BS EN 50164-6:2009

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Lightning Protection Components (LPC) —

Part 6: Requirements for lightning strike counters

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee GEL/81, Protection against lightning.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Lightning Protection Components (LPC) - Part 6: Requirements for lightning strike counters

Composants de protection contre la foudre (CPF) - Partie 6: Compteur de coups de foudre

Bitzschutzbauteile - Teil 6: Anforderungen an Blitzzähler

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European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 81X, Lightning protection.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50164-6 on 2008-11-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2009-11-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-11-01

EN 50164 series is a family standard under the generic title *"Lightning Protection Components (LPC)"* and consists of the following parts:

Part 1: Requirements for connection components

Part 2: Requirements for conductors and earth electrodes

Part 3: Requirements for isolating spark gaps

Part 4: Requirements for conductor fasteners

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

Part 6: Requirements for lightning strike counters

Part 7: Requirements for earth enhancing compounds

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Contents

1 Scope

This European Standard specifies the requirements and tests for devices intended to count the number of lightning strike pulses flowing in a conductor. This conductor may be part of a lightning protection system (LPS) or part of a surge protective device (SPD) installation.

NOTE Lightning strike counters may also be suitable for use in hazardous atmospheres. Regard should then be taken of the extra requirements necessary for the components to be installed in such conditions.

2 Normative references

The following referenced documents are indispensable for the application 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.

Publication	Year	Title
EN 60068-2-75	1997	Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests (IEC 60068-2-75:1997)
EN 62305-1	2006	Protection against lightning – Part 1: General principles (IEC 62305-1:2006)
EN 62305-3	2006	Protection against lightning – Part 3: Physical damage to structures and life hazard (IEC 62305-3:2006, mod.)
EN 62305-4	2006	Protection against lightning – Part 4: Electrical and electronic systems within structures (IEC 62305-4:2006)
EN 60529	1991	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
EN 61180-1	1994	High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements (IEC 61180-1:1992)

3 Definitions

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

3.1
lightning strike counter
device intended to count the number of lightning strikes based on current flowing in a conductor

3.2
threshold current (I_{tc})
peak value of the discharge current with an 8/20 waveform that the counter will count in 100 % of the cases

NOTE Values of current lower than $I_{tc}/3$ should not be counted by the counter.

3.3
maximum counting and withstand discharge current (I_{mcw})
peak value of a current through the conductor having an 8/20 or 10/350 waveform and magnitude according to the current counting and withstand test

NOTE 8/20 waveform can be used only for counters connected to SPDs Type 2.

3.4
impulse current (I_{imp})
defined by three parameters, a current peak value I_{peak}, a charge Q and a specific energy W/R. This is used for the current counting and withstand test

3.5
8/20 current impulse
current impulse with a virtual front time of 8 µs and a time to half-value of 20 µs

NOTE 1 The front time is defined according to HD 588.1/EN 60060-1 to be 1,25 x ($t_{90} – t_{10}$), where t_{90} and t_{10} are the 90 % and 10 % points on the leading edge of the waveform.

NOTE 2 The time to half-value is defined as the time between the virtual origin and the 50 % point on the tail. The virtual origin is the point where a straight line, drawn through the 10 % and 90 % points on the leading edge of the waveform, intersects the I = 0 line.

4 Requirements

The lightning strike counter shall be designed in such a way that in normal use their performance is reliable and without danger to persons and the surrounding.

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

4.1 Documentation

The manufacturer or supplier of the lightning strike counter shall provide adequate information in his literature to ensure that the installer can select and install the counter in a suitable and safe manner, in accordance with EN 62305-3 and EN 62305-4.

Compliance is checked by inspection.

4.2 Marking

All products complying with this standard 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 position of the assembly if necessary;
d) the degree of protection (IP) if applicable;
e) conformity to the present standard (of which in particular I_{tc} and I_{mcw} if applicable).

