

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Lightning protection system components (LPSC) –
Part 3: Requirements for isolating spark gaps (ISG)**

**Composants des systèmes de protection contre la foudre (CSPF) –
Partie 3: Exigences pour les éclateurs d'isolement**

<https://standards.iteh.ai/catalog/standards/sist/64d0fdce-38a9-4f46-974a-9971d11f47eb/iec-62561-3-2012>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2012 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

A propos de l'IEC

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

A propos des publications IEC

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

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Lightning protection system components (LPSC) –
Part 3: Requirements for isolating spark gaps (ISG)**

**Composants des systèmes de protection contre la foudre (CSPF) –
Partie 3: Exigences pour les éclateurs d'isolement**

<https://standards.iteh.ai/catalog/standards/sist/6146dce-38a9-4f46-974a-9971dflf47eb/iec-62561-3-2012>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.020 ; 91.120.40

ISBN 978-2-8322-2979-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 Classification.....	9
5 Requirements	9
5.1 General.....	9
5.2 Environmental requirements	9
5.3 Installation instructions	9
5.4 Lightning current carrying capability.....	10
5.5 Rated impulse sparkover voltage	10
5.6 Rated withstand voltage.....	10
5.6.1 Rated DC withstand voltage.....	10
5.6.2 Rated AC withstand voltage.....	10
5.7 Isolation resistance.....	10
5.8 Marking.....	10
5.9 UV resistance	10
6 Tests.....	11
6.1 General conditions for tests	11
6.2 Electrical test.....	11
6.2.1 Isolation resistance.....	11
6.2.2 Withstand voltage	11
6.2.3 Rated impulse sparkover voltage	12
6.2.4 Lightning current.....	12
6.2.5 Isolation resistance.....	13
6.2.6 Withstand voltage.....	13
6.2.7 Rated impulse sparkover voltage	13
6.3 Marking test.....	13
6.3.1 General conditions for tests	13
6.3.2 Acceptance criteria.....	13
7 Electromagnetic compatibility (EMC)	14
8 Structure and content of the test report.....	14
8.1 General.....	14
8.2 Report identification.....	14
8.3 Specimen description.....	14
8.4 Standards and references	14
8.5 Test procedure.....	15
8.6 Testing equipment description	15
8.7 Measuring instruments description.....	15
8.8 Results and parameters recorded	15
8.9 Statement of pass/fail	15

Annex A (normative) Environmental test for isolating spark gaps 16

Annex B (normative) Flow chart of tests..... 17

Bibliography..... 18

Table 1 – Lightning impulse current (I_{imp}) parameters^a 13

Witholdrawn

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/64d0fdce-38a9-4f46-974a-9971df1f47eb/iec-62561-3-2012>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –**Part 3: Requirements for isolating spark gaps (ISG)**

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 62561-3 has been prepared by IEC technical committee: Lightning protection.

This bilingual version (2015-10) corresponds to the English version published in 2012-02.

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

FDIS	Report on voting
81/418/FDIS	81/424A/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.

The French version of this standard has not been voted upon.

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

The content of this part of IEC 62561 is taken from the European Standard EN 50164-3.

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 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 62561-3:2012](https://standards.iteh.ai/catalog/standards/sist/64d0dce-38a9-4f46-974a-9971dflf47eb/iec-62561-3-2012)

<https://standards.iteh.ai/catalog/standards/sist/64d0dce-38a9-4f46-974a-9971dflf47eb/iec-62561-3-2012>

INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for isolating spark gaps (ISG) used for the installation of a lightning protection system (LPS) designed and implemented according to IEC 62305 series of standards.

Withhold
iTeh STANDARD PREVIEW
(standards.itih.ai)
<https://standards.itih.ai/catalog/standards/sist/64d0fdce-38a9-4f46-974a-9971dflf47eb/iec-62561-3-2012>

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 3: Requirements for isolating spark gaps (ISG)

1 Scope

This part of IEC 62561 specifies the requirements and tests for isolating spark gaps (ISG) for lightning protection systems.

ISGs can be used to indirectly bond a lightning protection system to other nearby metalwork where a direct bond is not permissible for functional reasons.

Typical applications include the connection to:

- earth termination systems of power installations;
- earth termination systems of telecommunication systems;
- auxiliary earth electrodes of voltage-operated, earth fault circuit breakers;
- rail earth electrode of AC and DC railways;
- measuring earth electrodes for laboratories;
- installations with cathodic protection and stray current systems;
- service entry masts for low-voltage overhead cables;
- bypassing insulated flanges and insulated couplings of pipelines.

This standard does not cover applications where follow currents occur.

NOTE Lightning protection system components (LPSC) can also be suitable for use in hazardous conditions such as fire and explosive atmosphere. Due regard will be taken of the extra requirements necessary for the components to be installed in such conditions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61643-11, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods*

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

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

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

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

3 Terms and definitions

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

3.1

isolating spark gap

ISG

component with discharge distance for isolating electrically conductive installation sections

Note 1 to entry In the event of a lightning strike, the installation sections are temporarily connected conductively as the result of the response of the discharge.

