



SLOVENSKI STANDARD
SIST-TS CLC/TS 50703-1:2021

01-september-2021

Nadomešča:

SIST-TS CLC/TS 50703-1:2020

Elementi za zaščito pred strelo (LPSC) - 1. del: Zahteve za preskušanje spojev kovinskih plošč, uporabljenih v LPS

Lightning Protection System Components (LPSC) - Part 1: Testing requirements for metal sheets' joints used in LPS

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Ta slovenski standard je istoveten z: **CLC/TS 50703-1:2021**

ICS:

91.120.40

Zaščita pred strelo

Lightning protection

SIST-TS CLC/TS 50703-1:2021

en

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TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CLC/TS 50703-1

June 2021

ICS 91.120.40

Supersedes CLC/TS 50703-1:2019

English Version

**Lightning Protection System Components (LPSC) - Part 1:
Testing requirements for metal sheets' joints used in LPS**

Composants des systèmes de protection contre la foudre
(CSPF) - Partie 1: Exigences d'essais relatives aux
jonctions des bandes métalliques utilisées dans les SPF

Blitzschutzsystembauteile (LPSC) - Teil 1:
Prüfanforderungen für in Blitzschutzsystemen (LPS)
verwendete Verbindungsstellen zwischen Metallblechen

This Technical Specification was approved by CENELEC on 2021-05-11.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (CLC/TS 50703-1:2021) has been prepared by CLC/TC 81X “Lightning protection”.

This document supersedes CLC/TS 50703-1:2019.

The document includes the following significant changes with respect to the previous edition:

- a) precise terms / definitions are given for the reader to understand and distinguish the under discussion types of the joints of metal sheets;
- b) conditioning tests have been added which contribute significant on the lightning current capability;
- c) two new classifications have been added as per the ability of the joints of metal sheets to withstand the lightning current with or without perforation;
- d) Table 1 – Clarifications that are more precise are given for parameters of the test current;
- e) requirements for approved measuring system have been added under clause 7.9.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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CLC/TS 50703-1:2021 (E)

1 Scope

This document defines the requirements and testing for joints of metal sheets, with or without insulating coatings, used as natural components in roofs, facades or walls of buildings, suitable to conduct lightning current in LPS where the interconnection of these metal sheets does not ensure durable electrical connection.

NOTE This document does not deal with the lightning interception capabilities of these components. The connection clamps for connecting the metallic sheet with the down conductor to the earth termination system are LPSC, tested according to EN 62561-1.

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.

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

EN 62305-3:2011, *Protection against lightning - Part 3: Physical damage to structures and life hazard (IEC 62305-3:2010)*

EN 62561-1:2017, *Lightning Protection System Components (LPSC) - Part 1: Requirements for connection components (IEC 62561-1:2017)*

ISO 22479:2019, *Corrosion of metals and alloys - Sulfur dioxide test in a humid atmosphere (fixed gas method)*

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

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3 Terms and definitions

For the purpose 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 <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

joint of metal sheets

electrical and mechanical connection between metal sheets with or without insulating coating

Note 1 to entry: Typical joints are shown in Figures A.1 and A.2 in Annex A.

Note 2 to entry: A thin coating of protective paint or about 1 mm asphalt or 0,5 mm PVC is not regarded as an insulator.

3.2

durability

ability to perform as required, under given conditions of use and maintenance, until the end of useful life

3.3**material connected metal sheets**

connection between two metal sheets (e.g. by means of welding, brazing or soldering), which allows no relative movement of metal sheets due to thermal expansion and to environmental load, e.g. snow, ice, wind where the interconnection of these metal sheets does assure durable electrical connection

3.4**force-locked metal sheets**

connection between two metal sheets (e.g. by means of crimping, clamping, bolting or screwing), which does not allow any relative movement of metal sheet's due to thermal expansion and to environmental load, e.g. snow, ice, wind where the interconnection of these metal sheets does assure durable electrical connection

3.5**form-locked metal sheets**

connection between two metal sheets (e.g. by seaming, overlapping and zipping, locked overlapping or hooking), which allows a small relative movement of metal sheet's due to thermal expansion and to environmental load, e.g. snow, ice, wind where the interconnection of these metal sheets does not assure durable electrical connection, as typically shown in Annex A

