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Lightning protection system components (LPSC) -
Part 8: Requirements for components for electrically insulated LPS

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Lightning protection system components (LPSC) - Part 8: Requirements for components for electrically insulated LPS

FOREWORD

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IEC 62561-8 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This first edition cancels and replaces IEC TS 62561-8 published in 2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC TC 62561-8:2018:

a) title and scope of the standard has been adjusted;
b) the document has been updated in line with IEC 60068-2-52:2017 on salt mist treatment;
c) the document has been updated in line with ISO 22479:2019 on humid sulphureous atmosphere treatment;
d) two different possible example configurations for pull out tests have been introduced;
e) additional information on pollution has been included;

f) an alternate test arrangement for high voltage impulse test has been included;

g) a new normative Annex H for applicability of previous tests has been introduced;

h) pass criteria for high voltage impulse testing updated;

i) explanation on high voltage impulse testing with negative polarity has been added.

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

Draft	Report on voting
81/806/FDIS	81/808/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 parts in the 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 components for electrically insulated LPS, used for the installation of a lightning protection system (LPS) designed and implemented according to the IEC 62305 series [1][1].

[1] Numbers in square brackets refer to the Bibliography.

1 Scope

This document specifies the requirements and tests for components used for electrically insulated LPS. These components, which can reduce the separation distance, are as follows:

– insulating stand-offs, used in conjunction with an air-termination system and down-conductors with the aim of maintaining the proper separation distance;

– insulating down-conductors, including their specific fasteners.

Testing of insulating stand-offs and insulating down-conductor components for an explosive atmosphere is not covered by this document.

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 60060-2:2025, *High-voltage test techniques - Part 2: Measuring systems*

IEC 60068-2-52:2017, *Environmental testing - Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-75:2014, *Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests*

IEC 61083-1, *Instruments and software used for measurements in high-voltage and high-current tests - Part 1: Requirements for instruments for impulse tests*

IEC 61083-2, *Instruments and software used for measurement in high-voltage and high-current tests - Part 2: Requirements for software for tests with impulse voltages and currents*

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

IEC 62561-1:2023, *Lightning protection system components (LPSC) - Part 1: Requirements for connection components*

IEC 62561-2:2025, *Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes*

IEC 62561-4, *Lightning protection system components (LPSC) - Part 4: Requirements for conductor fasteners*

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

ISO 4892-3:2024, *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 terminological databases for use in standardization at the following addresses:

– IEC Electropedia: available at http://www.electropedia.org/

– ISO Online browsing platform: available at http://www.iso.org/obp

3.1
insulating stand-off
non-metallic or composite component, consisting of the insulator and fixation parts, designed to retain, support and insulate the air-termination system or down-conductors at a required separation distance

3.2
effective length correction factor
k_x
factor evaluating the different withstand voltages of air gaps and insulators under test voltages

3.3
steepness correction factor
c_{is_st}
<insulating stand-off> factor considering the effect of higher steepness and the probability of occurrence of subsequent negative short strokes on the disruptive voltage of an insulating stand-off

Note 1 to entry: The value is defined in the test procedure.

3.4
effective length
l_{eff}
<insulating stand-off> length (distance) of an air gap with equivalent breakdown behaviour to an insulating stand-off

3.5
insulating length
l_{st}
<insulating stand-off> shortest measured clearance distance between two conductive elements of different electrical potential, for example between a metallic conductor fastener and a mounting assembly

3.6
equivalent separation distance
s_e
corrected distance value to be used instead of the insulating length of a stand-off distance value equivalent to the separation distance of conventional down-conductors required in IEC 62305-3

3.7
down-conductor
part of the down-conductor system intended to conduct lightning current from the air-termination system to the earth-termination system of the LPS

[SOURCE: IEC 62561-2:2025, 3.7]

3.8
insulating down-conductor
conductor provided with a layer of electric insulation with the purpose to reduce the separation distance

3.9
steepness correction factor
c_{dc_st}
<insulating down-conductor> factor considering the effect of higher steepness and the probability of occurrence of subsequent negative short strokes on the withstand voltage of insulating down-conductors during testing

Note 1 to entry: The value is defined in the test procedure.

