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(एलपीएससी)

भाग 6 तड़ित प्रहार रोधकों के लिए आवश्यकताएँ  
(एलएससीएस)

Lightning Protection System  
Components (LPSC)  
Part 6 Requirements for Lightning Strike  
Counters (LSCs)

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## NATIONAL FOREWORD

This Standard (Part 6) which is identical to IEC 62561-6 : 2023 'Lightning protection system components (LPSC) — Part 6: Requirements for lightning strike counters (LSCs)' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electrical Installation Sectional Committee and approval of the Electrotechnical Division Council.

This standard is published in several parts. The other parts in this series are:

- Part 1 Requirements for connection components
- Part 2 Requirements for conductors and earth electrodes
- Part 3 Requirements for isolating spark gaps ISGs
- Part 4 Requirements for conductor fasteners
- Part 5 Requirements for earth electrode inspection housings and earth electrode seals
- Part 7 Requirements for earthing enhancing compounds
- Part 8 Requirements for components for isolated LPS

The text of the IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted, are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 4892-2 : 2013 Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps	IS 17863 (Part 2) : 2022/ ISO 4892-2 : 2013 Plastics methods of exposure to laboratory light sources: Part 2 Xenon-arc lamps	Identical
ISO 4892-3 : 2016 Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps	IS 17863 (Part 3) : 2022/ ISO 4892-3 : 2016 Plastics — Methods of exposure to laboratory light sources: Part 3 Fluorescent UV lamps	Identical
ISO 4892-4 : 2013 Plastics — Methods of exposure to laboratory light sources — Part 4: Open-flame, carbon-arc lamp	IS 17863 (Part 4) : 2022/ ISO 4892-4 : 2013 Plastics — Methods of exposure to laboratory light sources: Part 4 Open-flame carbon-arc lamps	Identical

[\(Continued on third cover\)](#)

## CONTENTS

INTRODUCTION.....	v
1 Scope.....	1
2 Normative references .....	1
3 Terms and definitions .....	2
4 Classification .....	3
4.1 Type of LSC.....	3
4.2 LSC Internal circuit .....	3
4.3 LSC installation location .....	3
5 Requirements .....	4
5.1 General.....	4
5.2 Documentation.....	4
5.3 Marking.....	4
5.3.1 Content of marking .....	4
5.3.2 Durability and legibility.....	5
5.4 Design .....	5
6 Tests .....	6
6.1 General test conditions .....	6
6.1.1 General .....	6
6.1.2 Impulse discharge current count for LSC Type I.....	6
6.1.3 Nominal discharge current count for LSC Type II .....	7
6.2 Documentation and installation instructions .....	8
6.2.1 General conditions.....	8
6.2.2 Acceptance criteria .....	8
6.3 Marking test .....	8
6.3.1 General test conditions .....	8
6.3.2 Acceptance criteria .....	8
6.4 Ultraviolet (UV) light resistance.....	8
6.4.1 General test conditions .....	8
6.4.2 Acceptance criteria .....	8
6.5 Resistance tests to corrosion (for metallic parts).....	9
6.5.1 General test conditions .....	9
6.5.2 Acceptance criteria .....	9
6.6 Impact test.....	9
6.6.1 General test conditions .....	9
6.6.2 Acceptance criteria .....	10
6.7 Index of protection confirmation (IP Code) .....	10
6.8 Electrical tests .....	10
6.8.1 General test conditions .....	10
6.8.2 Minimum discharge current counting test.....	10
6.8.3 Threshold current test.....	11
6.8.4 Maximum impulse current counting test .....	12
6.8.5 Performance verification test .....	12
7 Electromagnetic compatibility (EMC) .....	12
7.1 Electromagnetic immunity .....	12
7.2 Electromagnetic emission .....	13

8	Structure and content of the test report.....	13
8.1	General.....	13
8.2	Report identification .....	13
8.3	Specimen description.....	13
8.4	Standards and references .....	14
8.5	Test procedure.....	14
8.6	Testing equipment description .....	14
8.7	Measuring instruments description .....	14
8.8	Results and parameters recorded .....	14
8.9	Statement of pass/fail .....	14
Annex A	(normative) Resistance to UV light.....	15
A.1	General.....	15
A.2	Test .....	15
A.3	First alternative test to Clause A.2 .....	15
A.4	Second alternative test to Clause A.2 .....	15
Annex B	(normative) Resistance to corrosion tests for LSCs .....	16
B.1	General.....	16
B.2	Salt mist test.....	16
B.3	Humid sulphurous atmosphere test .....	16
B.4	Ammonia atmosphere treatment.....	16
Annex C	(normative) Flowchart for testing LSCs .....	17
Annex D	(normative) Applicability of previous tests .....	18
Bibliography	.....	19
Figure C.1	– Flowchart for testing of LSCs .....	17
Table 1	– Preferred parameters for impulse discharge currents counted ( $I_{imp}$ ) .....	7
Table 2	– Preferred parameters for nominal discharge currents counted ( $I_n$ ) .....	7
Table D.1	– Differences in the requirements for LSCs complying with IEC 62561-6:2011 or IEC 62561-6:2018.....	18

## INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC) used to determine the number of impulses or nominal currents on specific conductors associated with a lightning protection system (LPS) designed and implemented according to the IEC 62305 series.