If for small devices, the place available is not sufficient for all the indications which must appear on it, the indications in items a) and b) above must be at least reproduced on the apparatus and be visible when this one is installed. The indications aimed at in c), d) and e) can be carried on the packing and/or in the installation data sheet and/or the catalogue of the manufacturer.

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

Compliance is checked in accordance with 6.7.

4.3 Design

The design of the lightning counter shall be such it carries out its function of counting the number of lightning strikes flowing in a conductor.

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

Lightning strike counters intended to be used outdoor must be able to withstand environmental conditions including temperature, dust and humidity. The minimum index of protection is IP43 obtained by itself or in combination with a box in accordance with EN 60529.

The threshold current I_{tc} and the maximum counting and withstand current I_{mcw} are both declared by the manufacturer. At $I_{tc}/3$ the surge counter shall not operate. Compliance is checked in accordance with 6.4.1, 6.4.2 and 6.4.3.

The size of display if any, must allow a normal reading of the number of lightning strikes recorded, when it is installed in accordance with the instructions of the manufacturer.

The fixing system of the counter should not apply an unacceptable stress to the conductor.

Its material must be compatible with that of the conductor (galvanic coupling).

5 Classification

Lightning strike counters are classified according to their application, threshold currents and maximum counting and withstand current.

Application: for connection on LPS conductors, for connection on SPD conductors and for connection on both conductors.

I_{tc} and I_{mcw} values should comply with Table 1.

Table 1 - Typical values for I_{tc} and I_{mcw}

Application	**Values for I_{tc}**		**Values for I_{mcw}**				
Connection on LPS conductors	-	1 kA 8/20	-	-	-	-	100 kA 10/350
Connection on SPD conductors	500 A 8/20	-	20 kA 8/20	40 kA 8/20	60 kA 8/20	80 kA 8/20	100 kA 8/20
Connection on LPS and SPD conductors	-	1 kA 8/20	-	-	-	-	100 kA 10/350
NOTE All current waveforms according to EN 62305-1.							

6 Tests

6.1 General

The tests in accordance with this standard are type tests.

6.1.1 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.

6.1.2 All tests are carried out on new specimens.

6.1.3 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 may 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 The applicant, when submitting a set of specimens, may also submit an additional set of specimens which may 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 General conditions for the tests

6.2.1 Identification of the counters submitted for testing

The counters submitted for testing must be identified by means of the following elements:

– marks and indications specified in 4.2;

– assembly instructions with reference and date.

6.2.2 Assembly of the lightning strike counters

The counters must be mounted in accordance with the instructions specified by the manufacturer in his assembly instructions.

6.2.3 Number of samples submitted for testing

The number of samples is 3 for the electric tests and 1 for the other tests.

NOTE The use of the same sample for several tests is possible after agreement of the manufacturer.

6.2.4 Conditions of ambient temperature and moisture

Unless otherwise specified, the tests are carried out at an ambient temperature ranging between 5 °C and 35 °C and not to vary during the duration of test of more than 3 K. The lightning strikes counters must be protected from a heating or an excessive external cooling.

6.3 Mechanical tests

The test is carried out on the part accessible from the lightning strikes counter, assembled under the normal operating conditions.

The samples are subjected to mechanical impacts.

6.3.1 Testing device

The lightning strikes counter is mounted on an impact test apparatus according to Clause 4 of EN 60068-2-75:1997, as shown in Figure 1. The impact test apparatus is mounted on a solid wall or structure providing sufficient support.

The striking part has a mass of 150 g ± 1 g and is fixed rigidly at the lower end of a steel tube of 9 mm diameter external and 0,5 mm thickness, swiveling at its higher end in order to be driven only in one vertical plane. The axis of the pivot is at 1 000 mm ± 1 mm above the axis of the striking part.

To determine Rockwell hardness of the polyamide striking part, one uses a ball with a diameter 12,7 mm ± 0,002 5 mm, the central load being of 100 N ± 2 N and the additional load 500 N ± 2,5 N.

