

INTERNATIONAL STANDARD

COMMENTED VERSION

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

get full document from standards.iteh.ai



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2026 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.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	4
INTRODUCTION	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Insulating stand-off	10
4.1 Classification	10
4.1.1 General	10
4.1.2 According to conductor clamping arrangement	10
4.1.3 According to mounting	10
4.2 Requirements	10
4.2.1 General	10
4.2.2 Construction	10
4.2.3 Mechanical requirements	11
4.2.4 Electrical requirements	12
4.2.5 Documentation and installation instructions	13
4.2.6 Marking	13
4.3 Tests	14
4.3.1 General test conditions	14
4.3.2 General test setup	16
4.3.3 Documentation	17
4.3.4 Marking test	17
4.3.5 Environmental influence tests	17
4.3.6 Mechanical tests	18
4.3.7 Electrical test	25
4.4 Electromagnetic compatibility (EMC)	27
4.5 Structure and content of the test report	27
4.5.1 General	27
4.5.2 Report identification	27
4.5.3 Specimen description	28
4.5.4 Characterization and condition of the test specimen or test assembly	28
5 Insulating down-conductor	29
5.1 Classification	29
5.2 Lightning current carrying capability	29
5.3 Preferred values of equivalent separation distance (s_e)	30
5.4 Requirements	30
5.4.1 General	30
5.4.2 Environmental requirements	30
5.4.3 Mechanical requirements	30
5.4.4 Electrical requirements	30
5.4.5 Documentation	31
5.4.6 Marking	31
5.5 Tests	32
5.5.1 General test conditions	32
5.5.2 General test setup	33
5.5.3 Documentation	34

5.5.4	Marking test.....	34
5.5.5	Environmental influence tests	34
5.5.6	Mechanical tests.....	36
5.5.7	Electrical tests.....	40
5.6	Electromagnetic compatibility (EMC).....	48
5.7	Structure and content of the test report.....	48
5.7.1	General	48
5.7.2	Report identification.....	49
5.7.3	Specimen description	49
5.7.4	Characterization and condition of the test specimen or test assembly.....	49
5.7.5	Insulating down-conductor	49
5.7.6	Standards and references.....	50
5.7.7	Test procedure	50
5.7.8	Testing equipment description	50
5.7.9	Measuring instruments description.....	50
5.7.10	Results and parameters recorded	50
Annex A (normative)	Environmental test – Corrosion resistance	51
A.1	General.....	51
A.2	Salt mist test.....	51
A.3	Humid sulphurous atmosphere test	51
A.4	Ammonia atmosphere test.....	51
Annex B (normative)	Environmental test – Resistance to ultraviolet light	52
B.1	General.....	52
B.2	Test.....	52
B.3	First alternative test to Clause B.2	52
B.4	Second alternative test to Clause B.2	52
Annex C (normative)	Flow chart of tests for insulating stand-offs	53
Annex D (normative)	Flow chart of tests for insulating down-conductors	55
Annex E (informative)	High voltage impulse test to determine the actual correction factor k_x for insulating stand-offs	57
E.1	Specimen preparation	57
E.2	Test setup.....	57
E.3	Test procedure.....	57
Annex F (informative)	Installation arrangement test to determine the influence of supporting structures on the separation distance	59
F.1	General.....	59
F.2	Specimen preparation for the high voltage installation arrangement test	59
F.3	Test procedure.....	60
Annex G (normative)	Alternate test arrangement for high voltage impulse test.....	61
Annex H (normative)	Applicability of previous tests.....	64
Bibliography	65
List of comments	66
Figure 1 – Typical insulating stand-off with a metallic fastener		11
Figure 2 – Typical insulating stand-off with a non-metallic fastener		12
Figure 3 – Typical insulating stand-off with a metallic fastener prepared for testing		14
Figure 4 – Typical insulating stand-off with a non-metallic fastener prepared for testing		15

