

INTERNATIONAL STANDARD



**Lightning protection system components (LPSC) –
Part 5: Requirements for earth electrode inspection housings and earth
electrode seals**

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IEC 62561-5

Edition 3.0 2023-12
REDLINE VERSION

INTERNATIONAL STANDARD



**Lightning protection system components (LPSC) –
Part 5: Requirements for earth electrode inspection housings and earth
electrode seals**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.020, 91.120.40

ISBN 978-2-8322-7963-2

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –**Part 5: Requirements for earth electrode inspection housings
and earth electrode seals**

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62561-5:2017. 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 62561-5 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2017. This edition constitutes a technical revision.

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

a) A classification of earth electrode seals has been added.

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

Draft	Report on voting
81/738/FDIS	81/753/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 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 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.

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INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC), specifically earth electrode inspection housings and earth electrode seals, used for the installation of a lightning protection system (LPS) designed and implemented according to the IEC 62305 series [1]¹.

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¹ Numbers in square brackets refer to the Bibliography.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 5: Requirements for earth electrode inspection housings and earth electrode seals

1 Scope

This part of IEC 62561 specifies the requirements and tests for earth electrode inspection housings (earth housings) installed in the earth and for earth electrode seals.

Lightning protection system components (LPSC) can also be suitable for use in hazardous atmospheres. For this reason, there are additional requirements when installing the components under such conditions.

NOTE Different requirements and test procedures are given in the EN 124 series [2] and the EN 1253 series [3].

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

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

earth electrode inspection housing

metallic or non-metallic enclosure that houses the down conductor and earth termination connection for inspection and testing purposes and consists of a housing and a removable lid

3.2

earth electrode seal

water pressure seal used in conjunction with an earth electrode that passes through or enters the foundation or wall of the building, preventing ground water from entering the building

3.3

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

EXAMPLE Earth rods, earth conductors and earth plates.

4 Classification

4.1 Earth electrode inspection housings

Earth electrode inspection housings are classified according to the ability to withstand load stress as follows:

- a) class H, heavy duty usage for slow moving vehicular traffic, multi-axle, etc;
- b) class M, medium duty usage for slow moving automobiles, etc;
- c) class L, light duty usage for walkways, etc.

4.2 Earth electrode seals

~~No classifications.~~

Earth electrode seals are classified according to the medium in contact with the earth electrode, as follows:

- a) earth electrode in watertight housing;
- b) earth electrode through watertight concrete.

5 Requirements

5.1 General

All earth electrode inspection housings and earth electrode seals shall be designed and constructed so that, in normal use according to the manufacturer's or supplier's instructions, their performance ~~is reliable and without danger to persons and the surroundings~~ 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.

5.2 Documentation and installation instructions

The manufacturer or supplier of the earth electrode inspection housing and earth electrode seals shall provide adequate information in their literature to ensure that the installer can select and install the materials in a suitable and safe manner, ~~in accordance with IEC 62305-3.~~

The literature shall contain at least the following information:

- a) classification as per Clause 4;
- b) load withstand force for earth electrode inspection housings in kN;
- c) installation instructions.

Compliance is checked by review in accordance with 6.2.

5.3 Marking

5.3.1 Content of marking

All products complying with this document shall be marked at least with:

- a) the manufacturer's or responsible vendor's name or trade mark ~~or identifying symbol~~;
- b) part number or identifying symbol;
- c) classification as per Clause 4;

d) load withstand force for earth electrode inspection housings in kN.

Where this proves to be impractical, the marking in accordance with ~~the identifying symbol b), c) and d)~~ may be given on the smallest packing unit.

Compliance is checked in accordance with 6.3.

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

5.3.2 Durability and legibility

Compliance is checked in accordance with 6.3.

5.4 Earth electrode inspection housing

The design of the earth electrode inspection housing shall be such that it carries out its function of enclosing the down conductor ~~and~~ earth rod termination in an acceptable and safe manner, and has sufficient internal dimensions to permit the assembly ~~or~~ disassembly of the earth rod clamp. The housing body shall be deep enough to permit the lid to sit flush on the body without interfering with the rod ~~or~~ conductor ~~or~~ clamp assembly.

The material of the earth electrode inspection housing shall be compatible with its surrounding environment, i.e. in terms of load rating, and shall comply with the tests given in 6.4.

5.5 Earth electrode seal

The design of the earth electrode seal shall be such that, in an acceptable and safe manner, it carries out its function of preventing ground water bypassing the earth electrode and entering the foundation or the ~~basement or~~ a wall of a building.

The material of the earth electrode seal shall be compatible with its surrounding environment and comply with the tests given in 6.5.

6 Tests

6.1 General ~~test conditions~~

The tests in accordance with this document are type tests. These tests are of such a nature that, after they have been performed, it is not necessary for these tests to be repeated unless changes are made to the materials, design or type of manufacturing process, which ~~might~~ can change the performance characteristics of the product.

Tests are carried out with the specimens prepared as in normal use according to the manufacturer's or supplier's instructions, unless otherwise specified.

All tests are carried out on new specimens.

Three new 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 a manufacturing fault, that test and any preceding one which ~~may~~ can have influenced the results of the test shall be repeated. The tests which follow shall be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements, unless otherwise specified.

The applicant, when submitting the first set of samples, can also submit an additional set of samples that ~~may~~ can be necessary should one sample fail. The testing laboratory shall then, without further request, test the additional set of samples, and shall only reject if a further failure

occurs. If the additional set of samples is not submitted at the same time, a failure of one sample shall entail rejection.

For products already tested according to IEC 62561-5:2011 and IEC 62561-5:2017, the applicability of previous tests according to Annex A, Table A.1 can be applied.

For new products, complete type tests and samples according to Clause 6 are required.

6.2 Documentation and installation instructions

6.2.1 General conditions ~~for tests~~

The content of the installation instructions is checked as per its completeness by ~~inspection~~ review.

6.2.2 Acceptance criteria

~~Installation instructions are deemed to have passed the test if they contain at least the following:~~

- ~~— the manufacturer's or responsible vendor's name or trade mark or identifying symbol;~~
- ~~— part number;~~
- ~~— classification as per Clause 4;~~
- ~~— load withstand force in kN.~~

Documentation or installation instructions are deemed to be acceptable if they contain at least the information given in 5.2.

6.3 Marking test

6.3.1 General test conditions ~~for tests~~

~~The marking shall be inspected after rubbing it by hand for 15 s with a piece of cloth soaked with water, followed by rubbing it with another piece of cloth soaked with white spirit for 15 s.~~

The marking is checked:

- a) as per its completeness in accordance with 5.3.1 by review;
- b) as per its durability and legibility by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with white spirit or mineral spirit.

