https://standards.iteh.ai/catalog/standards/sist/62561-4-2010/ec2-455a-4489-a3d1-3e241daa3d0d/iec-62561-4-2010>

WithDRAWN



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

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

A propos des publications CEI

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

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Composants de système de protection contre la foudre (CSPF) –
Partie 4: Exigences pour les fixations de conducteur**

<https://standards.iteh.ai/catalog/standards/sist/62561-4-2010/ec2-455a-4489-a3d1-3e241daa3d0d/iec-62561-4-2010>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

S

ICS 29.020; 91.120.40

ISBN 978-2-88912-261-5

CONTENTS

FOREWORD.....	3
INTRODUCTION	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions.....	6
4 Classification	7
5 Requirements.....	7
5.1 General.....	7
5.2 Environmental requirements.....	7
5.3 Mechanical strength	8
5.4 Installation instructions	8
5.5 Marking.....	8
6 Tests.....	8
6.1 General test conditions	8
6.2 Preparation of the specimen.....	9
6.3 Environmental influence test	9
6.4 Resistance to mechanical effects.....	11
6.5 Installation instructions	14
6.6 Marking test	15
6.7 Construction.....	15
7 Electromagnetic compatibility (EMC).....	15
8 Structure and content of the test report.....	15
8.1 General.....	15
8.2 Report identification.....	16
8.3 Specimen description	16
8.4 Characterization and condition of the test sample and/or test assembly.....	16
8.5 Conductor.....	16
8.6 Standards and references.....	17
8.7 Test procedure.....	17
8.8 Testing equipment, description.....	17
8.9 Measuring instruments description.....	17
8.10 Results and parameters recorded	17
Annex A (normative) Environmental test for metallic conductor fasteners	18
Annex B (normative) Environmental test for non-metallic conductor fasteners – Resistance to ultraviolet light.....	19
Annex C (normative) Flow chart of tests.....	20
Bibliography.....	21
Figure 1 – Basic arrangement of specimens	10
Figure 2– Basic arrangement of lateral load test	12
Figure 3– Typical arrangement for axial movement test.....	13
Figure 4 – Impact test apparatus.....	14

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62561-4 has been prepared by IEC technical committee 81: Lightning protection.

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

FDIS	Report on voting
81/369/FDIS	81/379/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 62561 series, 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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.4

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 62561-4:2010](https://standards.iteh.ai/catalog/standards/sist/62561-4-2010)

<https://standards.iteh.ai/catalog/standards/sist/62561-4-2010>

Withdrawn

INTRODUCTION

This Part 4 of IEC 62561 deals with the requirements and tests for conductor fasteners as being a lightning protection system component (LPSC) designed and implemented according to the IEC 62305 series of standards.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 62561-4:2010](https://standards.iteh.ai/catalog/standards/sist/62561-4-2010)

<https://standards.iteh.ai/catalog/standards/sist/62561-4-2010>

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 4: Requirements for conductor fasteners

1 Scope

This Part 4 of IEC 62561 deals with the requirements and tests for metallic and non-metallic conductor fasteners that are used in conjunction with the air termination, down conductor and earth termination system.

This standard does not cover the fixing of conductor fasteners to the fabric/membrane/gravel roofing of structures due to the vast number and types used in modern day construction.

LPSC may also be suitable for use in hazardous atmospheres. Regard should then be taken of the extra requirements necessary for the components to be installed in such conditions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

IEC 62305-3:2006, *Protection against lightning – Part 3: Physical damage to structures and life hazard¹*

ISO 4892-2:2006, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon – arc lamps*

ISO 4892-3:2006, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

ISO 4892-4:2004, *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*

3 Terms and definitions

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

¹ A second edition is in preparation.

3.1

conductor fastener

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

4 Classification

Conductor fasteners are classified as follows:

a) According to material

- metallic (e.g. hot dip galvanized steel, copper, aluminium, stainless steel);
- non-metallic (e.g. PVC, plastics);
- composite (combination of metal and plastic);

b) According to fixing arrangement of the conductor within the conductor fastener

- with screws;
- without screws (e.g. clips, springs);

c) According to conductor clamping arrangement

- conductor fasteners that are designed to clamp the conductor;
- 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 should be provided by manufacturers as to their suitability in varying environments.

NOTE 2 Conductor fasteners should be 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 surrounding.

5.2 Environmental requirements

5.2.1 Corrosion resistance

Metallic or composite conductor fasteners shall withstand corrosion effects.

Compliance is checked following the manufacturer's declaration for the classification of the conductor fastener in accordance with Clause 4 and by test specified in 6.3.2 and 6.3.4.

5.2.2 UV resistance

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

Compliance is checked following the manufacturer's declaration for the classification of the conductor fastener in accordance with Clause 4 and by test specified in 6.3.3 and 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 test 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 test specified in 6.4.3.

5.4 Installation instructions

The manufacturer or supplier of the conductor fastener shall provide adequate information in his literature to ensure that the installer can select and install the component in a suitable and safe manner, in accordance with IEC 62305-3.

Compliance is checked by inspection in accordance with 6.5.

5.5 Marking

Each conductor fastener shall be marked with

- the manufacturer's or responsible vendor's name or logo or trademark,
- 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.

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

Compliance is checked in accordance with 6.6.

6 Tests

6.1 General test conditions

Tests specified in this standard are type tests. These tests are of such a nature that, after they have been performed, they need not be repeated unless changes are made to the materials, design or type of manufacturing process, which might change the performance characteristics.

The standard 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 specified in the manufacturer's or supplier's instructions, with the recommended conductor materials, sizes and the tightening torques.

