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Interested committees:

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



81/685/CD

COMMITTEE DRAFT (CD)

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81/677/RR

IEC TC 81 : LIGHTNING PROTECTION

SECRETARIAT:

Italy

SECRETARY:

Mrs Marina Bernardi

OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 37A, TC 64, TC 88

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 8: Requirements for components for isolated LPS

FOREWORD

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- ~~• the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.~~

~~Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.~~

~~International Specification IEC 62561-8 has been prepared by IEC technical committee 81: Lightning Protection.~~

IEC 62561 is a family of Standards and Technical Specifications and consists of the following parts under the generic title *Lightning Protection System Components (LPSC)*:

- Part 1 *Requirements for connection components*
- Part 2 *Requirements for conductors and earth electrodes*
- Part 3 *Requirements for isolating spark gaps (ISG)*
- Part 4 *Requirements for conductor fasteners*
- Part 5 *Requirements for earth electrode inspection housings and earth electrode seals*
- Part 6 *Requirements for lightning strike counters (LSC)*
- Part 7 *Requirements for earthing enhancing compounds*
- Part 8 *Requirements for components for isolated LPS (Technical Specification)*

~~The text of this technical specification is based on the following documents:~~

Enquiry draft	Report on voting
81/XX/DTS	81/XX/RVC

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- ~~• transformed into an International standard,~~
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

The National Committees are requested to note that for this publication the stability date is 2026.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 8: Requirements for components for isolated LPS

1 Scope

This document specifies the requirements and tests for insulating stand-offs, used in conjunction with an air-termination system and down-conductors with the aim of maintaining the proper separation distance, and the requirements and tests for insulating down-conductors, including their specific fasteners, able to reduce the separation distance.

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

Requirements and tests for other type of components for isolated LPS are under consideration.

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2:2010, *High Voltage test techniques – Part 2: Measuring systems*

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

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

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

IEC 61083-2, *Digital recorders for measurements in high-voltage impulse tests – Part 2: Evaluation of software used for the determination of the parameters of impulse waveforms*

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

IEC 62561-2:2012, *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*

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

192 ISO 4892-4, *Plastics – Methods of Exposure to laboratory light sources – Part 4: Open –*
193 *flame carbon – arc lamps*

194 ISO 6988:1994, *Metallic and other non-organic coatings – Sulphur dioxide test with general*
195 *condensation of moisture*

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

197 **3 Definitions**

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

199 ISO and IEC maintain terminological databases for use in standardization at the following
200 addresses:

- 201 • IEC Electropedia: available at <http://www.electropedia.org/>
- 202 • ISO Online browsing platform: available at <http://www.iso.org/obp>

203 **3.1**

204 **insulating stand-off**

205 non-metallic or composite component, consisting of the insulator and fixation parts, designed
206 to retain, support and insulate the air-termination system and/or down-conductors at a
207 required separation distance

208 **3.2**

209 **effective length correction factor**

210 k_x

211 factor evaluating the different withstand voltage of air gaps and insulators under test voltages
212 and environmental influences like pollution and/or UV light degradation

213 **3.3**

214 **steepness correction factor for insulating stand-offs**

215 c_{is_st}

216 factor considering the effect of higher steepness and the probability of occurrence of
217 subsequent negative short strokes on the flashover voltage of an insulating stand-off

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

219 **3.4**

220 **effective length of an insulating stand-off**

221 l_{eff}

222 length (distance) of an air gap with equivalent break down behaviour to an insulating stand-off

223 **3.5**

224 **corrected distance value of an insulating stand-off**

225 l_{st}

226 the shortest measured clearance distance between two conductive elements of different
227 electrical potential, e.g. 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**

conductor made of bare metal

3.8**insulating down-conductor**

conductor provided with a layer of insulation with the purpose to reduce the separation distance

3.9**steepness correction factor for insulating down-conductors** $c_{dc, st}$

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**partial insulating down-conductor**

conductor provided with a layer of insulation with the purpose to reduce the separation distance, supported by insulating stand-offs

3.11**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

3.12**time to chopping** T_c

virtual parameter defined as the interval between the virtual origin and the instant of chopping

3.13**effective material insulating factor** k_m

the coefficient of material, which is depending on the electrical insulation material

SEE IEC 62305-3

3.14**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.

3.15**fasteners for insulating down-conductors**

metallic, non-metallic or composite component designed to retain and support down conductor installed at intervals along the length of the conductors. Fasteners are not supporting structures having an influence on the dielectric strength of the installation arrangement.

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

- 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

- 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/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:

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

Compliance is checked by visual inspection.

- 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 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.