3.10
clearance of the comparison arrangement
s_c
gap distance of the comparison arrangement used for verification of the effective length correction factor k_x and separation distance s_e

3.11
time to chopping
T_c
virtual parameter defined as the interval between the virtual origin and the instant of chopping

3.12
effective material insulating factor
k_m
coefficient of material which depends on the electrical insulation material

Note 1 to entry: See IEC 62305-3.

3.13
installation arrangement
installation containing one or more insulating down-conductors and additional installation means (according to the manufacturer's instruction) to keep the defined separation distance and to support the insulating down-conductor mechanically

Note 1 to entry: One example is given in Figure F.1.

3.14
fasteners for insulating down-conductors
metallic, non-metallic or composite components designed to retain and support down-conductor installed at intervals along the length of the conductors

4 Insulating stand-off

4.1 Classification

4.1.1 General

Classification of the product depends on the withstand capability of mechanical forces.

4.1.2 According to conductor clamping arrangement

There are two classes of insulating stand-off according to the conducting 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.

4.1.3 According to mounting

Regarding the mounting, there are two classes of insulating stand-off:

a) free standing;

b) rigidly fixed on a structure.

4.2 Requirements

4.2.1 General

An insulating stand-off shall retain, support and insulate the conductor when subjected to the stress of a lightning discharge under high impulse voltage and shall withstand the mechanical and environmental influences such as perpendicular and axial compression loads caused by the weight of the supported conductor along with snow, ice, wind and thermal expansion or contraction of the conductor.

An insulating stand-off shall be compatible with the conductor it is supporting and the surface to which it is fixed.

4.2.2 Construction

4.2.2.1 General

An insulating stand-off shall be so designed and constructed that

a) the surface is free from burrs, flash moulding, deformation and similar inconsistencies which are likely to inflict injury to the installer or user, and

b) it carries the perpendicular and axial compression loads caused by the weight of the supported conductor along with snow, ice, wind and thermal expansion/contraction of the conductor.

Compliance to a) is checked by visual inspection and compliance to b) is checked in accordance with 4.3.6.2 and 4.3.6.4.

4.2.2.2 Corrosion resistance

An insulating stand-off shall withstand the effects of corrosion typical of the environment to which it is exposed.

Compliance is checked by testing in accordance with 4.3.5.1.

4.2.2.3 UV light resistance

An insulating stand-off shall withstand the effects of UV exposure typical of the environment to which it is exposed.

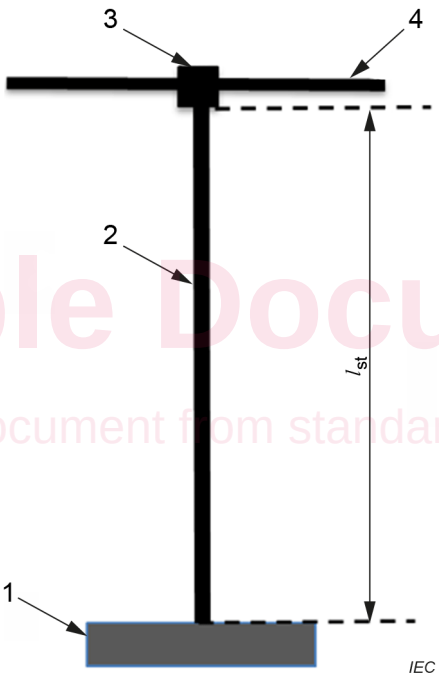
Compliance is checked by testing in accordance with 4.3.5.2.