Figure 5 – Basic arrangement for bending test.....	19
Figure 6 – Pendulum hammer test apparatus.....	20
Figure 7 – Basic arrangement for pull out test on rigidly fixed insulating stand-off.....	21
Figure 7 – Two alternative basic arrangements for pull out test on rigidly fixed insulating stand-off.....	22
Figure 8 – Basic arrangement for pull out test on free standing insulating stand-off.....	23
Figure 8 – Two alternative basic arrangements for pull out test on free standing insulating stand-off.....	24
Figure 9 – General description of the Typical test arrangement for the high voltage impulse test of an insulating stand-off.....	25
Figure 10 – Specimen preparation for UV light test.....	35
Figure 11 – Basic arrangement for lateral load test.....	36
Figure 12 – Typical arrangement for axial movement test.....	37
Figure 14 – General description of the test setup for the high voltage impulse test of the insulating down-conductor.....	40
Figure 11 – Basic arrangement for the lightning current carrying capability test.....	41
Figure 12 – Test arrangements for the high voltage impulse test of the insulating down-conductor.....	44
Figure 15 – Test arrangement for insulating down-conductors.....	45
Figure 16 – Test arrangement for partial insulating down-conductors.....	46
Figure 13 – Test arrangements for insulating down-conductors.....	47
Figure C.1 – Tests for insulating stand-offs.....	54
Figure D.1 – Tests for insulating down-conductors.....	56
Figure E.1 – General description of the test arrangement to determine the actual correction factor k_x for insulating stand-offs.....	57
Figure F.1 – Example for installation arrangement test – Specimen under test.....	59
Figure F.2 – Alternate example for installation arrangement test – Specimen under test.....	60
Figure G.1 – Typical test arrangement for the high voltage impulse test of an insulating stand-off – Alternate test arrangement to Figure 9.....	61
Figure G.2 – General description of the test setup for the high voltage impulse test of the insulating down-conductor – Alternate test set-up to Figure 12 a).....	62
Figure G.3 – Alternate test arrangement for the high voltage impulse test of the insulating down conductor – alternate test set-up to Figure 12 b).....	62
Figure G.4 – General description rod tip and rod – Plane arrangement geometry.....	63
Table 1 – Type test requirements for an insulating stand-off.....	16
Table 2 – Lightning impulse current (I_{imp}) parameters.....	29
Table 3 – Type test requirements for an insulating down-conductor and fasteners	33
Table H.1 – Differences in the requirements for electrically insulated LPS complying with IEC TS 62561-8:2018.....	64

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Lightning protection system components (LPSC) -
Part 8: Requirements for components for ~~isolated~~ electrically
insulated LPS 1**

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TS 62561-8:2018. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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.

Sample Document

get full document from standards.iteh.ai

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, ~~and the requirements and tests for insulating down-conductors, including their specific fasteners, able to reduce the separation distance;~~
- insulating down-conductors, including their specific fasteners. **2**

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

~~Requirements and tests for other types 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 60060-2:2010/2025, *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)* **3**

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 ~~impulse~~ 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 62561-1:2017/2023, *Lightning protection system components (LPSC) - Part 1: Requirements for connection components*

IEC 62561-2:2012/2025, *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 4892-3:2016/2024, *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 6988:1985, Metallic and other non-organic coatings — Sulfur dioxide test with general condensation of moisture~~

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) **4**

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 ~~and/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 ~~and environmental influences like pollution and/or UV light degradation~~

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 ~~flashover~~ 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

~~corrected distance value of an~~ **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

~~conductor made of bare metal~~

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 partial insulating down-conductor

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

3.10 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 expansion¹ 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

~~Compliance is checked by visual inspection.~~

- 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.

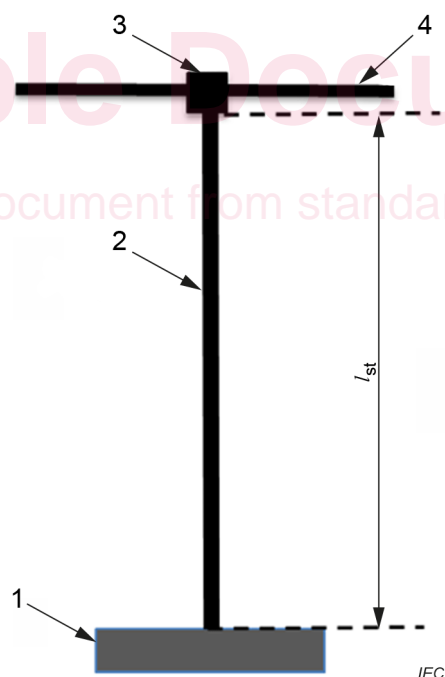
Compliance is checked by testing in accordance with 4.3.5.2.

4.2.3 Mechanical requirements

4.2.3.1 General

An insulating stand-off ~~may~~ can 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 their documentation.

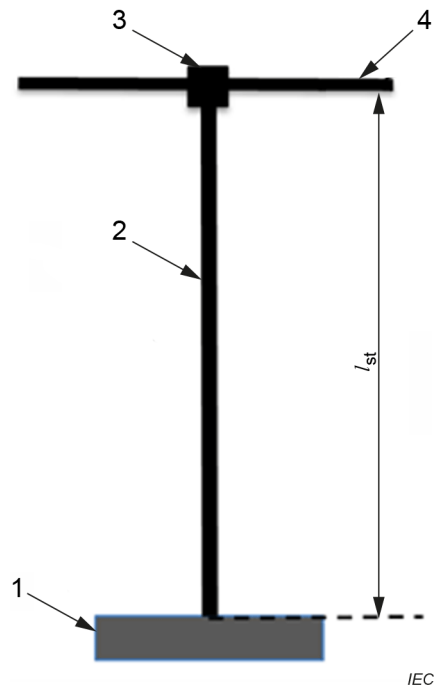
Compliance is checked by testing in accordance with 4.3.



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 ~~which shall~~ 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 ~~may~~ 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):

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

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 ~~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~~ 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.