

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Lightning protection system components (LPSC) –
Part 7: Requirements for earthing enhancing compounds**
(standards.iteh.ai)

**Composants des systèmes de protection contre la foudre (CSPF) –
Partie 7: Exigences pour les enrichisseurs de terre**

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LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –**Part 7: Requirements for earthing enhancing compounds**

FOREWORD

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International Standard IEC 62561-7 has been prepared by IEC technical committee 81: Lightning protection.

This second edition cancels and replaces the first edition, published in 2011. This edition constitutes a technical revision.

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

- a) information concerning the execution of the test for the determination of the resistivity in 5.4.3;
- b) addition of Annex A for the assessment of the corrosion load.

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

FDIS	Report on voting
81/576/FDIS	81/579/RVD

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

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

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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for earthing enhancing compounds as being a lightning protection system component (LPSC) designed and implemented according to IEC 62305 (all parts).

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LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC) –

Part 7: Requirements for earthing enhancing compounds

1 Scope

This part of IEC 62561 specifies the requirements and tests for earthing enhancing compounds producing low resistance of an 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.

ISO 4689-3, *Iron ores – Determination of sulfur content – Part 3: Combustion/infrared method*

ISO 14869-1, *Soil quality – Dissolution for the determination of total element content – Part 1: Dissolution with hydrofluoric and perchloric acids*

EN 12457-2, *Characterization of waste – Leaching – Compliance test for leaching of granular waste materials and sludges – Part 2: One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 4 mm (without or with size reduction)*

EN 16192, *Characterization of waste – Analysis of eluates*

ASTM G57-06, *Standard Test Method for Field Measurement of Soil Resistivity, Using the Wenner, Four-Electrode Method*

ASTM G59-97, *Standard Test Method for Conducting Potentiodynamic Polarization Resistance Measurements*

ASTM G102-89, *Standard Practice for Calculation of Corrosion Rates and Related Information from Electrochemical Measurements*

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

earthing enhancing compound

conductive compound producing low resistance of an earth termination system

3.2

manufacturer's instructions supplier's instructions

written instructions provided by the manufacturer or the supplier in his documentation

Note 1 to entry: See 4.2.

3.3

leaching test

test during which the earthing enhancing compound is put into contact with a leachant and some constituents of the material are extracted

3.4

corrosive load

sum of all the effects of a corrosive environment

4 Requirements

4.1 General

Earthing enhancing compounds shall be so designed and constructed that in normal use their performance is reliable and without danger to persons and the surrounding environment.

The choice of a material depends on its ability to match the requirements of a particular application.

4.2 Documentation

The manufacturer or supplier of the earthing enhancing compounds shall provide adequate information in his literature to ensure that the installer can select and install the materials in a suitable and safe manner.

Compliance is checked by inspection.

The manufacturer's literature shall contain information on how to maintain the characteristics of the earthing enhancing compound so it remains stable over time.

4.3 Material

The material of the earthing enhancing compound shall be chemically inert to subsoil. It shall not pollute the environment. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. The earthing enhancing compound shall not be corrosive to the earth electrodes being used.

Compliance is checked by the tests specified in 5.2, 5.3, 5.4 and 5.5.

4.4 Marking

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

- a) manufacturer's or responsible vendor's name or trade mark;
- b) identifying symbol;
- c) resistivity.

The marking should be given on the packing unit.

Compliance is checked in accordance with 5.6.

5 Tests

5.1 General

The tests in accordance with this document are type tests.

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

All tests are carried out on new specimens.

NOTE Unless otherwise specified, three samples are subjected to each individual test and the requirements are satisfied if all the criteria are met. The applicant, when submitting the material to be tested, can also submit an additional quantity which could be necessary should one test fail. The testing station will then, without further request, repeat the test and will reject the samples only if a further failure occurs. If the additional sample is not submitted at the same time, the failure of one test will entail rejection.

5.2 Leaching test

5.2.1 General

The leaching test shall be performed according to EN 12457-2 in order to determine the content of:

- Fe (iron);
- Cu (copper);
- Zn (zinc);
- Ni (nickel);
- Cd (cadmium);
- Co (cobalt);
- Pb (lead).

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5.2.2 Determination of leachable ions

Determination of the concentrations of any or all of the metals listed in 5.2.1 shall be performed according to EN 16192.

5.2.3 Passing criteria

The criteria are given by national or international regulations.

5.3 Sulphur determination

5.3.1 General

Test for the determination of sulphur shall be performed according to ISO 4689-3 or ISO 14869-1 and the adapted analyses instrumentation (ICP-OES, ICP-AES or other ICP methods).

5.3.2 Passing criteria

The material is deemed to have passed the test if all measured values are less than 2 %. The recorded value resulting from this test shall be indicated within the product documentation.

5.4 Determination of resistivity

5.4.1 General

The four-electrode method shall be used to measure the resistivity of earthing enhancing compounds as described in ASTM G57-06. Representative samples of the materials shall be taken from a typical package as provided by the manufacturer and prepared in accordance with the manufacturer's instructions. Three samples of the earthing enhancement material shall be tested in a four-electrode soil box.

With the four-electrode method, a voltage is applied to the outer electrodes, which causes current to flow. The resulting voltage drop between the inner electrodes is measured using a voltmeter, and the resulting resistance is calculated. The resistance of the material can also be measured directly.

