



DPC: 22/30454213 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 05 April 2022

Origin: International

Latest date for receipt of comments: 11 May 2022

Project No. 2021/00654

Responsible committee: GEL/81 Protection against lightning

Interested committees:

Title: Draft BS EN IEC 62561-2 Lightning protection system components (LPSC). Part 2: Requirements for conductors and earth electrodes.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 11 May 2022

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

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

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (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.	



81/696/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62561-2 ED3

DATE OF CIRCULATION:

2022-03-18

CLOSING DATE FOR COMMENTS:

2022-06-10

SUPERSEDES DOCUMENTS:

81/649/CD, 81/662A/CC

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

This document is still under study and subject to change. It should not be used for reference purposes.

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 2: Requirements for conductors and earth electrodes

NOTE FROM TC/SC OFFICERS:

Copyright © 2022 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

Documents
Document Sharing Hub

CONTENTS

1		
2	CONTENTS	2
3	FOREWORD	5
4	INTRODUCTION	7
5	1 Scope	8
6	2 Normative references	8
7	3 Terms and definitions	8
8	4 Requirements	10
9	4.1 General	10
10	4.2 Documentation – installation instructions	10
11	4.3 Air-termination conductors, air-termination rods, catenary wires, earth lead- in rods and down conductors	11
12	4.4 Earth electrodes	13
13	4.4.1 General	13
14	4.4.2 Earth rods	14
15	4.4.3 Couplers for earth rods	14
16	4.4.4 Earth conductors and earth plates	15
17	4.5 Marking	15
18	5 Tests	17
19	5.1 General conditions for tests	17
20	5.2 Air-termination conductors, air-termination rods, catenary wires, down conductors, earth lead-in rods, earth conductors and earth plates	17
21	5.2.1 General	17
22	5.2.2 Test for thickness of coating	18
23	5.2.3 Bending and adhesion test for coated conductors	20
24	5.2.4 Environmental test for coated materials	20
25	5.2.5 Electrical resistivity test	20
26	5.2.6 Tensile strength test	21
27	5.3 Earth rods	21
28	5.3.1 General	21
29	5.3.2 Test for thickness of coating on earth rods	21
30	5.3.3 Adhesion test for copper coated earth rods	21
31	5.3.4 Bending test	22
32	5.3.5 Environmental test for coated earth rods	22
33	5.3.6 Electrical resistivity test	23
34	5.3.7 Tensile strength test	23
35	5.3.8 Test for yield/tensile ratio (for copper coated steel earth rods only)	24
36	5.4 Couplers for earth rods	24
37	5.4.1 General	24
38	5.4.2 Compression test by mechanical means	24
39	5.4.3 Environmental test	26
40	5.4.4 Lightning current test	26
41	5.4.5 Tensile strength test	26
42	5.5 Marking test	26
43	5.5.1 General conditions for tests	26
44	5.5.2 Acceptance criteria	27
45	6 Electromagnetic compatibility (EMC)	27
46	7 Structure and content of the test report	27

49	7.1	General.....	27
50	7.2	Report identification.....	27
51	7.3	Specimen description.....	27
52	7.4	Conductor.....	28
53	7.5	Standards and references.....	28
54	7.6	Test procedure.....	28
55	7.7	Testing equipment, description.....	28
56	7.8	Measuring instruments description.....	28
57	7.9	Results and parameters recorded.....	28
58	7.10	Statement of pass/fail.....	28
59	Annex A (normative)	Environmental test.....	29
60	A.1	General.....	29
61	A.2	Salt mist treatment.....	29
62	A.3	Humid sulphurous atmosphere treatment.....	29
63	A.4	Ammonia atmosphere treatment.....	29
64	Annex B (normative)	Lightning current test.....	30
65	B.1	General.....	30
66	B.2	Acceptance criteria.....	30
67	Annex C (normative)	Requirements and tests for air-termination conductors, air-termination rods, catenary wires and down conductors.....	31
68			
69	Annex D (normative)	Requirements and tests for earth lead-in conductors, earth plates, earth rods and couplers for earth rods.....	32
70			
71	Annex E (normative)	Flow chart of tests for air-termination conductors, air-termination rods, earth lead-in conductors, down-conductors, earth conductors and earth plates, see Figure E.1.....	33
72			
73			
74	Annex F (normative)	Flow chart of tests for earth rods.....	34
75	Annex G (normative)	Flow chart of tests of couplers for earth rods.....	35
76	Annex H (normative)	Material, configuration and cross-sectional area test.....	36
77	H.1	General conditions for tests.....	36
78	H.2	Acceptance criteria for air-termination conductors, air-termination rods, catenary wires, earth lead-in rods and down conductors.....	36
79			
80	H.3	Acceptance criteria for earth electrodes.....	36
81	Bibliography.....		37
82			
83	Figure 1 – Coating measurements around the circumference of a round conductor.....		18
84	Figure 2 – Coating measurements of a plate conductor.....		19
85	Figure 3 – Typical test arrangement for adhesion test.....		22
86	Figure 4 – Definitions of upper yield strength R_{eH} and tensile strength R_m		24
87	Figure 5 – Typical test arrangement for the compression test by mechanical means.....		25
88	Figure E.1 – Flow chart of tests for air-termination conductors, air-termination rods, earth lead-in conductors, down-conductors, earth conductors and earth plates.....		33
89			
90	Figure F.1 – Flow chart of tests for earth rods.....		34
91	Figure G.1 – Flow chart of tests of couplers for earth rods.....		35
92			
93	Table 1 – Material, configuration and cross-sectional area of air-termination conductors, air-termination rods, earth lead-in conductors ⁹ and down-conductors.....		12
94			