NOTE Marking made by moulding, pressing or engraving is not subjected to the test of 6.3.1 b).

6.3.2 Acceptance criteria

The specimen is deemed to have passed the test if:

- a) the marking contains all information of 5.3.1;
- b) after the test of 6.3.1 b) the marking remains legible.

6.4 Earth electrode inspection housing

6.4.1 General test conditions

All tests shall be performed on three new lid specimens using one housing.

6.4.2 Load test

Concrete lid and concrete housing specimens shall be tested after a 28 day curing period. Lid specimens of all other materials shall be tested after a seven day curing period.

The test is carried out on a complete assembly and prepared according to the manufacturer's instructions.

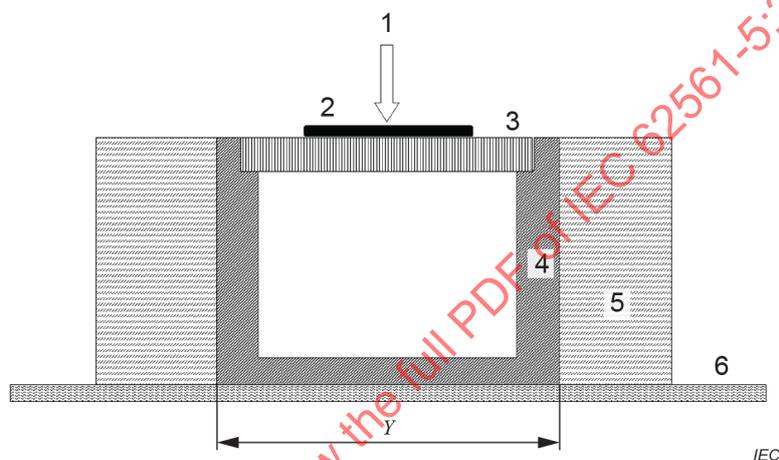
a) First alternative load test

The housing of the specimen shall be surrounded by a material relevant to a declared load rating in accordance with the manufacturer's instructions.

The thickness of the surrounding material shall be at least 0,5 times the nominal external size of the housing and not greater than the nominal size of the housing or can be reduced as specified by the manufacturer.

The arrangement should be placed on a rigid support.

An example for the test arrangement is shown in Figure 1.



Key

- 1 force
- 2 circular steel plate
- 3 removable lid
- 4 housing
- 5 surrounding material
- 6 rigid support
- Y* nominal size

The thickness of the surrounding material (5) is usually equal to $0,5 \times Y$ up to $1 \times Y$. It can be reduced as specified by the manufacturer.

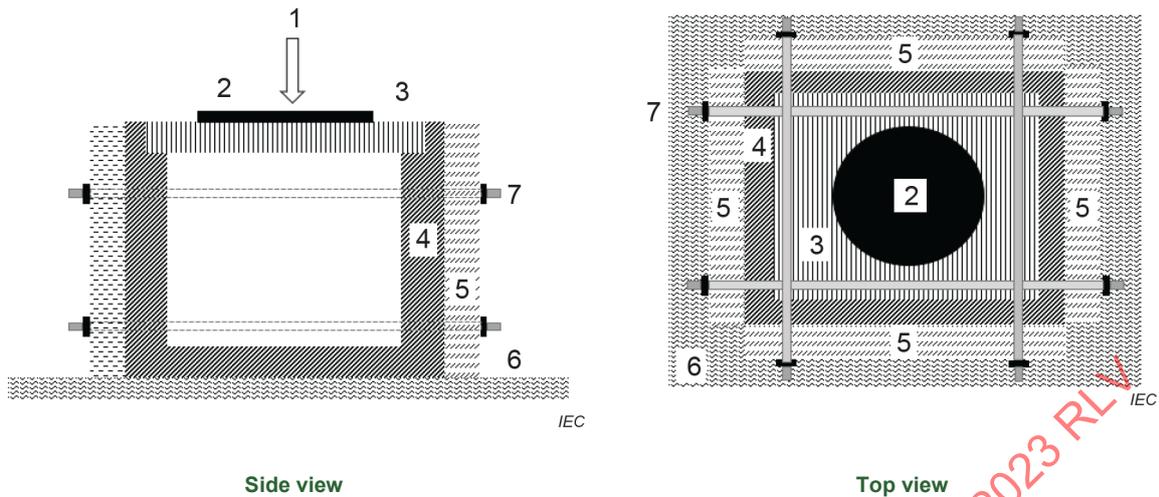
Figure 1 – Test arrangement of the first alternative for load test

b) Second alternative load test

The housing of the specimen shall be confined within steel plates with a minimum thickness of 10 mm, according to the manufacturer's instructions, held together by suitable means for example using threaded rods, fasteners.

The arrangement should be placed on a rigid support.

An example of the second alternative of the load test is shown in Figure 2.



Key

- 1 force
- 2 circular steel plate
- 3 removable lid
- 4 housing
- 5 steel plates
- 6 rigid support
- 7 threaded rod

Figure 2 – Test arrangement of the second alternative for load test

The product applicable for heavy duty usage, class H (slow moving vehicular traffic, multi-axle, etc.) shall be subjected to a force of 30 kN vertically applied through a circular steel plate with a $(170 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with a radius of both edges (top and bottom) of ~~minimum~~ approximately 2 mm.

The product applicable for medium duty usage, class M (slow moving automobiles, etc.) shall be subjected to a force of 15 kN vertically applied through a circular steel plate with a $(130 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The product applicable for light duty usage, class L (walkways, etc.) shall be subjected to a force of 4 kN vertically applied through a circular steel plate with a $(62 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The centre of the circular plate should be positioned over the centre of the lid.

The force shall be gradually applied over (60 ± 10) s and maintained for (120 ± 5) s.

The tested load of the product should be declared by the manufacturer.

6.4.3 Acceptance criteria

After the test, the specimens shall show no signs of disintegration, nor crack be visible to normal or corrected vision without additional magnification. One minute after the load has been removed, there shall be no permanent deformation exceeding 3 mm.

The specimens are deemed to have passed the tests if all specimens meet the above requirements.