*Indian Standard*  
**LIGHTNING PROTECTION SYSTEM COMPONENTS  
(LPSC)  
PART 6 REQUIREMENTS FOR LIGHTNING STRIKE  
COUNTERS (LSCs)**

## **1 Scope**

This part of IEC 62561 specifies the requirements and tests for devices intended to count the number of lightning strikes based on the current flowing in a conductor. This conductor can be part of a lightning protection system (LPS) or connected to an SPD installation or other conductors, which are not intended to conduct a significant portion of lightning currents.

Extra requirements for the components can be necessary for LSCs intended for use in hazardous atmospheres.

NOTE In CENELEC member countries, testing requirements of components for explosive atmospheres are specified in CLC/TS 50703-2.

## **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 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-3:2016, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

ISO 4892-4:2013, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame, carbon-arc lamps*

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

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

### 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 <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **LSC**

##### **lightning strike counter**

device intended to count the number of lightning strikes based on current flowing in a conductor

#### 3.2

##### **lightning strike counter Type I**

##### **LSC Type I**

LSC classified by its design to count impulse discharge currents

#### 3.3

##### **lightning surge counter Type II**

##### **LSC Type II**

LSC classified by its design to count nominal discharge currents

#### 3.4

##### **impulse discharge current**

$I_{imp}$

crest value of an impulse current 10/350 through the LSC with specified charge transfer  $Q$  and specified energy  $W/R$  in the specified time

#### 3.5

##### **minimum impulse discharge current counted**

$I_{imp\ min}$

minimum crest value of the impulse counting discharge current that the LSC will count

#### 3.6

##### **maximum impulse discharge current counted**

$I_{imp\ max}$

maximum crest value of the impulse counting discharge current that the LSC will count and withstand

#### 3.7

##### **nominal discharge current**

$I_n$

crest value of a surge current 8/20 through the LSC

#### 3.8

##### **minimum discharge current counted**

$I_n\ min$

minimum crest value of the surge current that the LSC will count

#### 3.9

##### **maximum discharge current counted**

$I_n\ max$

maximum crest value of the surge current that the LSC will count and withstand



### 3.10

#### IP code

##### degree of protection of enclosure

numerical classification according to IEC 60529, preceded by the symbol IP, applied to the enclosure of electrical apparatus to provide:

- protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure,
- protection of the electrical apparatus against ingress of solid foreign objects, and
- protection of the electrical apparatus against harmful ingress of water where indicated by the classification

[SOURCE: IEC 60050-426:2020, 426-04-02, modified – In the term, "code" has been added, in the definition, "according to IEC 60529" has been added, "equipment" has been replaced with "electrical apparatus" and the Notes to entry have been deleted.]

### 3.11

#### point of strike

point where a lightning flash strikes the earth, or protruding structure

EXAMPLE: Structure, LPS, line, tree.

Note 1 to entry: A lightning flash can have more than one point of strike.

### 3.12

#### strike

all strokes from a single lightning flash that attach to a point of strike on a structure

### 3.13

#### impulse current

transient current created by direct lightning strike into the LPS

### 3.14

#### surge

transient created by lightning electromagnetic pulse (LEMP) that appears either as an overvoltage or as an overcurrent, or both

## 4 Classification

### 4.1 Type of LSC

LSCs are classified according to the discharge current count:

- a) Type I to count impulse discharge current count as defined in 3.2;
- b) Type II to count nominal discharge current count as defined in 3.3.

### 4.2 LSC Internal circuit

LSCs are classified according to their internal circuit:

- a) LSCs without electronic circuit;
- b) LSCs with electronic circuit.

### 4.3 LSC installation location

LSCs are classified according to their installation location:

- a) indoor LSCs are intended for use in enclosures or inside buildings or shelters;
- b) outdoor LSCs are intended for use without enclosures and outside of buildings or shelters;

c) LSCs intended for use in special environments as specified by the manufacturer.

The degree of protection of enclosure (IP code) defined in IEC 60529 is particularly relevant to the intended location of an LSC but it is possible that they will not be applicable to an LSC integral with an SPD.

NOTE LSCs installed in outdoor enclosures or shelters are suitable for indoor use.