3.2

sparkover voltage

maximum voltage value before disruptive discharge between the electrodes of the ISG

3.3

withstand voltage

value of the test voltage to be applied under specified conditions in a withstand test, during which a specified number of disruptive discharges is tolerated

3.4

power frequency withstand voltage

r.m.s value of a sinusoidal power frequency voltage that the ISG can withstand during tests made under specified conditions and for a specified time

3.5

DC withstand voltage

value of a DC voltage that the ISG can withstand during tests made under specified conditions and for a specified time

3.6

rated withstand voltage

value of a withstand voltage declared by the manufacturer to characterize the isolating behaviour of an ISG

3.7

rated power frequency withstand voltage

$U_{W AC}$

value of a power frequency withstand voltage declared by the manufacturer to characterize the isolating behaviour of an ISG

3.8

rated DC withstand voltage

$U_{W DC}$

value of a DC withstand voltage declared by the manufacturer to characterise the isolating behaviour of an ISG

3.9

impulse sparkover voltage

impulse voltage of the waveshape 1,2/50 to classify the sparkover behaviour of the ISG

3.10

rated impulse sparkover voltage

$U_{r imp}$

manufacturer's declaration of the ISG sparkover voltage

3.11

isolation resistance

ohmic resistance of the ISG between the active parts

3.12

lightning impulse current

I_{imp}
impulse current that classifies an ISG

Note 1 to entry Five parameters are to be considered; the peak value, the charge, the duration, the specific energy and the rate of rise of the impulse current.

4 Classification

According to the ISG's capability to withstand lightning current, as per Table 1, the following classes apply:

- a) class H for heavy duty;
- b) class N for normal duty;
- c) class 1L for light duty;
- d) class 2L for light duty;
- e) class 3L for light duty.

5 Requirements

5.1 General

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

5.2 Environmental requirements

ISGs shall be designed in such way that they operate satisfactorily under the environmental conditions given by the normal service conditions. Outdoors ISG shall be contained in a weather shield of glass-glazed ceramic, or other acceptable material, that is resistant to UV radiation, corrosion and erosion.

5.3 Installation instructions

The manufacturer of the ISG shall provide adequate instructions in their literature to ensure that the installer of the ISG can select and install them in a suitable and safe manner.

These instructions shall contain at least the following information:

- classification and lightning current capability (I_{imp});
- rated withstand voltage;
- rated impulse sparkover voltage ($U_{r imp}$);
- rated power frequency withstand voltage ($U_{W AC}$);
- rated DC withstand voltage ($U_{W DC}$);
- assembly instructions with installation location (if crucial to the function);
- appropriate connection components for the installation if not part of the ISG.

Compliance is checked by inspection.

5.4 Lightning current carrying capability

ISGs shall have sufficient lightning current carrying capability.

Compliance is checked in accordance with Clause 6 following the manufacturer's declaration for the class of the ISG in accordance with Clause 4.

5.5 Rated impulse sparkover voltage

The ISG shall always spark over at this value during the tests.

The ISG may experience some variation of sparkover characteristics before and after the lightning current test. This shall be included in the rated impulse sparkover voltage defined by the manufacturer.

5.6 Rated withstand voltage

5.6.1 Rated DC withstand voltage

The ISG shall never spark over at this value during the tests even after performing the lightning current test.

5.6.2 Rated AC withstand voltage

The ISG shall never spark over at this value during the tests even after performing the lightning current test.

5.7 Isolation resistance

Before the lightning current test, the isolation resistance shall be higher than 100 M Ω and after the lightning current test, isolation resistance shall not be lower than 500 k Ω .

Compliance is checked in accordance with 6.2.1.

5.8 Marking

The ISG shall be marked at least with the following:

- a) manufacturer's or responsible vendor's name or trade mark;
- b) part number;
- c) the classification in accordance with Clause 4.

If the marking in accordance with b) is not practical, it may be given on the smallest packaging unit. The marking shall be durable and legible.

Compliance is checked in accordance with 6.3.

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

5.9 UV resistance

ISG housings shall be made of UV resistant material specified by the material's supplier.

Compliance is checked by inspection of the documentation.

6 Tests

6.1 General conditions for tests

The tests in accordance with this standard are type tests and performed in a sequence according to Annex B.

- Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use according to the manufacturer's or supplier's instructions.
- Unless otherwise specified, three specimens are subjected to the tests and the requirements are satisfied if all the tests are met.
- If only one of the specimens does not satisfy a test due to an assembly or manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated. The tests which follow shall also be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements.
- If the ISG has an integral connection component part with its design, it shall be subjected to the testing regime of IEC 62561-1 using the appropriate lightning current given in Table 1 of this standard.

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

Prior to the testing of the ISG and clamp assembly, suitable protection measures should be employed to ensure that the housing is not exposed to the conditioning treatment.

6.2 Electrical test

6.2.1 Isolation resistance

The test is conducted with a d.c. voltage of 0,5 times the rated withstand voltage up to a maximum of 500 V.

The resistance shall be measured after 30 s of applying the test voltage.

The specimen is deemed to have passed the test if the resistance is equal or greater than 100 M Ω .

6.2.2 Withstand voltage

6.2.2.1 General

The rated withstand voltage shall be tested according to the value declared by the manufacturer in accordance with 3.6.

6.2.2.2 Power frequency withstand voltage

6.2.2.2.1 General conditions for tests

The rated power frequency withstand voltage is tested by applying an a.c. voltage at the terminals of the ISG. The voltage is increased continuously at a rate of 100 V/s with a nominal frequency of 50 Hz or 60 Hz until the r.m.s. value as declared by the manufacturer is reached and this is maintained for a time of 60 s \pm 1 s.