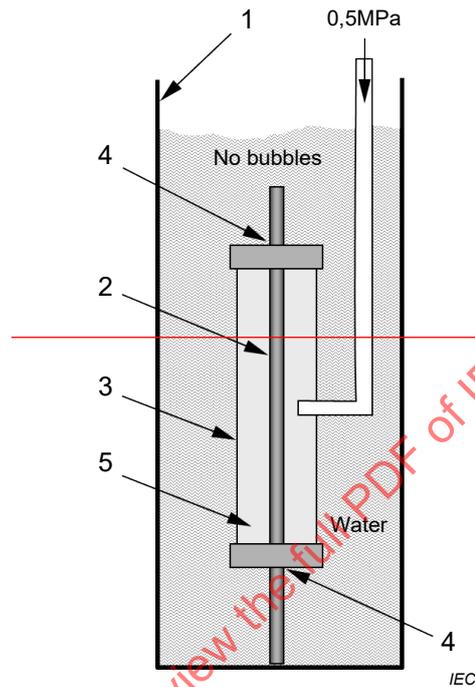
6.5 Earth electrode seal test

6.5.1 Earth electrode in watertight housing

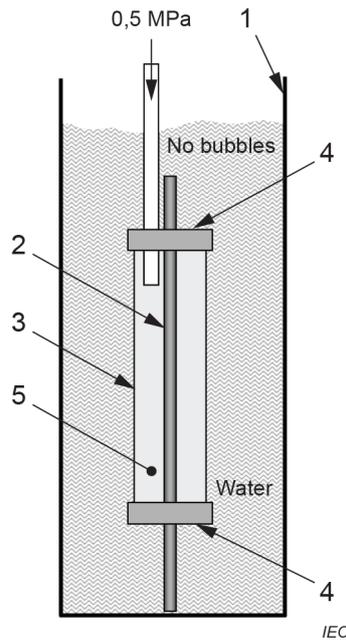
6.5.1.1 General test conditions

Specimens are subjected to a sealing test as follows:

The earth electrode seal shall be assembled in a typical test bed that proves its intended application (as shown in Figure 3).



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Key

- 1 tank filled with water
- 2 earth electrode rod
- 3 earth electrode seal arrangement
- 4 seals
- 5 air

Figure 3 – Test arrangement for sealing test

A minimum air pressure of 0,5 MPa shall be continuously applied to the seal arrangement for 24 h.

6.5.1.2 Acceptance criteria

The specimens are deemed to have passed the test if no leakage is detected at the sealing points at the completion of the test.

6.5.2 Earth electrode in or through watertight concrete

6.5.2.1 General test conditions

The earth electrode seal shall be set in concrete according to the manufacturer's instructions in a specimen according to 6.5.2.1 a).

a) Specimen

The specimen shall be cubic with a minimum edge length of 150 mm. The composition of the concrete shall be in accordance with Table 1.

Table 1 – Parameters for concrete used for the test arrangement

Component thickness	Water-cement ratio W/C	Cement content	Compressive strength
> 40 cm	$\leq 0,7$	No requirement	C25/30 or higher
≤ 40 cm	$\leq 0,6$	$\geq 280 \text{ kg/m}^3$ $\geq 270 \text{ kg/m}^3$ where additions are taken into account	

The concrete shall be compacted immediately after placing in the moulds.

b) Curing of specimen

Leave the specimen in the mould for at least 16 h, but not longer than three days, protected against shock, vibration and dehydration at a temperature of $(20 \pm 5) \text{ }^\circ\text{C}$. After removal from the mould, cure the test specimen till immediately before testing, in water at a temperature of $(20 \pm 2) \text{ }^\circ\text{C}$, or in a chamber at $(20 \pm 2) \text{ }^\circ\text{C}$ and a relative humidity $\geq 95 \%$.

c) Application of water pressure

The test shall be started when the specimen is at least 28 days old. Place the specimen in the apparatus and apply a water pressure of $(100 \pm 10) \text{ kPa}$ for $(72 \pm 2) \text{ h}$ (as shown in Figure 4).

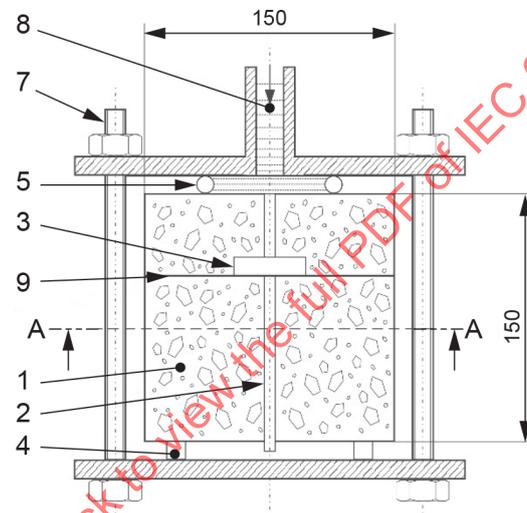
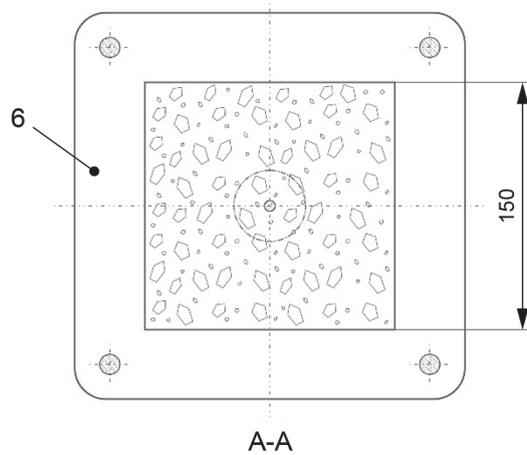
d) Examination of specimen

After the pressure has been applied for the specified time, remove the specimen from the apparatus. Wipe the face on which the water pressure was applied to remove excess water. Split the specimen in half, perpendicularly to the face on which the water pressure was applied. When splitting the specimen, and during the examination, place the face of the specimen exposed to the water pressure on the bottom. As soon as the split face has dried to such an extent that the water penetration front can be clearly seen, mark the water front on the specimen. Measure the maximum depth of penetration under the test area and record it.

6.5.2.2 Pass Acceptance criteria

The specimen is deemed to have passed the test if the depth of water penetration does not exceed the point identified by line 9 in Figure 4.

Dimensions in millimetres



IEC

Key

- 1 specimen made of concrete
- 2 earth electrode seal (e.g. wall bushing or fixed earthing terminal)
- 3 water barrier
- 4 packing piece
- 5 sealing ring
- 6 screwed-on plate
- 7 bolt
- 8 water under pressure
- 9 permitted maximum water penetration

Figure 4 – Example of a test arrangement for depth of penetration of water under pressure

7 Electromagnetic compatibility (EMC)

Products covered by this document are, in normal use, passive in respect of electromagnetic influences (emission and immunity).

8 Structure and content of the test report

8.1 General

The purpose of this Clause 8 is to provide general requirements for laboratory test reports. It is intended to promote clear, complete reporting procedures for laboratories submitting test reports.

The results of each test carried out by the testing laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be reported in a test report and shall include all the information necessary for the interpretation of the test results and all information required by the method used.