## **5 Requirements**

### **5.1 General**

LSCs shall be designed in such a manner that when they are installed in accordance with manufacturer's instructions, their performance shall be reliable, stable and safe to persons and surrounding equipment.

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

### **5.2 Documentation**

The manufacturer or supplier of the LSC shall provide adequate information in their literature to ensure that the installer can select and install the counter in a suitable and safe manner.

The ranges for operating temperature, humidity, altitude, IP code and the classifications according to Clause 4 shall be declared by the manufacturer.

The following information shall also be provided (as applicable):

$$I_{\text{imp min}}; I_{\text{imp max}}; I_{\text{imp}}; I_{\text{n}}; I_{\text{n min}}; I_{\text{n max}}$$

where

$I_{\text{imp min}}$  is the minimum impulse discharge current counted;

$I_{\text{imp max}}$  is the maximum impulse discharge current counted;

$I_{\text{imp}}$  is the impulse discharge current;

$I_{\text{n}}$  is the nominal discharge current;

$I_{\text{n min}}$  is the minimum discharge current counted;

$I_{\text{n max}}$  is the maximum discharge current counted.

Compliance is checked by inspection 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 the following:

- a) the name of the manufacturer or his trademark;
- b) the reference of the type or the serial number;
- c) the classification;
- d)  $I_{\text{imp min}}; I_{\text{imp max}}; I_{\text{n min}}; I_{\text{n max}}$ ;
- e) the degree of protection (IP code);
- f) conformity to this document.

If the device is small and sufficient space is not available for all the markings to appear, the indications cited in a) and b) above shall at least be reproduced on the apparatus and still be visible after installation. The indications cited in c), d), e) and f) can be given on the packaging or in the installation data sheet (documentation), or in the catalogue of the manufacturer.

Compliance is checked in accordance with 6.3.1 a).

NOTE 1 Marking can be applied, for example, by moulding, pressing, engraving, printing adhesive labels.

NOTE 2 Marking can be applied with water slide transfers for only components installed indoors.

### **5.3.2 Durability and legibility**

The marking shall be durable and legible.

Compliance is checked by test in accordance with 6.3.1 b).

## **5.4 Design**

The lightning strike counter shall be designed to carry out its function of counting the number of lightning strikes causing a current to flow in a conductor.

These devices shall detect and record lightning strikes regardless of the polarity of the current.

LSCs intended to be used outdoors shall be able to withstand environmental conditions including temperature, dust and humidity. The minimum degree of protection is IP 43 obtained by itself or in combination with a box in accordance with IEC 60529.

This test is necessary for LSCs designed to be installed outdoors or in specific environments.

Non-metallic LSC housings for outdoor application shall withstand ultraviolet (UV) effects.

Compliance is checked in accordance with 6.4, 6.5, 6.6.

The manufacturer shall provide information regarding the range of environmental operating conditions, such as temperature, altitude and humidity which the strike counter is designed to operate within.

LSCs shall be capable of counting and withstanding specified currents without unacceptable changes in their characteristics.

Compliance is checked in accordance with 6.7, 6.8.2, 6.8.3, 6.8.4 and 6.8.5.

The size of the characters in the display, if any, shall allow a normal reading, i.e. by normal or corrected vision without magnification, of the number of lightning strikes recorded, when the LSC is installed in accordance with the instructions of the manufacturer.

Compliance is checked by visual inspection.

The fixing system of the LSC should not apply an unacceptable stress or damage to the conductor.

The materials of the LSC shall be compatible with that of the lightning conductor, so that corrosion due to galvanic coupling may be avoided.

Compliance is checked by visual inspection.

## 6 Tests

### 6.1 General test conditions

#### 6.1.1 General

The tests in accordance with this document are type tests, performed in a sequence according to Annex C. 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 instructions.

All tests are carried out on new specimens.

Unless otherwise specified, three 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 could have influenced the results of the test shall be repeated and also 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.

NOTE 1 One set of three specimens can be used for more than one test, subject to agreement by the manufacturer.

NOTE 2 The applicant can also submit an additional set of specimens which can be used should one specimen fail. The testing laboratory will then, without further request, test the additional set of specimens and will reject the set 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.

Unless otherwise specified, the tests are carried out at an ambient temperature ranging between 5 °C and 35 °C and the ambient temperature shall not vary during the duration of the test by more than 3 °C. The LSC shall be protected from excessive heating or excessive external cooling.

See Annex C, Figure C.1 for a flowchart for testing LSCs.

For products already tested according to IEC 62561-6:2011 and IEC 62561-6:2018, the applicability of previous tests according to Annex D, Table D.1 may be applied.

For new products, complete type tests and samples according to clauses specified in Annex A and Annex B are required.