NOTE Further information concerning the establishment of Rockwell hardness of the plastics is indicated in publication ASTM D 785-65 (70). The testing device is such as it is necessary to apply a force between 1,9 N and 2,0 N on the face of the part of striking to maintain the tube in horizontal position.

The lightning strike counter is assembled on a plywood plate of 8 mm thickness, of square form with 175 mm side, fixed on its higher and lower corners than the support of assembly (see Figure 1).

This support must have a mass of 10 kg ± 1 kg and must be assembled on a rigid frame via pivots. This frame is fixed to solid wall.

The design of the testing device is such as:

– the counter can be moved horizontally and can turn around an axis perpendicular to the surface of plywood;

– plywood can turn around a vertical axis.

6.3.2 Test procedure

The hammer is allowed to fall from a height of 200 mm so that one impact in 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 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 plan crossing the two axes, comes into contact with surface.

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

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

6.3.3 Passing criteria

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

After the test the counter shall not have increased nor decreased the count value in the display (especially for electromechanical counters).

6.4 Electrical tests

The tests are carried out in accordance with EN 61180-1.

6.4.1 Minimum detectable current I_{tc}

The minimum detectable current is given by the manufacturer according to the classification as per Clause 5.

Description:

The test is carried out with a 8/20 waveform current and peak value I_{tc}. The test is carried out once on each polarity.

Pass criteria:

After the test, the counter shall have incremented by two.

6.4.2 Checking of non detection with $I_{tc}/3$

Description:

The test is the same one as into 6.4.1.

Pass criteria:

The counter shall not be incremented.

6.4.3 Withstand and counting at I_{mcw} current

This test is carried out on the counter having passed the tests of 5.4.1.

The maximum discharge current is given by the manufacturer.

Description:

The test is carried out with a waveform depending of the classification as per Clause 5 and the peak value equal to I_{mcw} – 0 % + 5 %. The test is carried out once for each polarity of the current.

Pass criteria:

One should observe no opening or degradation of the parts carrying the current as well as for the housing of the counter. The counter must be incremented by two after the test.

6.5 Resistance test to corrosion (for metallic parts)

The parts to be tested are degreased by immersion during 10 min in a cold chemical grease-remover such as methyl-chloroform or refined gasoline; they are then immersed in a solution to 10 % of ammonium chloride in water maintained at a temperature of 20 ºC ± 5 ºC.

Without drying them, but after having shaken the possible drops, one suspends them during 10 min in an enclosure with atmosphere saturated with moisture at a temperature of 20 ºC ± 5 ºC.

After the parts were dried during 10 min in a drying oven at a temperature of 100 ºC ± 5 ºC, they should not present any trace of rust on surfaces.

One does not take into account traces of rust on the edges, nor a yellowish veil disappearing by simple friction.

6.6 Checking of IP degree

This checking must be carried out in accordance with EN 60529.

6.7 Marking test

The marking is checked by inspection and 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 by white spirit.

Pass criteria:

After the test the marking shall be legible. Marking must allow the identification of the counter. It should not be possible to easily remove the labels and those do not retract.

7 Electromagnetic compatibility (EMC)

7.1 Electromagnetic immunity

Lightning strike counters either incorporating no electronic circuits or incorporating electronic circuits in which all components are passive (for example diodes, resistors, capacitors, inductors, varistors and other surge protective components) are not sensitive to normal electromagnetic disturbances and therefore no immunity tests are required.

The requirements for lightning strike counters containing electronic circuits are under consideration.

7.2 Electromagnetic emission

For lightning strike counters not incorporating electronic circuits, or incorporating electronic circuits that do not generate fundamental frequencies greater than 9 kHz in normal operation, electromagnetic disturbances can only be generated during protective operations. The duration of these disturbances is in the order of microseconds to milliseconds.

The frequency, level and the consequences of these emissions are considered as part of the normal electromagnetic environment of low-voltage installations. Therefore, the requirements for electromagnetic emissions are deemed to be satisfied and no verification is necessary.

The requirements for lightning strike counters containing electronic circuits generating fundamental frequencies greater than 9 kHz are under consideration.