3.6**non-locked metal sheets**

connection between two metal sheets (e.g. by means of overlapping), which allows a small relative movement due to thermal expansion and to environmental load, e.g. snow, ice, wind where the interconnection of these metal sheets does not assure durable electrical connection, as typically shown in Annex A

3.7**electrical continuity**

transmission path in an electrical connection

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[SOURCE: 714-11-17, modified]

3.8**durable electrical continuity**

transmission path in an electrical connection without requiring excessive maintenance or repair, when faced with the challenges of normal operation (load caused by a surge current during a lightning strike) over its design lifetime

Note 1 to entry: According to EN 62305-3:2011, 5.2.5 and 5.5.3, the electrical continuity between the various parts is made durable (e.g. by means of brazing, welding, crimping, seaming, screwing or bolting and clamping).

[SOURCE: IEC 60364-5-53, modified]

3.9**electrical connection**

intentional electric contact between conductors

[SOURCE: IEC 60364-5-53, modified]

CLC/TS 50703-1:2021 (E)**3.10****durable electrical connection**

intentional electric contact between mechanically material connected or force-locked conductors without requiring excessive maintenance or repair, when faced with the challenges of normal operation (load caused by a surge current during a lightning strike) over its design lifetime

Note 1 to entry: Those durable electrical connections shall fulfil the requirements of EN 62561-1.

Note 2 to entry: According to EN 62305-3:2011, 5.2.5, the electrical continuity between the various parts is made durable (e.g. by means of brazing, welding, crimping, seaming, screwing or bolting) when the metal is not clad with insulating material.

Note 3 to entry: According to EN 62305-3:2011, 5.3.5 and 5.5.3, the connections shall be made secure by such means as brazing, welding, clamping, crimping, seaming, screwing or bolting) where the metal installations may be clad with insulating material.

Note 4 to entry: According to Scope of EN 62561-1:2017, the following connection types shall be considered as connection components: exothermic, brazing, welding, clamping, crimping, seaming, screwing or bolting.

[SOURCE: IEV 131-12-74, modified]

3.11**non durable electrical connection**

intentional electric contact between mechanically form-locked or non-locked connections requiring excessive maintenance or repair, when faced with the challenges of normal operation (load caused by a surge current during a lightning strike) over its design lifetime

Note 1 to entry: The type test according to CLC/TS 50703-1 is required.

Note 2 to entry: The electrical continuity between the various parts is made non-durable (e.g. by means of seaming, overlapping and zipping, locked overlapping, overlapping or hooking) as shown in Figures A.1 and A.2 in Annex A.

[SOURCE: IEV 131-12-74]

3.12**durable electrical connection of metal sheets**

electrical connection of metal sheets made by material connection or force-locked connection of bare metal sheets

Note 1 to entry: Those durable connections shall fulfil the requirements of EN 62561-1.

Note 1 to entry: According to EN 62305-3:2011, 5.2.5 and 5.5.3, the electrical continuity between the various parts is made durable (e.g. by means of brazing, welding, crimping, seaming, screwing or bolting and clamping).

3.13**non-durable electrical connection of metal sheets**

electrical connection of metal sheets made by form-locked or non-locked connection of bare metal sheets or coated metal sheets which does not ensure durable electrical connection

Note 1 to entry: The type test according to CLC/TS 50703-1 is required.

Note 2 to entry: The electrical continuity between the various parts is made non-durable (e.g. by means of seaming, overlapping and zipping, locked overlapping, overlapping or hooking).

3.14**type test**

test required to be made before supplying a type of material covered by this document 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 done, they don't need to be repeated unless changes are made to the accessory materials, design or type of manufacturing process which might change the performance characteristics.

3.15**natural component of LPS**

conductive component installed not specifically for lightning protection which can be used in addition to the LPS or in some cases could provide the function of one or more parts of the LPS

Note 1 to entry: Example of the use of this term include:

- natural air-termination;
- natural down-conductor;
- natural earth electrode.

4 Classification

4.1 Classification of non-durable joints of metal sheets according to the ability to withstand lightning current:

a) class H for heavy duty;

b) class N for normal duty.