#### 6.1.2 Impulse discharge current count for LSC Type I

The impulse discharge current passing through the device under test is defined by the crest value  $I_{imp}$ , the charge  $Q$  and the specific energy  $W/R$ . The impulse current shall show no polarity reversal and shall reach  $I_{imp}$  within 50  $\mu$ s.

The transfer of the charge  $Q$  shall occur within 5 ms and the specific energy  $W/R$  shall be dissipated within 5 ms.

The impulse duration shall not exceed 5 ms.

Table 1 gives values of  $Q$  (As) and  $W/R$  (kJ/ $\Omega$ ) for example values of  $I_{imp}$  (kA).

The relationships between  $I_{imp}$ ,  $Q$  and  $W/R$  are as follows:

$$Q = I_{imp} \times a$$

where  $a = 5 \times 10^{-4}$  s.

$$W/R = I_{imp}^2 \times b$$

where  $b = 2,5 \times 10^{-4}$  s.

**Table 1 – Preferred parameters for impulse discharge currents counted ( $I_{imp}$ )**

$I_{imp}$ (crest value) kA $\pm 10$ % within 50 $\mu$ s	$Q$ As $\begin{matrix} +20 \\ -10 \end{matrix}$ % within 5 ms	$W/R$ kJ/ $\Omega$ $\begin{matrix} +45 \\ -10 \end{matrix}$ % within 5 ms
100	50	2 500
50	25	625
25	12,5	156
10	5	25
5	2,5	6,25
2	1	1
1	0,5	0,25

NOTE One of the possible test impulses which meet the above parameters is the 10/350 wave shape proposed in IEC 62305-1.

### 6.1.3 Nominal discharge current count for LSC Type II

The nominal discharge current passing through the device under test is defined by the crest value  $I_n$  (see Table 2) and has the wave shape 8/20 according to IEC 62475.

**Table 2 – Preferred parameters for nominal discharge currents counted ( $I_n$ )**

$I_n$ (8/20), crest value kA $\pm 10$ %
100
80
60
40
20
1
0,5

The tolerances on the current wave shape passing through the device under test are as follows:

front time  $T_1$   $\pm 20$  %;

time to half value  $T_2$   $\pm 20$  %.

A small overshoot or oscillation is tolerable provided that the amplitude of any oscillation is not more than 5 % of the crest value. Any polarity reversal after the current has fallen to zero shall not be more than 30 % of the crest value.

NOTE For  $T_1$  and  $T_2$ , see IEC 62305-1:2010, Figure A.1.

## **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 and installation instructions are deemed to be acceptable if they contain the information given in 5.2.

## **6.3 Marking test**

### **6.3.1 General test conditions**

All three specimens used and complying with tests described in 6.2 shall be subjected to the marking test:

- a) as per its completeness by review, in accordance with 5.3.1 and
- 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.

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

### **6.3.2 Acceptance criteria**

The specimen is deemed to have passed the test if:

- a) the marking contains all the information given in 5.3.1;
- b) after the test of 5.3.2, the marking remains fixed and legible.

## **6.4 Ultraviolet (UV) light resistance**

### **6.4.1 General test conditions**

One set of three new specimens shall be assembled and mounted rigidly on an insulating plate (e.g. brick, polytetrafluoroethylene [PTFE]) in accordance with the manufacturer's installation instructions.

Ensure that the surface of the mounting plate is suitable to resist UV radiation.

The specimens shall be subjected to an environmental test consisting of an UV light test as specified in Annex A.

### **6.4.2 Acceptance criteria**

The specimens are deemed to have passed this part of the test if there are no signs of disintegration and no cracks visible to normal or corrected vision.

## **6.5 Resistance tests to corrosion (for metallic parts)**

### **6.5.1 General test conditions**

This test is necessary for LSCs having metallic housings or parts designed to be installed outdoors or in specific environments.

The specimens used and compliant with the test in 6.4 shall be subjected to corrosion tests as per Annex B.

This only applies to LSCs having housings with metallic parts. For LSCs with metal housings three new samples are required.

### **6.5.2 Acceptance criteria**

After the parts have been dried during 10 min in a drying oven at a temperature of  $100\text{ °C} \pm 5\text{ °C}$ , they shall not present any trace of rust on surfaces.

Traces of rust on the edges or a yellowish stain removed by rubbing are not taken into account. White rust is not considered as corrosive deterioration.

## **6.6 Impact test**

### **6.6.1 General test conditions**

All specimens complying with 6.4 or 6.5 shall be stressed three times by a mechanical test.

All specimens are subjected to a mechanical test by applying mechanical impacts.

The impacts are carried out on the LSC's accessible parts which in use can be mechanically stressed accidentally.

The specimens are assembled under their normal operating conditions specified in the manufacturer's documentation.