95	Table 2 – Mechanical and electrical characteristics of air-termination rods, air-	
96	termination conductors, catenary wires and down conductors, earth lead-in conductors,	
97	earth conductors, earth plates and earth rods	14
98	Table 3 – Material, configuration and cross-sectional area of earth electrodes	16
99	Table B.1 – Lightning impulse current (I_{imp}) parameters	30
100	Table C.1 – Summary of requirements for various elements tested according to Table 1	
101	and Table 2	31
102		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 2: Requirements for conductors and earth electrodes

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 62561-2 has been prepared by subcommittee 81: Lightning protection.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition:

.....

.....

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

FDIS	Report on voting

154
155 Full information on the voting for the approval of this International Standard can be found in
156 the report on voting indicated in the above table.

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

158 A list of all parts in the IEC 62561 series, published under the general title *Lightning*
159 *protection system components (LPSC)*, can be found on the IEC website

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

- 163 • reconfirmed,
164 • withdrawn,
165 • replaced by a revised edition, or
166 • amended.

167 The contents of the corrigendum of August 2019 have been included in this copy.

168

169

INTRODUCTION

170 This part of IEC 62561 deals with the requirements and tests for lightning protection system
171 components (LPSC), specifically conductors and earth electrodes, used for the installation of
172 a lightning protection system (LPS) designed and implemented according to IEC 62305 (all
173 parts).

174

175

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 2: Requirements for conductors and earth electrodes

1 Scope

Part 2 of IEC 62561 specifies the requirements and tests for:

- metallic conductors (other than "natural" conductors) that form part of the air-termination and down-conductor systems,
- metallic earth electrodes that form part of the earth-termination system.

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

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

IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

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

ISO 2178, *Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method*

ISO 6892-1, *Metallic materials – Tensile testing – Part 1: Method of test at room temperature*

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 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**air-termination system**

part of an external lightning protection system (LPS) intended to intercept lightning flashes

EXAMPLES: Air-termination rods, air-termination conductors and catenary wires

3.2**air-termination rod**

part of the air-termination system consisting of a metal rod for intercepting and conducting flashes to the down-conductor and earthing system of the lightning protection system (LPS)

3.3**air-termination conductor**

part of the air-termination system consisting of a conductor for intercepting and conducting flashes to the down-conductor and earthing system of the lightning protection system (LPS)

3.4**catenary wire**

part of the air-termination system consisting of an overhead wire for intercepting and conducting flashes to the down-conductor and earthing system of the lightning protection system (LPS)

3.5**down-conductor system**

part of an external LPS intended to conduct lightning current between the air-termination system and the earth-termination system

3.6**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

3.7**earth lead-in conductor**

conductor installed between the down-conductor / test joint and the earth electrode intended to provide mechanical protection against accidental stresses to the down conductor system

3.8**earth-termination system**

part of an external lightning protection system, which is intended to conduct and disperse lightning current to the earth

3.9**earth electrode**

part or group of parts of the earth-termination system, which provides direct electrical contact with and disperses the lightning current to the earth

EXAMPLES: Earth conductor, earth plate and earth rod

3.10**earth conductor**

earth electrode consisting of a conductor buried in the ground

3.11**earth plate**

earth electrode consisting of a metal plate buried in the ground

3.12**earth rod**

earth electrode consisting of a metal rod driven into the ground

3.13**earth rod coupler**

part of the earth-termination system that facilitates the coupling of one section of an earth rod to another for the purpose of deep driving

3.14**earth rod driving head**

tool used in those applications where it is necessary to drive the earth rod

3.15**type test**

test required to be made before supplying a type of material covered by IEC 62561-1 on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application

Note 1 to entry: These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made to the accessory materials, design or type of manufacturing process which might change the performance characteristics.

4 Requirements**4.1 General**

Conductors and earth electrodes 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 to persons and surrounding equipment.

The choice of a material depends on its ability to match the particular application requirements such as life cycle of the material, effects from galvanic corrosion and compatibility with other interconnected materials or services.

Summaries of the requirements are given in Annex C and Annex D and their corresponding tests are given in Annex A, Annex B and the sequence of tests in Annex E, Annex F and Annex G.

4.2 Documentation – installation instructions

The manufacturer or supplier of the conductors and rods shall provide adequate information in their documentation / installation instructions by drawings, photographs to ensure that the installer of the conductors and rods can select and install the materials in a suitable and safe manner, in accordance with IEC 62305-3 and IEC 62305-4.

To facilitate the installer the manufacturer or supplier may also recommend the proper tools for their installation and instruments in order to perform specified measurements by IEC 62305. In addition where it is necessary to recommend a training for the safe selection and use of LPS components.

Documentation and installation instructions content shall not be in contradiction with the content of the relative testing report of each component.

Instructions are checked as per their completeness by review.