~~Particular care and attention shall be paid to the arrangement of the report, especially with regard to presentation of the test data and ease of assimilation by the reader. The report shall be arranged and presented in such a way that it is easily assimilated by the reader, especially with regards to presentation of the test data. The format shall be carefully and specifically designed for each type of test carried out, but the headings shall be standardized as indicated below.~~

The structure of each report shall include at least the information specified in 8.2 to 8.9.

8.2 Report identification

The following information shall be included²:

- a) a title or subject of the report;
- b) name and e-mail address or telephone number of the testing laboratory;
- c) name, address and telephone number of the sub-testing laboratory where the test was carried out if different from the company which was assigned to perform the test;
- d) unique identification number (or serial number) of the test report;
- e) name and address of the vendor;
- f) ~~Report shall be~~ paginated report and indication of the total number of pages ~~indicated~~ on each page, including appendices or annexes;
- g) date of issue of the report;
- h) date(s) test(s) was (were) performed;
- i) signature and title, or an equivalent identification of the person(s) authorized to sign by the testing laboratory to attest to the content of the report;
- j) signature and title of person(s) conducting the test(s);
- k) the following declaration in order to avoid misuse: "This type test report shall not be reproduced other than in full, except with the prior written approval of the issuing test laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production."

8.3 Specimen description

- a) sample description;
- b) detailed description and unambiguous identification of the test specimen and/or test assembly, for example part number, type, classification, material, dimensions;
- c) characterization and condition of the test specimen ~~and/or~~ test assembly or both;

² ~~It is suggested to insert in the test report a specific declaration to avoid its misuse. A declaration example is "This type test report may not be reproduced other than in full, except with the prior written approval of the issuing test laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production."~~

- d) sampling procedure, where relevant;
- e) date of receipt of test samples;
- f) photographs, drawings or any other visual documentation, if available.

8.4 Standards and references

- a) ~~Identification of~~ The test standard used shall be identified and the date of issue of the standard shall be given.
- b) Reference to this document may only be made if the full set of tests is performed and reported, except where the deviations are clearly justified in 8.5 b).
- c) Other relevant documentation with the documentation date shall be provided.

8.5 Test procedure

- a) description of the test procedure;
- b) justification for any deviations from, additions to or exclusions from the referenced standard;
- c) any other information relevant to a specific test such as environmental conditions;
- d) configuration of testing assembly and measuring set-up;
- e) location of the arrangement in the testing area and measuring techniques.

8.6 Testing equipment, description

Description of equipment used for every test conducted, e.g. presses, air compressors.

8.7 Measuring instruments description

Characteristics, serial number and calibration date of all instruments used for measuring the values specified in this document, e.g. dynamometers, air boost gauges.

8.8 Results and parameters recorded

- a) the required passing criteria for each test as defined in the standard;
- b) the relevant measured, observed or derived results of the tests.

The above shall be presented by way of tables, graphs, drawings, photographs or other documentation of visual observations as appropriate.

8.9 Statement of pass/ or fail

~~A statement of pass/fail is necessary, identifying the part of the test for which the specimen has failed and also a description of the failure.~~

A statement that the specimen passed or failed the tests shall be reported. If the specimen has failed, a description of failure is necessary.

Annex A (normative)

Applicability of previous tests

For earth electrode inspection housings and earth electrode seals already successfully tested in accordance with IEC 62561-5:2011 or IEC 62561-5:2017, differences between versions in the test procedures identified in Table A.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of IEC 62561-5:2023.

It is not necessary to repeat tests when the manufacturer of that product clearly states that their product meets all the following requirements.

- There is no change in the classification of the product since it was successfully tested;
- There is no change in the method of manufacture of the product since it was successfully tested;
- There is no change in the design of the product since it was successfully tested;
- There is no change in the materials used in the product since it was successfully tested;

For new products, complete type tests according to this document shall be performed.

Table A.1 – Differences in the requirements for earth electrode inspection housings and earth electrode seals complying with IEC 62561-5:2011 or IEC 62561-5:2017

Test description	IEC 62561-5:2011	IEC 62561-5:2017	Re-testing required
Load test	5.2.2	6.2.2	No
Earth electrode in watertight housings test	5.3	6.3.1	No
Earth electrode in or through watertight concrete	-	6.3.2	No

Bibliography

- [1] IEC 62305 (all parts), *Protection against lightning*
- [2] EN 124 (all parts), *Gully tops and manhole tops for vehicular and pedestrian areas—~~Design requirements, type testing, marking, quality control~~*
- [3] EN 1253 (all parts), *Gullies for buildings*
- ~~[3] EN 1253-1:2015, *Gullies for buildings—Part 1: Trapped floor gullies with a depth water seal of at least 50 mm*~~

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Lightning protection system components (LPSC) –
Part 5: Requirements for earth electrode inspection housings and earth
electrode seals**

**Composants des systèmes de protection contre la foudre (CSPF) –
Partie 5: Exigences pour les regards de visite et les joints des électrodes de
terre**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –**Part 5: Requirements for earth electrode inspection housings
and earth electrode seals**

FOREWORD

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IEC 62561-5 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2017. This edition constitutes a technical revision.

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

- a) A classification of earth electrode seals has been added.

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

Draft	Report on voting
81/738/FDIS	81/753/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 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 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.

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INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC), specifically earth electrode inspection housings and earth electrode seals, used for the installation of a lightning protection system (LPS) designed and implemented according to the IEC 62305 series [1]¹.

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¹ Numbers in square brackets refer to the Bibliography.

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 5: Requirements for earth electrode inspection housings and earth electrode seals

1 Scope

This part of IEC 62561 specifies the requirements and tests for earth electrode inspection housings (earth housings) installed in the earth and for earth electrode seals.

Lightning protection system components (LPSC) can also be suitable for use in hazardous atmospheres. For this reason, there are additional requirements when installing the components under such conditions.

NOTE Different requirements and test procedures are given in the EN 124 series [2] and the EN 1253 series [3].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

earth electrode inspection housing

metallic or non-metallic enclosure that houses the down conductor and earth termination connection for inspection and testing purposes and consists of a housing and a removable lid

3.2

earth electrode seal

water pressure seal used in conjunction with an earth electrode that passes through or enters the foundation or wall of the building, preventing ground water from entering the building

3.3

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

EXAMPLE Earth rods, earth conductors and earth plates.

4 Classification

4.1 Earth electrode inspection housings

Earth electrode inspection housings are classified according to the ability to withstand load stress as follows:

- a) class H, heavy duty usage for slow moving vehicular traffic, multi-axle, etc;
- b) class M, medium duty usage for slow moving automobiles, etc;
- c) class L, light duty usage for walkways, etc.

4.2 Earth electrode seals

Earth electrode seals are classified according to the medium in contact with the earth electrode, as follows:

- a) earth electrode in watertight housing;
- b) earth electrode through watertight concrete.