The LSC is mounted on a pendulum hammer test apparatus according to IEC 60068-2-75:2014, Clause 4. The striking element material shall be polyamide as per IEC 60068-2-75:2014, Table 1 and its mass shall be 250 g as per IEC 60068-2-75:2014, Table 2, impact energy 0,35 J.

The hammer shall fall from a height of 140 mm so that one impact on each side is applied, as far as possible perpendicular to the length of the arrangement. The drop height is the vertical distance between the position of the point of control, when the pendulum is released, and the position of this point at the time of the impact.

The point of control as per IEC 60068-2-75:2014 is located on the surface of the striking part where the line passing by the point of intersection of the axes of the steel tube of the pendulum and the part of striking, perpendicular to the plane crossing the two axes, comes into contact with the surface.

The impacts are not applied to the display window or to the connectors.

NOTE In theory, the centre of gravity of the striking part will be the point of control but, in practice, as it is difficult to determine the centre of gravity, the point of control has been chosen as described above.

### **6.6.2 Acceptance criteria**

After the test, the LSC shall show no cracks or similar damage visible to normal or corrected vision without magnification and shall not present damage which can potentially affect its later use.

After the test, the LSC shall not have increased nor decreased the count value in the display (especially for electromechanical LSCs).

### **6.7 Index of protection confirmation (IP Code)**

IP code confirmation shall be performed in accordance with IEC 60529, on the used specimens and in compliance with the test of 6.6.

The specimens shall be in compliance with IEC 60529 requirements.

### **6.8 Electrical tests**

#### **6.8.1 General test conditions**

After the test of 6.7, each specimen shall be tested with the following electrical tests.

LSCs classified as Type I and Type II according to 4.1 shall be tested with their listed impulse discharge currents and nominal discharge currents.

#### **6.8.2 Minimum discharge current counting test**

##### **6.8.2.1 LSC Type I**

###### **6.8.2.1.1 General test conditions**

For an LSC Type I, an impulse discharge current 10/350 with a crest value equal to  $I_{imp\ min}$  is applied with positive and negative polarity.

###### **6.8.2.1.2 Acceptance criteria**

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

##### **6.8.2.2 LSC Type II**

###### **6.8.2.2.1 General test conditions**

For an LSC Type II, a nominal discharge current 8/20 with a crest value equal to  $I_n\ min$  is applied with positive and negative polarity.

###### **6.8.2.2.2 Acceptance criteria**

The specimens have passed, if the counter of the LSC is incremented by two.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.



### 6.8.2.3 LSC Type I and Type II

#### 6.8.2.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents  $I_{\text{imp min}} 10/350$  and the corresponding nominal discharge currents  $I_{\text{n min}} 8/20$  are applied with positive and negative polarity.

#### 6.8.2.3.2 Acceptance criteria

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by four.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

### 6.8.3 Threshold current test

#### 6.8.3.1 LSC Type I

##### 6.8.3.1.1 General test conditions

For an LSC Type I, an impulse discharge current with a crest value equal to  $0,5 I_{\text{imp min}} 10/350$  is applied with positive polarity and with negative polarity.

##### 6.8.3.1.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

#### 6.8.3.2 LSC Type II

##### 6.8.3.2.1 General test conditions

For an LSC Type II, a nominal discharge current with a crest value equal to  $0,5 I_{\text{n min}} 8/20$  is applied with positive polarity and with negative polarity.

##### 6.8.3.2.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

#### 6.8.3.3 LSC Type I and Type II

##### 6.8.3.3.1 General test conditions

For an LSC classified as Type I and Type II, the corresponding impulse discharge current  $0,5 I_{\text{imp min}} 10/350$  and the corresponding nominal discharge current  $0,5 I_{\text{n min}} 8/20$  are applied with positive and negative polarity.

##### 6.8.3.3.2 Acceptance criteria

The test is passed, if the counter of the LSC is not incremented.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

#### **6.8.4 Maximum impulse current counting test**

##### **6.8.4.1 LSC Type I**

###### **6.8.4.1.1 General test conditions**

For an LSC Type I, three impulse discharge currents with a crest value equal to  $I_{imp\ max}$  10/350 are applied with positive and negative polarity.

###### **6.8.4.1.2 Acceptance criteria**

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

##### **6.8.4.2 LSC Type II**

###### **6.8.4.2.1 General test conditions**

For an LSC Type II, three nominal discharge currents with a crest value equal to  $I_{n\ max}$  8/20 are applied with positive and negative polarity.