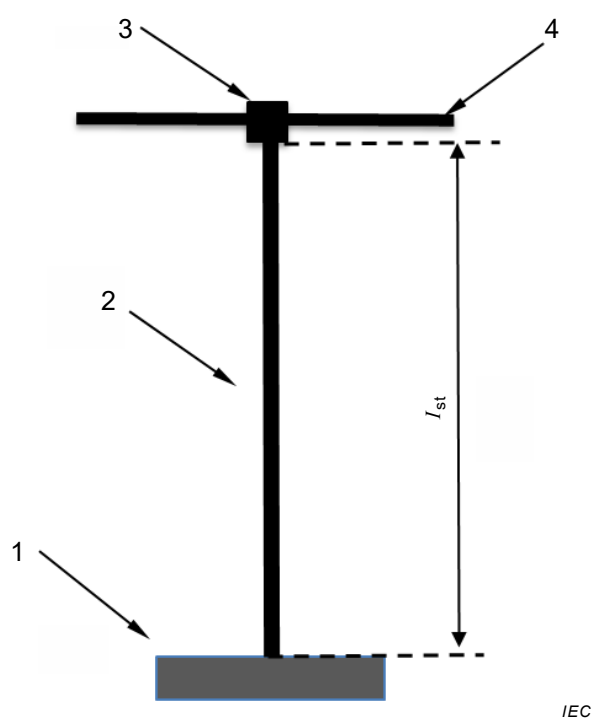
Compliance is checked by testing in accordance with 4.3.5.2.

4.2.3 Mechanical requirements

4.2.3.1 General

An insulating stand-off may consist of a mounting assembly, an insulator and a conductor fastener as shown in Figure 1 and/or 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 his documentation.

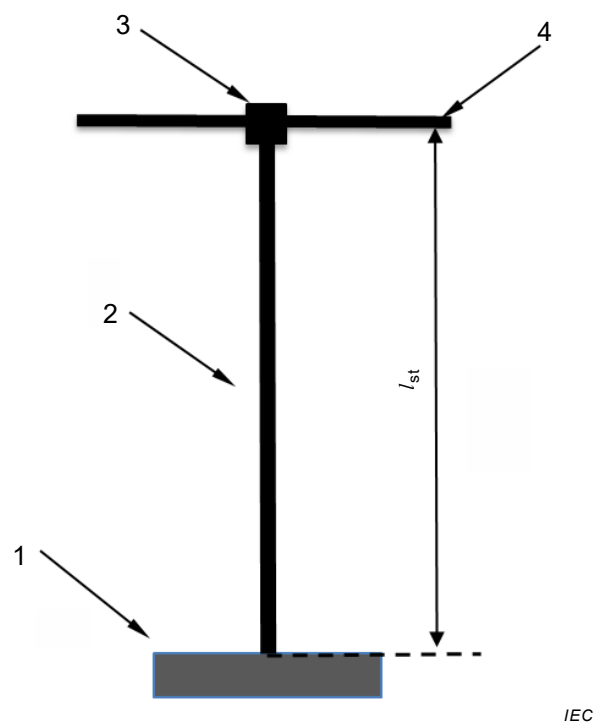
Compliance is checked by testing in accordance with 4.3.



Key

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

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



IEC

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 e.g. pull out force, impact strength, 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 able to withstand the very high impulse voltages generated by a lightning strike.

An insulating stand-off has an insulating length l_{st} which is different from its effective length l_{eff} . The isolating capability of an insulating stand-off may 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 follows:

$$k_x = \frac{l_{eff}}{l_{st}}$$

The effective length l_{eff} is the value which shall 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 .

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 k_m can be set equal to the value k_x .

NOTE Based on experience, a value of $k_x = 0,7$ for GFRP, PE and PVC insulating stand-offs under normal operating conditions has been found to be typical.

4.2.5 Documentation

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

An insulating stand-off 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 provided on the smallest supplied packaging.

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.

4.3 Tests

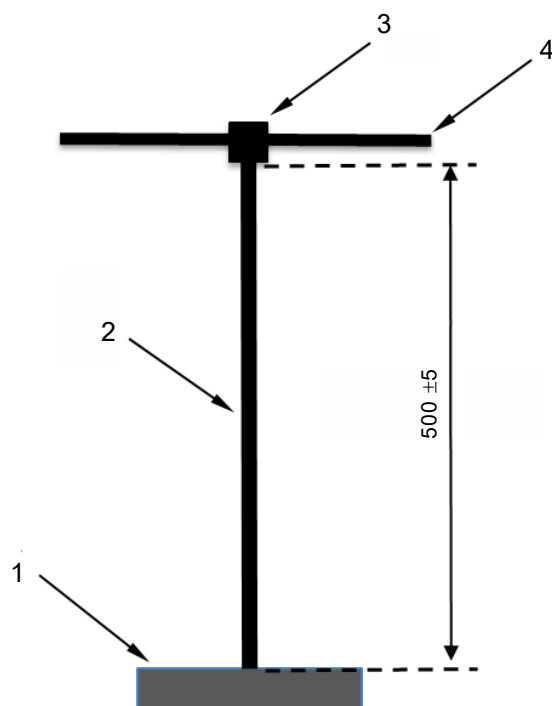
4.3.1 General test conditions

Tests according to this document 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 of the insulating stand-off.