5 Requirements

5.1 General

All earth electrode inspection housings and earth electrode seals shall be designed and constructed so that, in normal use according to the manufacturer's or supplier'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.

5.2 Documentation and installation instructions

The manufacturer or supplier of the earth electrode inspection housing and earth electrode seals shall provide adequate information in their literature to ensure that the installer can select and install the materials in a suitable and safe manner.

The literature shall contain at least the following information:

- a) classification as per Clause 4;
- b) load withstand force for earth electrode inspection housings in kN;
- c) installation instructions.

Compliance is checked by review in accordance with 6.2.

5.3 Marking

5.3.1 Content of marking

All products complying with this document shall be marked at least with:

- a) the manufacturer's or responsible vendor's name or trade mark;
- b) part number or identifying symbol;
- c) classification as per Clause 4;
- d) load withstand force for earth electrode inspection housings in kN.

Where this proves to be impractical, the marking in accordance with b), c) and d) may be given on the smallest packing unit.

Compliance is checked in accordance with 6.3.

NOTE Marking can be applied for example by moulding, pressing, engraving, and printing.

5.3.2 Durability and legibility

Compliance is checked in accordance with 6.3.

5.4 Earth electrode inspection housing

The design of the earth electrode inspection housing shall be such that it carries out its function of enclosing the down conductor and earth rod termination in an acceptable and safe manner, and has sufficient internal dimensions to permit the assembly or disassembly of the earth rod clamp. The housing body shall be deep enough to permit the lid to sit flush on the body without interfering with the rod or conductor or clamp assembly.

The material of the earth electrode inspection housing shall be compatible with its surrounding environment, i.e. in terms of load rating, and shall comply with the tests given in 6.4.

5.5 Earth electrode seal

The design of the earth electrode seal shall be such that, in an acceptable and safe manner, it carries out its function of preventing ground water bypassing the earth electrode and entering the foundation or the basement or a wall of a building.

The material of the earth electrode seal shall be compatible with its surrounding environment and comply with the tests given in 6.5.

6 Tests

6.1 General

The tests in accordance with this document are type tests. These tests are of such a nature that, after they have been performed, it is not necessary for these tests to be repeated unless changes are made to the materials, design or type of manufacturing process, which can change the performance characteristics of the product.

Tests are carried out with the specimens prepared as in normal use according to the manufacturer's or supplier's instructions, unless otherwise specified.

All tests are carried out on new specimens.

Three new 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 a manufacturing fault, that test and any preceding one which can have influenced the results of the test shall be repeated. The tests which follow shall be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements, unless otherwise specified.

The applicant, when submitting the first set of samples, can also submit an additional set of samples that can be necessary should one sample fail. The testing laboratory shall then, without further request, test the additional set of samples, and shall only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample shall entail rejection.

For products already tested according to IEC 62561-5:2011 and IEC 62561-5:2017, the applicability of previous tests according to Annex A, Table A.1 can be applied.

For new products, complete type tests and samples according to Clause 6 are required.

6.2 Documentation and installation instructions

6.2.1 General conditions

The content of the installation instructions is checked as per its completeness by review.

6.2.2 Acceptance criteria

Documentation or installation instructions are deemed to be acceptable if they contain at least the information given in 5.2.

6.3 Marking test

6.3.1 General test conditions

The marking is checked:

- a) as per its completeness in accordance with 5.3.1 by review;
- b) as per its durability and legibility by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with white spirit or mineral spirit.

NOTE Marking made by moulding, pressing or engraving is not subjected to the test of 6.3.1 b).

6.3.2 Acceptance criteria

The specimen is deemed to have passed the test if:

- a) the marking contains all information of 5.3.1;
- b) after the test of 6.3.1 b) the marking remains legible.

6.4 Earth electrode inspection housing

6.4.1 General test conditions

All tests shall be performed on three new lid specimens using one housing.

6.4.2 Load test

Concrete lid and concrete housing specimens shall be tested after a 28 day curing period. Lid specimens of all other materials shall be tested after a seven day curing period.

The test is carried out on a complete assembly and prepared according to the manufacturer's instructions.

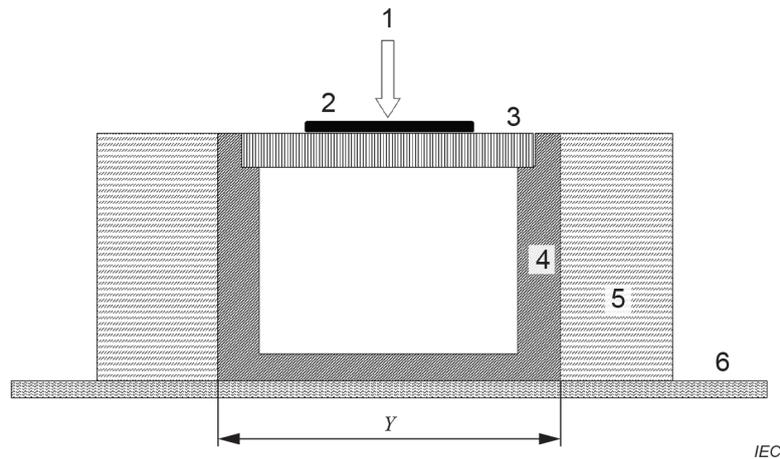
- a) First alternative load test

The housing of the specimen shall be surrounded by a material relevant to a declared load rating in accordance with the manufacturer's instructions.

The thickness of the surrounding material shall be at least 0,5 times the nominal external size of the housing and not greater than the nominal size of the housing or can be reduced as specified by the manufacturer.

The arrangement should be placed on a rigid support.

An example for the test arrangement is shown in Figure 1.

**Key**

- 1 force
- 2 circular steel plate
- 3 removable lid
- 4 housing
- 5 surrounding material
- 6 rigid support
- Y nominal size

The thickness of the surrounding material (5) is usually equal to $0,5 \times Y$ up to $1 \times Y$. It can be reduced as specified by the manufacturer.