###### **6.8.4.2.2 Acceptance criteria**

The specimens have passed, if the counter of the LSC is incremented by six.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

##### **6.8.4.3 LSC Type I and Type II**

###### **6.8.4.3.1 General test conditions**

For an LSC classified as Type I and Type II, the corresponding impulse discharge currents  $I_{imp\ max}$  10/350 and the corresponding nominal discharge currents  $I_{n\ max}$  8/20 are applied three times with positive and negative polarity.

###### **6.8.4.3.2 Acceptance criteria**

LSCs classified as Type I and Type II specimens have passed the test, if the counter of LSCs is incremented by twelve.

No visible damage shall occur during the tests. There shall be no opening or degradation of the parts carrying the current or of the housing of the LSC.

#### **6.8.5 Performance verification test**

This test shall be performed after the maximum current counting test of 6.8.4.

For this purpose, the test described in 6.8.2 shall be repeated once.

## **7 Electromagnetic compatibility (EMC)**

### **7.1 Electromagnetic immunity**

LSCs containing electronic circuits shall fulfil the requirements of IEC 61000-6-2.

## 7.2 Electromagnetic emission

LSCs shall fulfil the requirements of IEC 61000-6-4.

## 8 Structure and content of the test report

### 8.1 General

The purpose of Clause 8 is to provide general requirements for 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 laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be given 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 given 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, address and telephone number of the test laboratory;
- c) name, address and telephone number of the sub-testing laboratory where the test was carried out, if different from the company which has been 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 for the content of the report;
- j) signature and title of person(s) conducting the test;
- k) the following declaration report 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 testing 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 sample and test assembly;
- c) characterization and condition of the test sample and test assembly;
- 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 and the date of issue of the standard;
- b) other relevant documentation with the documentation date.

#### **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. conditioning or ageing device.

#### **8.7 Measuring instruments description**

Characteristics and calibration dates of all instruments used for measuring the values specified in this document, e.g. meters.

#### **8.8 Results and parameters recorded**

The measured, observed or derived results shall be clearly identified at least for:

- a) impulse discharge current (10/350);
- b) crest value  $I_{imp}$ ;
- c) charge  $Q$ ;
- d) specific energy  $W/R$ ;
- e) nominal discharge current (8/20);
- f) crest value;
- g) front time;
- h) time to half value;
- i) current reversal;
- j) IP code test;
- k) impact test;
- l) corrosion test;
- m) UV test;
- n) marking test;
- o) minimum discharge current counting test.

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

#### **8.9 Statement of pass/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.

## Annex A (normative)

### Resistance to UV light

#### A.1 General

For non-metallic LSC housings, one sample shall be subjected to UV light conditioning specified in Clauses A.2, A.3 or A.4. The tested sample is considered representative of the material's entire colour range.

The sample shall be mounted on the inside of the cylinder in the UV light apparatus and shall be positioned in such a way that the fixation surface for the rod is perpendicular to the light source.

Passing criteria: after the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

#### A.2 Test

The specimens shall be exposed for  $(1\ 000 \pm 1)$  h to a xenon-arc, in accordance with ISO 4892-2:2013, Method A. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of  $(120 \pm 1)$  min consisting of a  $(102 \pm 1)$  min light exposure and a  $(18 \pm 1)$  min exposure to water spray with light, shall be used. The apparatus shall operate with a water-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of  $0,35\ \text{W} \times \text{m}^{-2} \times \text{nm}^{-1}$  at 340 nm and a black panel temperature of  $(65 \pm 3)$  °C. The temperature of the chamber shall be  $(45 \pm 5)$  °C. The relative humidity in the chamber shall be  $(50 \pm 5)$  %.

#### A.3 First alternative test to Clause A.2

The specimens shall be exposed for  $(720 \pm 1)$  h to an open-flame sunshine carbon-arc, in accordance with ISO 4892-4:2013. Continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of  $(120 \pm 1)$  min consisting of a  $(102 \pm 1)$  min light exposure and a 18 min exposure to water spray with light, shall be used. The apparatus shall operate with an open-flame sunshine carbon-arc lamp, borosilicate glass Type 1 inner and outer optical filters, a spectral irradiance of  $0,35\ \text{W} \times \text{m}^{-2} \times \text{nm}^{-1}$  at 340 nm and a black panel temperature of  $(65 \pm 3)$  °C. The temperature of the chamber shall be  $(45 \pm 5)$  °C with a relative humidity of  $(50 \pm 5)$  %.

#### A.4 Second alternative test to Clause A.2

The specimens shall be exposed to total irradiation energy equal to the values given in Clause A.2, and to fluorescent UV in accordance with ISO 4892-3:2016. The exposure conditions shall be by continuous exposure to light and intermittent exposure to water spray, with a programmed cycle of  $(360 \pm 1)$  min light exposure and  $(60 \pm 1)$  min exposure to water spray with light as described in ISO 4892-3:2016, Table 4, Method A, cycle 3.