The selection of classes H and N should be performed by the manufacturer in accordance with the test parameters identified in Table 1.

4.2 Classification of non-durable joints of metal sheets according to the ability to pass the lightning current tests with respect to perforation as follows:

a) class NP joints of metal sheets without perforation;

b) class P joints of metal sheets with perforation with a size less than 2 cm².

The selection of classes NP and P shall be performed by the manufacturer of the joints of metal sheets in accordance with the intended application.

5 Requirements**5.1 General**

Joints of metal sheets shall be designed in such 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.

CLC/TS 50703-1:2021 (E)**5.2 Installation instructions**

The manufacturer of form-locked and non-locked electrical non-durable joints of metal sheets shall provide at least the following information:

- a) the classification of the joints of the metal sheets class N or H and NP or P;
- b) the configuration of the joints of the metal sheets;
- c) the connection configuration of the joints of the metal sheets.

The selection of classes NP and P shall be performed by the manufacturer of the joints of metal sheets in accordance with the intended application as per EN 62305-3.

As per EN 62305-3 perforation is acceptable, if it is not important to prevent puncture of the sheeting or to consider ignition of any readily combustible materials underneath. – Class P.

Perforation is not acceptable, if it is necessary to take precautions against puncture or to consider hot spot problems. – Class NP.

Compliance is checked by review as per 6.2.

5.3 Marking

Metal sheet shall be marked at least with the following:

- a) manufacturer's or responsible vendor's name or trade mark;
- b) identifying symbol (picture, product number, etc.);
- c) classification, i.e. class N or H and NP or P.

Where this proves to be impractical the marking in accordance with a), b) and c) shall be given on the type test report together with the accompanying documentation, including the complete information of the joint of metal sheet to be kept available for consultation.

Compliance is checked by review in accordance with 6.3.2.

The marking shall be durable and legible.

Compliance is checked in accordance with tests as per 6.3.3.

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

5.4 Lightning current carrying capability

The joints of metal sheet shall have sufficient lightning current carrying capability.

Compliance is checked by tests in accordance with 6.4 following the manufacturer's declaration for the class (H or N and NP or P) of the metal sheet in accordance with Clause 4.

6 Tests**6.1 General condition on tests**

The tests in accordance with this document are type tests (see 3.16) and performed in a sequence according to Figure D.1 in Annex D.

This document does not deal with the verification of metal sheets as natural air-termination. It deals only with the joints of metal sheets to conduct lightning current where the interconnection of these metal sheets does not ensure durable electrical connection. The effect to intercept direct lightning flashes is not verified and has to be tested separately.

- a) Unless otherwise specified, tests are carried out with the specimens assembled and installed as in normal use according to the manufacturer's or supplier's installation instructions.
- b) All tests are carried out on new specimens.
- c) Unless otherwise specified, three specimens are subjected to the tests and the requirements are satisfied if all the tests are met.
- d) The electrical test shall be carried out in the order given, after conditioning / ageing of the arrangement of the specimen in accordance with 6.4.2.
- e) If only one of the specimens does not satisfy the test due to an assembly or a manufacturing fault, that test shall be repeated, on another full set of specimens, all of which shall comply with the requirements.
- f) The applicant, when submitting the sets of specimens, may also submit an additional set of specimens which could be necessary should one specimen fail. The testing laboratory will then, without further request, test the additional set of specimens and will reject only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will entail rejection.

6.2 Installation instructions

6.2.1 General conditions for tests

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

6.2.2 Acceptance criteria

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

- a) classification as per Clause 4;
- b) joint configuration;
- c) connection configuration.

6.3 Marking test

6.3.1 General conditions for tests

The marking is checked by inspection for its completeness by review as per 6.3.2 and its durability / legibility by test as per 6.3.3.

6.3.2 Acceptance criteria for marking completeness

The content of the marking shall be in line with 5.3.

6.3.3 Acceptance criteria for marking durability and legibility

Durability/legibility of the marking is checked by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for another 15 s with a piece of cloth soaked with white spirit/mineral spirit. The test is deemed to have been passed if the marking remains durable and legible on all specimens, Markings made by moulding, pressing or engraving are not subjected to this test.