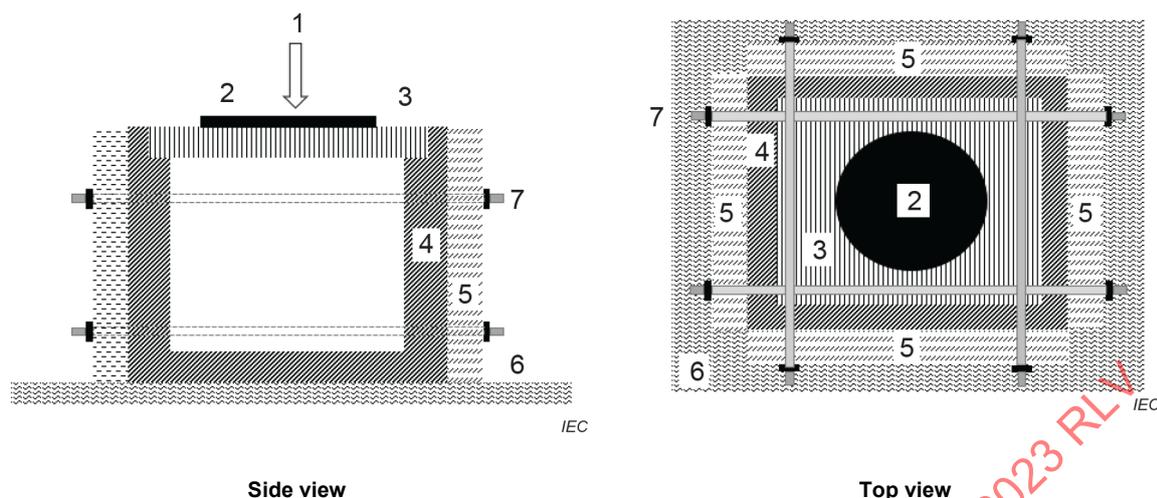
Figure 1 – Test arrangement of the first alternative for load test

b) Second alternative load test

The housing of the specimen shall be confined within steel plates with a minimum thickness of 10 mm, according to the manufacturer's instructions, held together by suitable means for example using threaded rods, fasteners.

The arrangement should be placed on a rigid support.

An example of the second alternative of the load test is shown in Figure 2.



Key

- 1 force
- 2 circular steel plate
- 3 removable lid
- 4 housing
- 5 steel plates
- 6 rigid support
- 7 threaded rod

Figure 2 – Test arrangement of the second alternative for load test

The product applicable for heavy duty usage, class H (slow moving vehicular traffic, multi-axle, etc.) shall be subjected to a force of 30 kN vertically applied through a circular steel plate with a $(170 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with a radius of both edges (top and bottom) of approximately 2 mm.

The product applicable for medium duty usage, class M (slow moving automobiles, etc.) shall be subjected to a force of 15 kN vertically applied through a circular steel plate with a $(130 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The product applicable for light duty usage, class L (walkways, etc.) shall be subjected to a force of 4 kN vertically applied through a circular steel plate with a $(62 \pm 0,5)$ mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The centre of the circular plate should be positioned over the centre of the lid.

The force shall be gradually applied over (60 ± 10) s and maintained for (120 ± 5) s.

The tested load of the product should be declared by the manufacturer.

6.4.3 Acceptance criteria

After the test, the specimens shall show no signs of disintegration, nor crack be visible to normal or corrected vision without additional magnification. One minute after the load has been removed, there shall be no permanent deformation exceeding 3 mm.

The specimens are deemed to have passed the tests if all specimens meet the above requirements.

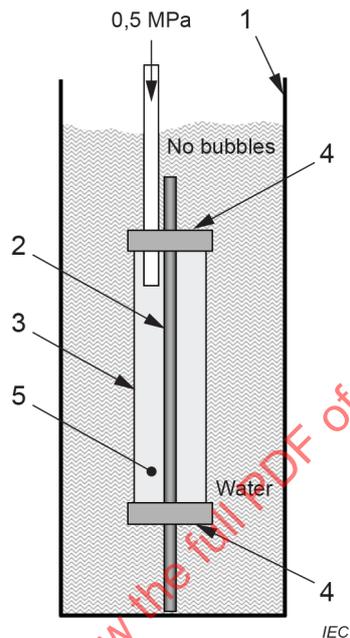
6.5 Earth electrode seal test

6.5.1 Earth electrode in watertight housing

6.5.1.1 General test conditions

Specimens are subjected to a sealing test as follows:

The earth electrode seal shall be assembled in a typical test bed that proves its intended application (as shown in Figure 3).



Key

- 1 tank filled with water
- 2 earth electrode rod
- 3 earth electrode seal arrangement
- 4 seals
- 5 air

Figure 3 – Test arrangement for sealing test

A minimum air pressure of 0,5 MPa shall be continuously applied to the seal arrangement for 24 h.

6.5.1.2 Acceptance criteria

The specimens are deemed to have passed the test if no leakage is detected at the sealing points at the completion of the test.

6.5.2 Earth electrode in or through watertight concrete

6.5.2.1 General test conditions

The earth electrode seal shall be set in concrete according to the manufacturer's instructions in a specimen according to 6.5.2.1 a).

- a) Specimen

The specimen shall be cubic with a minimum edge length of 150 mm. The composition of the concrete shall be in accordance with Table 1.

Table 1 – Parameters for concrete used for the test arrangement

Component thickness	Water-cement ratio W/C	Cement content	Compressive strength
> 40 cm	≤ 0,7	No requirement	C25/30 or higher
≤ 40 cm	≤ 0,6	≥ 280 kg/m ³ ≥ 270 kg/m ³ where additions are taken into account	

The concrete shall be compacted immediately after placing in the moulds.

b) Curing of specimen

Leave the specimen in the mould for at least 16 h, but not longer than three days, protected against shock, vibration and dehydration at a temperature of $(20 \pm 5)^\circ\text{C}$. After removal from the mould, cure the test specimen till immediately before testing, in water at a temperature of $(20 \pm 2)^\circ\text{C}$, or in a chamber at $(20 \pm 2)^\circ\text{C}$ and a relative humidity $\geq 95\%$.

c) Application of water pressure

The test shall be started when the specimen is at least 28 days old. Place the specimen in the apparatus and apply a water pressure of (100 ± 10) kPa for (72 ± 2) h (as shown in Figure 4).