## **Annex B** (normative)

### **Resistance to corrosion tests for LSCs**

#### **B.1 General**

The resistance to corrosion test consists of a salt mist treatment as specified in Clause B.2 followed by a humid sulphurous atmosphere treatment as specified in Clause B.3 and an additional ammonia atmosphere treatment for specimens where any component part is made of copper alloy with a copper content less than 80 %, as specified in Clause B.4.

The manufacturer or supplier shall provide proof of the copper content of any part of the assembly made from a copper alloy.

#### **B.2 Salt mist test**

The salt mist treatment shall be in accordance with IEC 60068-2-52:2017 except for Clauses 7, 10 and 11 which are not applicable. The test is carried out using test method (2).

If the salt mist chamber can maintain the temperature conditions as specified in IEC 60068-2-52:2017, 9.3 and a relative humidity of not less than 90 % then the specimen can remain in the chamber for the humidity storage period.

#### **B.3 Humid sulphurous atmosphere test**

The humid sulphurous atmosphere treatment shall be in accordance with ISO 22479:2019, Method B with 7 cycles with a sulphur dioxide content 0,2 L (at  $300 \pm 10$ ) L of capacity, except for Clauses 9 and 10 which are not applicable.

Each cycle which has a duration of 24 h is composed of a heating period of 8 h at a temperature of  $40 \text{ °C} \pm 3 \text{ °C}$  in the humid saturated atmosphere which is followed by a rest period of 16 h. After that, the humid sulphurous atmosphere is replaced.

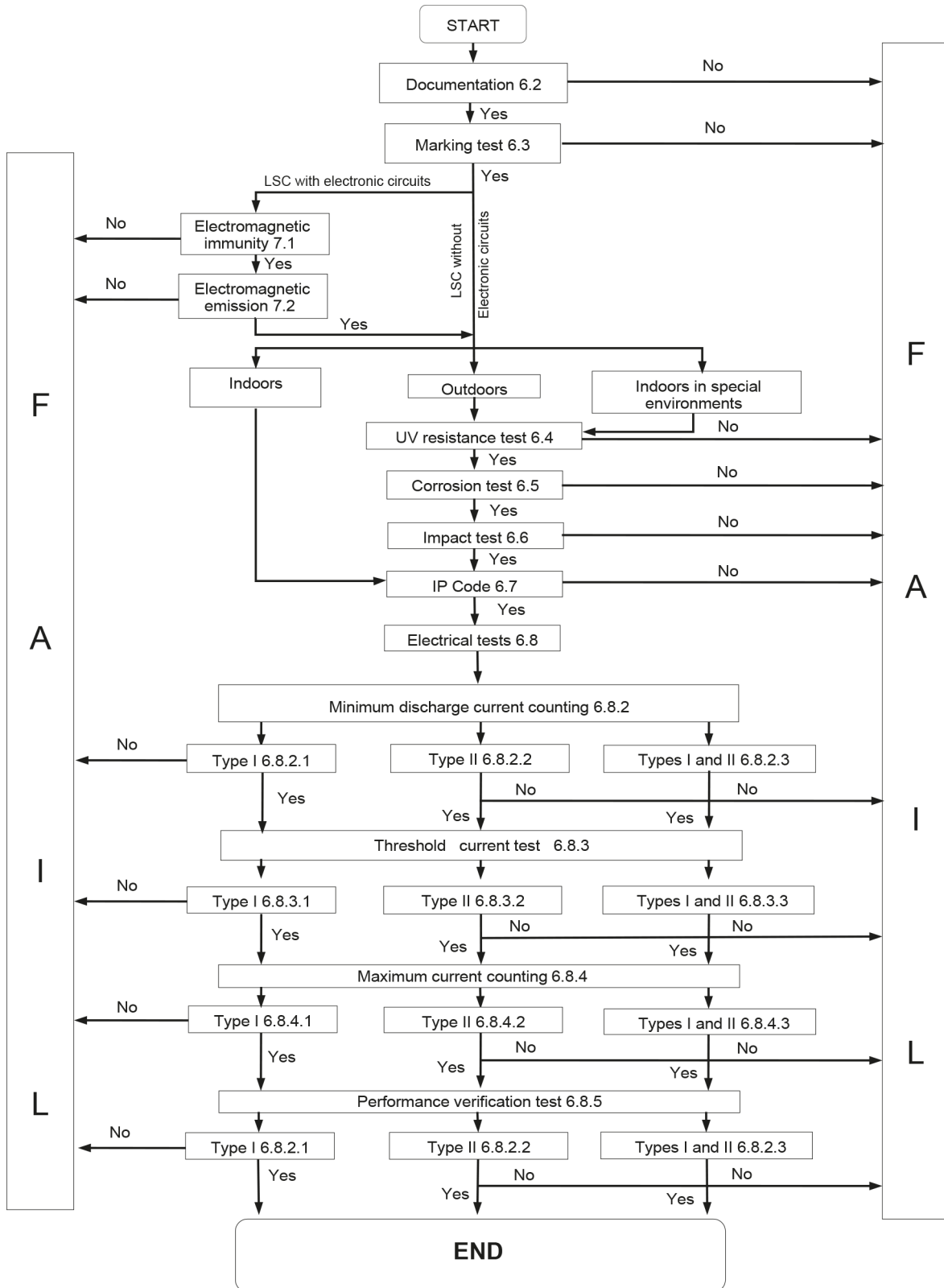
If the test chamber maintains the temperature conditions as specified in ISO 22479:2019, 8.5, then the specimen can remain in the chamber for the storage period.