The resistance of each earthing enhancing compound sample shall be converted to the resistivity value using the following formula:

$$\rho = \frac{R \times A}{a}$$

where:

ρ is the sample resistivity ($\Omega \cdot \text{m}$);

R is the resistance (Ω);

A is the cross sectional area of the container perpendicular to the current flow (m^2);

a is the inner electrode spacing, measured from inner edges of electrodes (m).

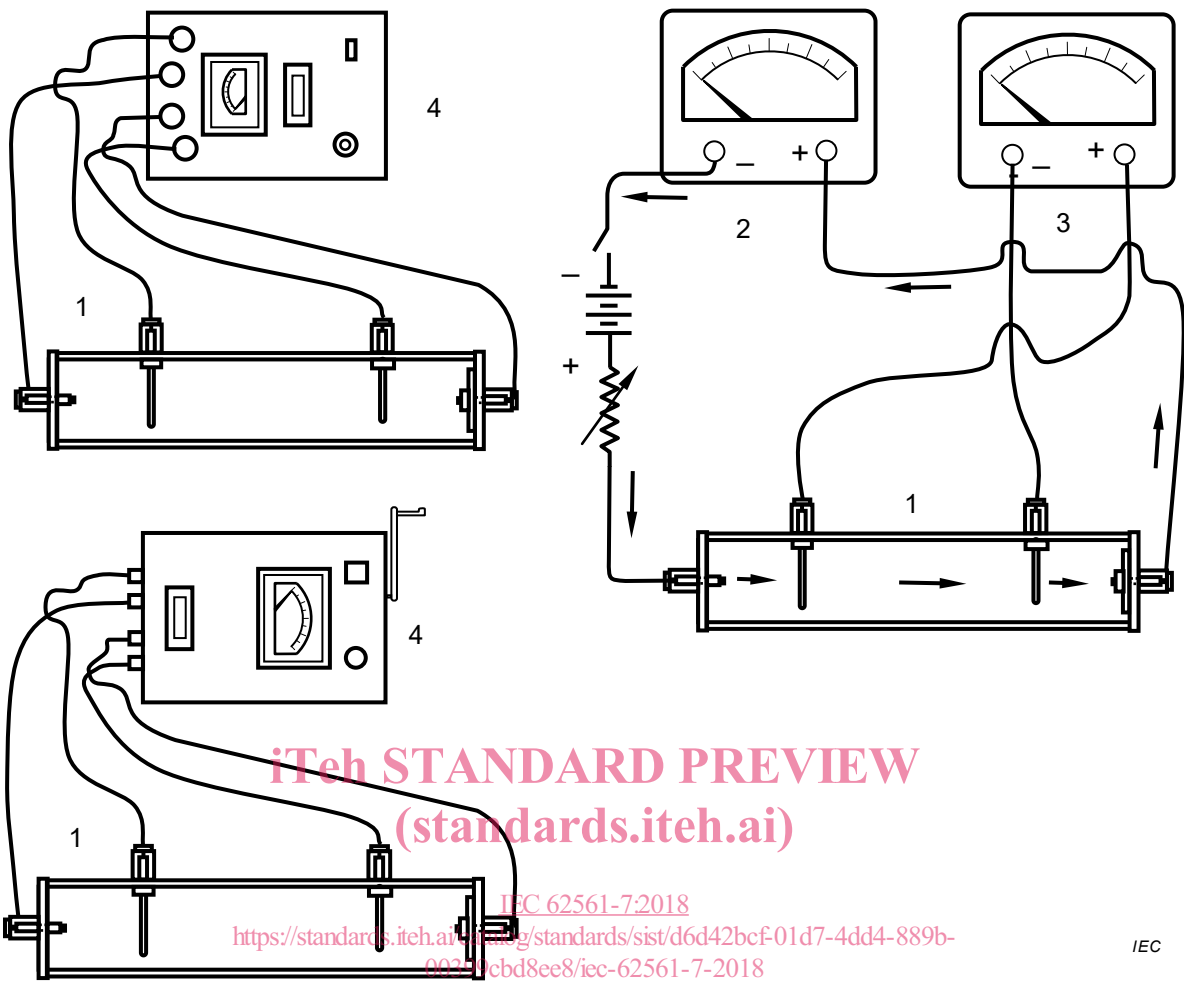
5.4.2 Testing apparatus

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The following apparatus are permitted to be used:

- Any reliable commercially available earth resistance meter having two current and two voltage terminals or low frequency AC source, a high input impedance voltmeter and ammeter. Typical connections for use of a soil box with various types of instruments are shown in Figure 1.
- Four-electrode soil box, made of an inert non-conductive material with four permanently mounted electrodes manufactured of mild or stainless steel. Soil boxes are commercially available or can be constructed in various sizes, as long as the inside dimensions are known.
- Connecting cables.



Key

- 1 soil box
- 2 ammeter
- 3 voltmeter
- 4 earth resistance meter

Figure 1 – Configuration of four-electrode soil box

5.4.3 Test procedure

The earthing enhancing compound shall be prepared according to the manufacturer's instructions. If the material is to be installed as provided, with no preparation required, the earthing enhancing compound shall be tested as received.

The resistivity measurements shall be taken after the elapsed time, as specified by the manufacturer, to allow for curing or maturing if required.

The sample of the earthing enhancing compounds shall be placed in the soil box in a manner to ensure good constant electrical contact between the earth enhancing compound and the electrodes. For solid materials, a standard 100 N/m² force should be applied evenly to the surface of the material under test within the soil box for a period of 1 h and be maintained during the resistance measurement.