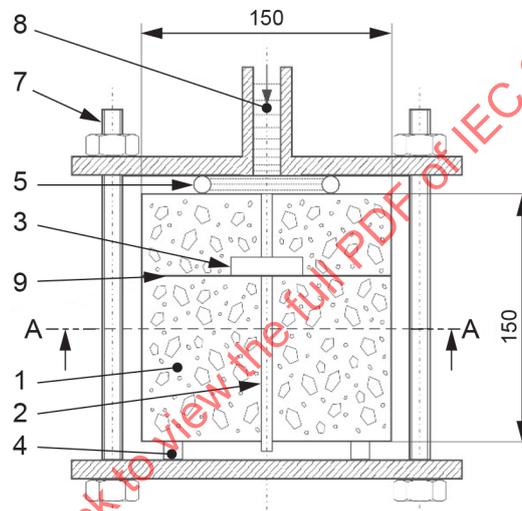
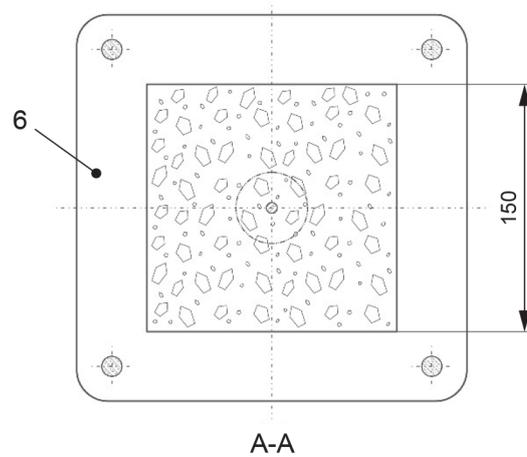
d) Examination of specimen

After the pressure has been applied for the specified time, remove the specimen from the apparatus. Wipe the face on which the water pressure was applied to remove excess water. Split the specimen in half, perpendicularly to the face on which the water pressure was applied. When splitting the specimen, and during the examination, place the face of the specimen exposed to the water pressure on the bottom. As soon as the split face has dried to such an extent that the water penetration front can be clearly seen, mark the water front on the specimen. Measure the maximum depth of penetration under the test area and record it.

6.5.2.2 Acceptance criteria

The specimen is deemed to have passed the test if the depth of water penetration does not exceed the point identified by line 9 in Figure 4.

Dimensions in millimetres



IEC

Key

- 1 specimen made of concrete
- 2 earth electrode seal (e.g. wall bushing or fixed earthing terminal)
- 3 water barrier
- 4 packing piece
- 5 sealing ring
- 6 screwed-on plate
- 7 bolt
- 8 water under pressure
- 9 permitted maximum water penetration

Figure 4 – Example of a test arrangement for depth of penetration of water under pressure

7 Electromagnetic compatibility (EMC)

Products covered by this document are, in normal use, passive in respect of electromagnetic influences (emission and immunity).

8 Structure and content of the test report

8.1 General

The purpose of this Clause 8 is to provide general requirements for laboratory test reports. It is intended to promote clear, complete reporting procedures for laboratories submitting test reports.

The results of each test carried out by the testing laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be reported in a test report and shall include all the information necessary for the interpretation of the test results and all information required by the method used.

The report shall be arranged and presented in such a way that it is easily assimilated by the reader, especially with regards to presentation of the test data. The format shall be specifically designed for each type of test carried out, but the headings shall be standardized as indicated below.

The structure of each report shall include at least the information specified in 8.2 to 8.9.

8.2 Report identification

The following information shall be included:

- a) a title or subject of the report;
- b) name and e-mail address or telephone number of the testing laboratory;
- c) name, address and telephone number of the sub-testing laboratory where the test was carried out if different from the company which was assigned to perform the test;
- d) unique identification number (or serial number) of the test report;
- e) name and address of the vendor;
- f) paginated report and indication of the total number of pages on each page, including appendices or annexes;
- g) date of issue of the report;
- h) date(s) test(s) was (were) performed;
- i) signature and title, or an equivalent identification of the person(s) authorized to sign by the testing laboratory to attest to the content of the report;
- j) signature and title of person(s) conducting the test(s);
- k) the following declaration in order to avoid misuse: "This type test report shall not be reproduced other than in full, except with the prior written approval of the issuing test laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production."

8.3 Specimen description

- a) sample description;
- b) detailed description and unambiguous identification of the test specimen and test assembly, for example part number, type, classification, material, dimensions;
- c) characterization and condition of the test specimen or test assembly or both;
- d) sampling procedure, where relevant;
- e) date of receipt of test samples;
- f) photographs, drawings or any other visual documentation, if available.

8.4 Standards and references

- a) The test standard used shall be identified and the date of issue of the standard shall be given.
- b) Reference to this document may only be made if the full set of tests is performed and reported, except where the deviations are clearly justified in 8.5 b).
- c) Other relevant documentation with the documentation date shall be provided.

8.5 Test procedure

- a) description of the test procedure;
- b) justification for any deviations from, additions to or exclusions from the referenced standard;
- c) any other information relevant to a specific test such as environmental conditions;
- d) configuration of testing assembly and measuring set-up;
- e) location of the arrangement in the testing area and measuring techniques.

8.6 Testing equipment, description

Description of equipment used for every test conducted, e.g. presses, air compressors.

8.7 Measuring instruments description

Characteristics, serial number and calibration date of all instruments used for measuring the values specified in this document, e.g. dynamometers, air boost gauges.

8.8 Results and parameters recorded

- a) the required passing criteria for each test as defined in the standard;
- b) the relevant measured, observed or derived results of the tests.

The above shall be presented by way of tables, graphs, drawings, photographs or other documentation of visual observations as appropriate.

8.9 Statement of pass or fail

A statement that the specimen passed or failed the tests shall be reported. If the specimen has failed, a description of failure is necessary.

Annex A
(normative)

Applicability of previous tests

For earth electrode inspection housings and earth electrode seals already successfully tested in accordance with IEC 62561-5:2011 or IEC 62561-5:2017, differences between versions in the test procedures identified in Table A.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of IEC 62561-5:2023.

It is not necessary to repeat tests when the manufacturer of that product clearly states that their product meets all the following requirements.

- There is no change in the classification of the product since it was successfully tested;
- There is no change in the method of manufacture of the product since it was successfully tested;
- There is no change in the design of the product since it was successfully tested;
- There is no change in the materials used in the product since it was successfully tested;

For new products, complete type tests according to this document shall be performed.

Table A.1 – Differences in the requirements for earth electrode inspection housings and earth electrode seals complying with IEC 62561-5:2011 or IEC 62561-5:2017

Test description	IEC 62561-5:2011	IEC 62561-5:2017	Re-testing required
Load test	5.2.2	6.2.2	No
Earth electrode in watertight housings test	5.3	6.3.1	No
Earth electrode in or through watertight concrete	-	6.3.2	No

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Bibliography

- [1] IEC 62305 (all parts), *Protection against lightning*
- [2] EN 124 (all parts), *Gully tops and manhole tops for vehicular and pedestrian areas*
- [3] EN 1253 (all parts), *Gullies for buildings*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**COMPOSANTS DES SYSTÈMES DE PROTECTION CONTRE LA
FOUDRE (CSPF) –****Partie 5: Exigences pour les regards de visite et les joints des électrodes
de terre****AVANT-PROPOS**

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L'IEC 62561-5 a été établie par le comité d'études 81 de l'IEC: Protection contre la foudre. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2017. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) une classification des joints d'électrodes de terre a été ajoutée.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
81/738/FDIS	81/753/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC 62561, publiée sous le titre général *Composants des systèmes de protection contre la foudre (CSPF)*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

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INTRODUCTION

La présente partie de l'IEC 62561 traite des exigences et des essais pour les composants des systèmes de protection contre la foudre (CSPF), en particulier des regards de visite et des joints d'électrodes de terre utilisés pour l'installation d'un système de protection contre la foudre (SPF) conçu et mis en œuvre conformément à la série IEC 62305 [1]¹.