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

The insulating length l_{st} of all specimens shall be (500 ± 5) mm unless otherwise specified in the relevant test procedure. The manufacturer shall prepare the test specimens according to Figure 3 and/or Figure 4.

Dimension in millimetres



IEC

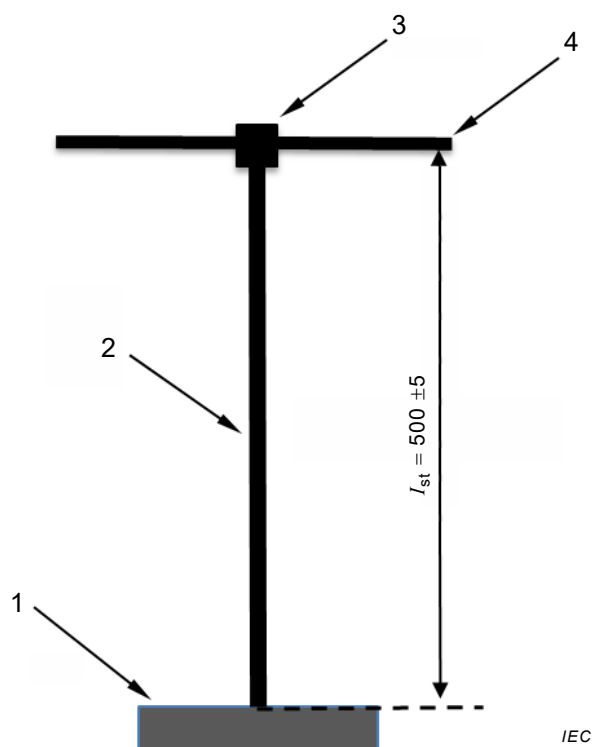
Key

- 1 mounting assembly
- 2 insulator
- 3 metallic conductor fastener
- 4 conductor

Figure 3 – Typical insulating stand-off with a metallic fastener prepared for testing

405

Dimension in millimetres



406

407 **Key**

- 408 1 mounting assembly
 409 2 insulator
 410 3 non metallic conductor fastener
 411 4 conductor
 412 l_{st} insulating length

413

414 **Figure 4 – Typical insulating stand-off with a non-metallic fastener**
 415 **prepared for testing**

416 This Technical Specification cannot cover all possible types of insulating stand-offs and the
 417 way of fixing them on various surfaces of different materials. When required for these
 418 applications, agreement should be obtained between the test engineer and manufacturer on
 419 the specific testing regime.

420 An insulating stand-off classified by the manufacturer in more than one of the classifications
 421 in 4.1 shall be tested for each applicable category.

422 Type tests are carried out on three specimens according to the test sequence indicated in
 423 Table 1. Within any test sequence, the tests shall be carried out in the order given in
 424 Annex C.

425 A specimen has passed a test sequence of Table 1 if all the requirements of the relevant test
 426 clauses and the relevant pass criteria have been fulfilled.

427 If the required number of specimens pass a test sequence, the design of the insulating
 428 stand-off is acceptable for that test sequence. If two or more test specimens fail a test
 429 sequence, the insulating stand-off does not comply with this Technical Specification.

430 In the event that a single specimen does not pass a test, this test, and those preceding in the
 431 same test sequence that may have influenced the result of this test, shall be repeated with

three new specimens. No failure of any specimen is allowed in the second sequence of tests. One set of three specimens may be used for more than one test sequence if agreed by the manufacturer.

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

Tests shall not commence earlier than 168 h from the time of manufacture.

When not otherwise specified, the test shall be performed in free air, with an ambient temperature between +15 °C and +40 °C and relative humidity between 25 % and 75 %.

A torque meter having a resolution of at least 0,5 Nm and an accuracy of at least 4 % shall be used for all tightening operations.

NOTE Upon the instructions of the manufacturer, a set of specimens previously tested may also be suitable for use in other tests of this same standard as well.

Table 1 – Type test requirements for an insulating stand-off

Test sequence	Test description	Sub-clause	Identification of sets (one set consists of 3 specimens)	Number of specimens
1	Documentation	4.3.3	A	1
	Marking test	4.3.4	A	3
	Construction	4.3.6.1	A	3
	UV light test	4.3.5.2	B,C,D	9 or more due to surface deterioration during high voltage test.
	Corrosion test	4.3.5.1	A	3
	Pull out test	4.3.6.4	A	3
2	Bending test	4.3.6.2	B	3
	Impact test of the insulator	4.3.6.3	C	3
	Electrical test	4.3.7	D	3 or more due to surface deterioration during high voltage test.

4.3.2 General test setup

Unless 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 according to the manufacturer's installation instructions, e.g. with the recommended conductors and tightening torques.

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

Any insulating stand-off accommodating a range of conductor's variance in diameter shall be tested on the minimum conductor size recommended.