4.2.3 Mechanical requirements

4.2.3.1 General

An insulating stand-off can consist of a mounting assembly, an insulator and a conductor fastener as shown in Figure 1 and Figure 2. The manufacturer of the insulating stand-off shall guarantee with appropriate mechanical tests or calculations that the stand-off fulfills the requirements stated in their documentation.

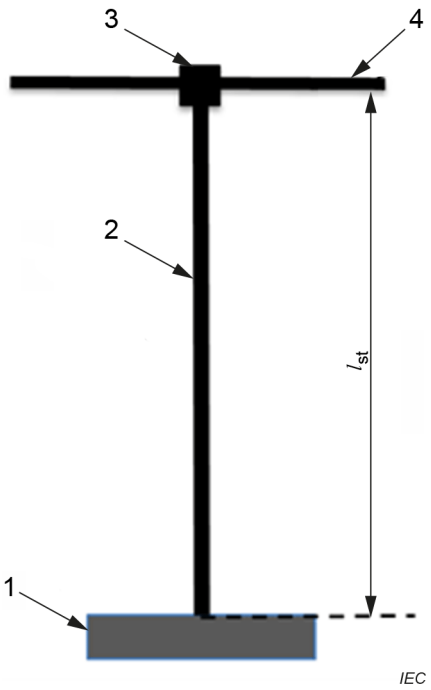
Compliance is checked by testing in accordance with 4.3.



Key

1 mounting assembly
2 insulator
3 metallic conductor fastener
4 conductor
l_{st} insulating length

Figure 1 – Typical insulating stand-off with a metallic fastener



Key

1 mounting assembly

2 insulator

3 non metallic conductor fastener

4 conductor

l_{st} insulating length

Figure 2 – Typical insulating stand-off with a non-metallic fastener

4.2.3.2 Mounting assembly

The mounting assembly, which holds the insulator in position on the structure, shall withstand mechanical stress.

Compliance is checked by testing in accordance with 4.3.6.

4.2.3.3 Insulator

The insulator shall withstand mechanical stress, for example pull out force, impact strength and bending load.

Compliance is checked by testing in accordance with 4.3.6.

4.2.3.4 Conductor fastener

The conductor fastener, which is part of the insulating stand-off, shall comply with the requirements and tests of IEC 62561-4.

4.2.4 Electrical requirements

An insulating stand-off shall be capable of withstanding the very high impulse voltages generated by a lightning strike.

An insulating stand-off has an insulating length l_{st}, as shown in Figure 1 and Figure 2. This is different from its effective length l_{eff}, which is the value to be compared to the required separation distance s according to IEC 62305-3. This effective length of the insulating stand-off shall be equal to or greater than the required separation distance s.

The isolating capability of an insulating stand-off can be provided by either

a) its effective length l_{eff}, or

b) its effective length correction factor k_x.

The effective length correction factor k_x is determined from the effective length l_{eff} and the insulating length l_{st} as showed in Formula (1):

$$k_x = \frac{I_{eff}}{I_{st}} \quad (1)$$

Compliance is checked by testing in accordance with 4.3.1, 4.3.2 and 4.3.7.

For the purpose of calculating the separation distance as used in IEC 62305-3, the value of the effective material insulating factor k_m can be set equal to the value k_x.

NOTE A value of k_x = 0,7 for GFRP, PE and PVC insulating stand-offs under normal operating conditions can be used, based on laboratory test results [2].

4.2.5 Documentation and installation instructions

The manufacturer or supplier of the insulating stand-off shall provide adequate information in the installation instructions to ensure that the installer can select and install the component in a suitable and safe manner in accordance with the requirements of IEC 62305-3.

Compliance is checked by inspection in accordance with 4.3.3.

4.2.6 Marking

4.2.6.1 Content of marking

An insulating stand-off shall be marked with

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

b) the product identification or type.

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

Compliance is checked by visual inspection.

4.2.6.2 Durability and legibility

Marking on the product shall be durable and easily legible.

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

Compliance is checked by testing in accordance with 4.3.4.