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¹ Les chiffres entre crochets renvoient à la Bibliographie.

COMPOSANTS DES SYSTÈMES DE PROTECTION CONTRE LA Foudre (CSPF) –

Partie 5: Exigences pour les regards de visite et les joints des électrodes de terre

1 Domaine d'application

La présente partie de l'IEC 62561 spécifie les exigences et les essais pour les regards de visite des électrodes de terre (regards de terre) installés dans le sol et pour les joints des électrodes de terre.

Les composants des systèmes de protection contre la foudre (CSPF) peuvent aussi être employés dans des atmosphères dangereuses. Pour cette raison, il existe des exigences supplémentaires pour installer les composants dans de telles conditions.

NOTE Différentes exigences et procédures d'essai sont données dans la série EN 124 [2] et dans la série EN 1253 [3].

2 Références normatives

Le présent document ne contient aucune référence normative.

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse <https://www.electropedia.org/>
- ISO Online browsing platform: disponible à l'adresse <https://www.iso.org/obp>

3.1

regard de visite d'électrode de terre

enveloppe métallique ou non métallique qui abrite la connexion entre le conducteur de descente et la prise de terre à des fins d'examen et d'essai, et qui se compose d'un regard et d'un couvercle amovible

3.2

joint d'électrode de terre

presse-étoupe associé à une électrode de terre qui traverse ou pénètre dans les fondations ou les murs d'un bâtiment, évitant toute remontée d'eau dans le bâtiment

3.3

électrode de terre

élément ou ensemble d'éléments de la prise de terre qui assure un contact électrique direct avec la terre et dissipe le courant de foudre dans la terre

EXEMPLE Piquets de terre, conducteurs de terre et plaques de terre.

4 Classification

4.1 Regards de visite d'électrodes de terre

Les regards de visite d'électrodes de terre sont classés selon leur aptitude à supporter les charges, comme suit:

- a) classe H, usage sous de fortes charges pour le trafic routier lent, sur axes multiples, etc.;
- b) classe M, usage sous des charges moyennes pour les automobiles lentes, etc.;
- c) classe L, usage sous des charges légères pour les passages piétons, etc.

4.2 Joints d'électrodes de terre

Les joints d'électrodes de terre sont classés selon le milieu en contact avec l'électrode de terre, comme suit:

- a) électrode de terre dans un regard étanche;
- b) électrode de terre à travers du béton étanche.

5 Exigences

5.1 Généralités

Tous les regards de visite et les joints d'électrodes de terre doivent être conçus et construits de telle façon qu'en usage normal, conformément aux instructions du fabricant ou du fournisseur, leurs performances doivent être fiables, stables et sûres pour les personnes et les matériels environnants.

Le choix d'un matériau dépend de sa capacité à satisfaire aux exigences d'applications particulières.

5.2 Documentation et instructions d'installation

Le fabricant ou le fournisseur de regards de visite et de joints d'électrodes de terre doit fournir dans sa documentation les informations pertinentes afin de s'assurer que les matériaux puissent être choisis et installés par l'installateur de manière adaptée et en toute sécurité.

La documentation doit comprendre au moins les informations suivantes:

- a) la classification selon l'Article 4;
- b) la force de résistance à la charge pour les regards de visite d'électrodes de terre, en kN;
- c) les instructions d'installation.

La conformité est vérifiée par examen, conformément au 6.2.

5.3 Marquage

5.3.1 Contenu du marquage

Tous les produits conformes au présent document doivent porter, par marquage, au moins les informations suivantes:

- a) le nom du fabricant ou du fournisseur responsable, ou la marque commerciale;
- b) la référence de la pièce ou un symbole d'identification;
- c) la classification selon l'Article 4;
- d) la force de résistance à la charge pour les regards de visite d'électrodes de terre, en kN.

Lorsque cela n'est pas possible, le marquage selon b), c) et d) peut être inscrit sur l'emballage le plus petit.

La conformité est vérifiée selon 6.3.

NOTE Le marquage peut être réalisé, par exemple, par moulage, pressage, gravure et impression.

5.3.2 Durabilité et lisibilité

La conformité est vérifiée selon 6.3.

5.4 Regard de visite d'électrode de terre

La conception d'un regard de visite d'électrode de terre doit être telle que le regard remplisse sa fonction d'enveloppe abritant la connexion entre le conducteur de descente et le piquet de terre de manière acceptable et en toute sécurité, et présente des dimensions intérieures suffisantes pour permettre l'assemblage ou le désassemblage des fixations du piquet de terre. Le regard de visite doit être suffisamment profond pour permettre au couvercle de ne pas faire pression sur l'assemblage du piquet ou du conducteur ou de la fixation.

Le matériau du regard de visite d'électrode de terre doit être compatible avec son environnement, en ce qui concerne la charge assignée, et doit satisfaire aux essais décrits en 6.4.

5.5 Joint d'électrode de terre

La conception du joint d'électrode de terre doit être telle que le joint remplisse sa fonction d'étanchéité de manière acceptable et en toute sécurité au niveau de l'électrode de terre en empêchant l'eau de s'infiltrer dans les fondations, le sous-sol ou un mur du bâtiment.

Le matériau du joint d'électrode de terre doit être compatible avec son environnement et satisfaire aux essais décrits en 6.5.

6 Essais

6.1 Généralités

Les essais spécifiés dans le présent document sont des essais de type. Ces essais sont de telle nature qu'après avoir été réalisés, il n'est pas nécessaire de les répéter, à moins que des modifications n'aient été introduites dans les matériaux, dans la conception ou dans le type de procédé de fabrication, susceptibles de modifier les caractéristiques de performance du produit.

Les essais sont effectués avec des échantillons préparés comme en usage normal, conformément aux instructions du fabricant ou du fournisseur, sauf spécification contraire.

Tous les essais sont effectués sur des échantillons neufs.

Trois échantillons neufs sont soumis aux essais et les exigences sont respectées si tous les essais sont réalisés avec succès. Si un seul échantillon échoue à un essai à cause d'un défaut d'assemblage ou de fabrication, cet essai et tout autre essai préalable qui peut avoir influencé les résultats de l'essai doivent être répétés. Les essais qui suivent doivent être effectués dans l'ordre exigé sur un autre lot complet d'échantillons, qui doivent tous satisfaire aux exigences, sauf spécification contraire.