8 Structure and content of the test report

The purpose of this instruction is to provide general requirements for laboratory test reports. This document 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 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 format shall be carefully and specifically designed for each type of test carried out, but the headings shall be standardized as indicated herein.

The structure of each report shall include at least the information according to 8.1 to 8.7.

8.1 Report identification

8.1.1 A title or subject of the report.

8.1.2 Name, address and telephone number of the test laboratory.

8.1.3 Name, address and telephone number of the sub test laboratory where the test was carried out if different from company which has been assigned to perform the test.

8.1.4 Unique identification number (or serial number) of the test report.

8.1.5 Name and address of the vendor.

8.1.6 Report shall be paginated and the total number of pages indicated.

8.1.7 Date of issue of report.

8.1.8 Date(s) of performance of test(s).

8.1.9 Signature and title, or an equivalent identification of the person(s) authorized to sign for the testing laboratory for the content of the report.

8.1.10 Signature and title of person(s) conducting the test.

8.2 Specimen description

8.2.1 Sample description.

8.2.2 Detailed description and unambiguous identification of the test sample and/or test assembly.

8.2.3 Characterization and condition of the test sample and/or test assembly.

8.2.4 Sampling procedure, where relevant.

8.2.5 Date of receipt of test items.

8.2.6 Photographs, drawings or any other visual documentation, if available.

8.3 Standards and references

8.3.1 Identification of the test standard used and the date of issue of the standard.

8.3.2 Other relevant documentation with the documentation date.

8.4 Test procedure

8.4.1 Description of the test procedure.

8.4.2 Justification for any deviations from, additions to or exclusions from the referenced standard.

8.4.3 Any other information relevant to a specific test such as environmental conditions.

8.4.4 Configuration of testing assembly.

8.4.5 Location of the arrangement in the testing area and measuring techniques.

8.5 Testing equipment description

8.5.1 Description of equipment used for every test conducted i.e. conditioning/ageing device, etc.

8.6 Measuring instruments description

8.6.1 Characteristics and calibration date of all instruments used for measuring the values specified in the standard i.e. meter.

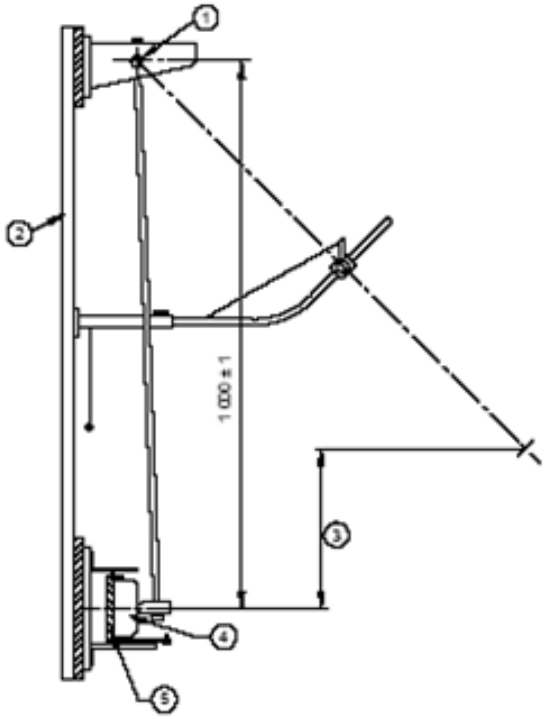
8.7 Results and parameters recorded

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

- current,
- charge,
- specific energy,
- duration.

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

8.7.2 A statement of pass/fail identifying the part of the test for which the specimen has failed and also a description of the failure. This shall be illustrated by drawings, photographs or other documentation of visual observations as appropriate.



Key
1. Pendulum
2. Frame
3. Height of fall
4. Arrangement of specimens
5. Mounting fixture

Figure 1 - Pendulum hammer

Bibliography

HD 588.1, High-voltage test techniques – Part 1: General definitions and test requirements (IEC 60060-1)

ASTM D 785-65 (1970), Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials

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