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 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 have influenced the results of the test shall be repeated and also 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.

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 and an accuracy of $\pm 4\%$ or less.

The applicable tolerance for any applied mechanical load shall be within $\pm 5\%$.

NOTE The applicant, when submitting the first set of samples, may also submit an additional set of samples that may 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.

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, e.g. 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 that a conductor fastener meets the requirements of this standard, environmental tests shall be carried out according to Annex A and/or Annex B.

The selection of the tests to be performed depends upon the conductor fastener material. Annex C 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 because 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, Teflon) as shown in Figure 1 in accordance with the manufacturer's installation instructions, e.g. 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.1 followed by a humid sulphurous atmosphere test as specified in Clause A.2. An additional test by an ammonia atmosphere as specified in Clause A.3, 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 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 is not considered as corrosive deterioration.

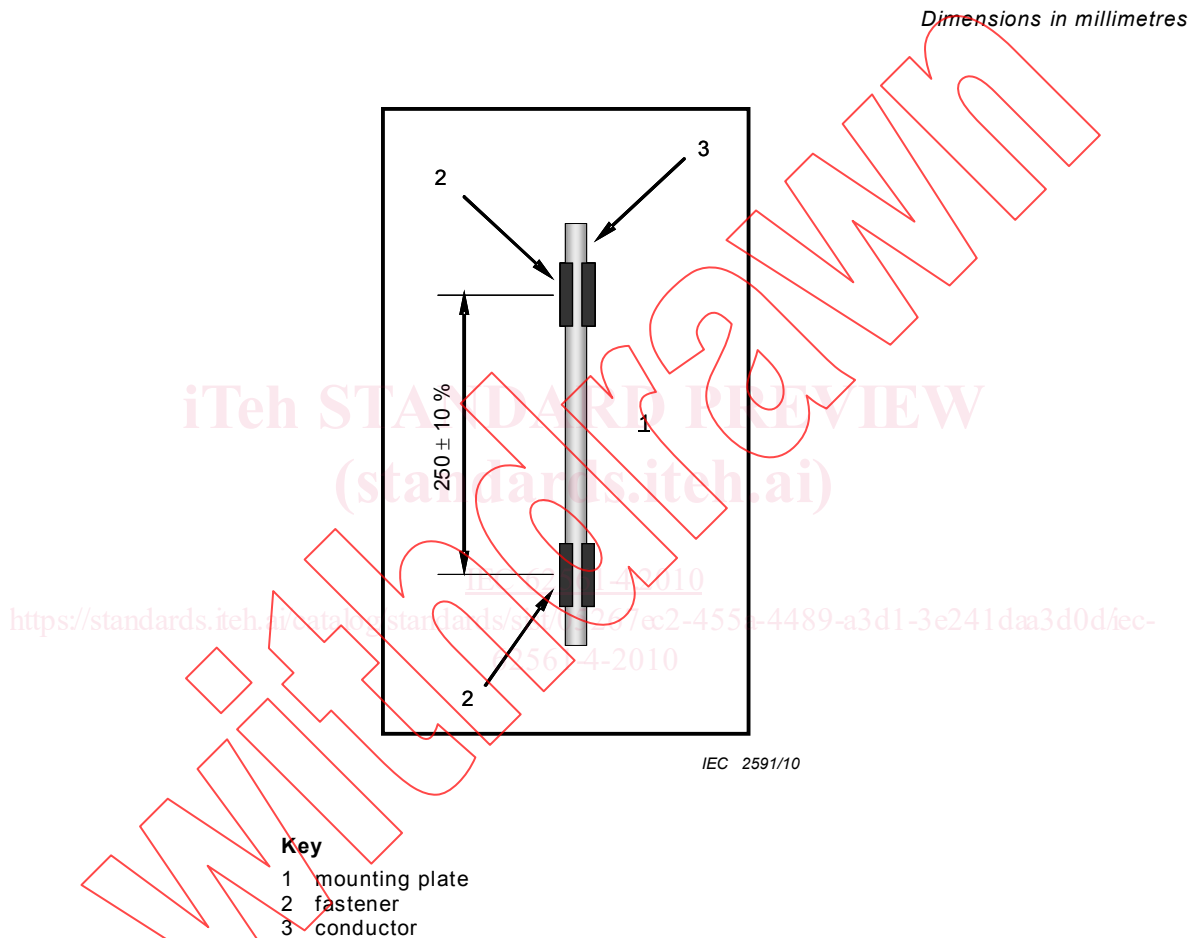


Figure 1 – Basic arrangement of specimens

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, Teflon) as shown in Figure 1 in accordance with the manufacturer's installation instructions, e.g. 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 ultra violet 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.

NOTE 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, Teflon) as shown in Figure 1 in accordance with the manufacturer's installation instructions, e.g. 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 as per 6.3.3 and
- test as per 6.3.2.

The specimens are deemed to have passed this part of the test if the base metal of its metal parts does not exhibit any corrosive deterioration and if its plastic parts show no sign of disintegration and no cracks visible to normal or corrected vision.

NOTE 1 Ensure that the surface of the mounting plate is suitable to resist UV radiation.

NOTE 2 White rust is not considered as 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 are 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 period of 5 min to 6 min and for composite and non-metallic conductor fasteners, the full test load is applied for a minimum period of 60 min to 61 min.

All tests are carried out at a temperature of -10 °C ($\pm 1\text{ °C}$) and repeated at a temperature of $+40\text{ °C}$ ($\pm 4\text{ °C}$).

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