#### **B.4 Ammonia atmosphere treatment**

The ammonia atmosphere treatment shall be in accordance with ISO 6957:1988 for a moderate atmosphere with the pH value 10, except for 8.4 and Clause 9, which are not applicable.

**Annex C**  
(normative)

**Flowchart for testing LSCs**



IEC

**Figure C.1 – Flowchart for testing of LSCs**

## Annex D (normative)

### Applicability of previous tests

For LSCs already successfully tested according to IEC 62561-6:2011<sup>1</sup> or IEC 62561-6:2018, differences between versions in the test procedures identified in Table D.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of this third edition of IEC 62561-6:2023.

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 in accordance with this document are required.

**Table D.1 – Differences in the requirements for LSCs complying with  
IEC 62561-6:2011 or IEC 62561-6:2018**

Test description	IEC 62561-6:2011	IEC 62561-6:2018	Testing required
Preferred parameters for impulse nominal discharge currents counted	Table 1	Table 1, Table 2	No
Resistance to UV light	6.2, Annex A	6.2, Annex A	No
Impact (mechanical) test	6.4	6.4	No
Resistance to corrosion tests	6.3, Annex B	6.3, Annex B	No

<sup>1</sup>8 Withdrawn.



## Bibliography

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres*, available at <http://www.electropedia.org>

IEC 61180, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements, test equipment*

IEC 62305 (all parts), *Protection against lightning*

IEC 62305-1:2010, *Protection against lightning – Part 1: General principles*

IEC 62475, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

ASTM D 785-65, *Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials*

CLC/TS 50703-2, *Lightning Protection System Components (LPSC) – Part 2: Specific testing requirements for LPS components used in explosive atmospheres*

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**NATIONAL ANNEX E**

*(National Foreword)*

**E-1 BIS CERTIFICATION MARKING**

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

[\(Continued from second cover\)](#)

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 6957 : 1988 Copper alloys — Ammonia test for stress corrosion resistance	IS 16872 : 2019/ISO 6957 : 1988 Copper alloys — Ammonia test for stress corrosion resistance	Identical
IEC 60529 Degrees of protection provided by enclosures	IS/IEC 60529 : 2001 Degrees of protection provided by enclosures (IP code)	Identical
IEC 61000-6-2 : 2016 Electromagnetic compatibility (EMC) — Part 6-2: Generic standards – Immunity standard for industrial environments	IS 14700 (Part 6/Sec 2) : 2019/IEC 61000-6-2 : 2016 Electromagnetic compatibility (EMC): Part 6 Generic standards, Section 2 Immunity standard for industrial environments ( <i>first revision</i> )	Identical
IEC 60068-2-75 : 2014 Environmental testing — Part 2: Tests — Test Eh: Hammer tests	IS 9000 (Part 7/Sec 7) : 2020/IEC 60068-2-75 : 2014 Environmental testing: Part 7 Tests, Section 7 Test Eh: Hammer tests ( <i>first revision</i> )	Identical

The Committee has reviewed the provisions of the following international standards referred in this adopted standard and decided that they are acceptable for use in conjunction with this standard.

<i>International Standard</i>	<i>Title</i>
ISO 22479 : 2019	Corrosion of metals and alloys — Sulphur dioxide test in a humid atmosphere (fixed gas method)
IEC 60068-2-52 : 2017	Environmental testing — Part 2-52: Tests — Test Kb: Salt mist, cyclic (sodium, chloride solution)
IEC 61000-6-4	Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments

Only the English language text has been retained while adopting it in this Indian Standard, and as such, the page number given here are not the same as in the IEC publication.

India specific changes have been made to the adopted IEC 62561-1 as outlined in [National Annex E](#).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-[www.bis.gov.in](http://www.bis.gov.in) or [www.standardsbis.in](http://www.standardsbis.in).

This Indian Standard has been developed from Doc No.: ETD 20 (24503).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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