



SLOVENSKI STANDARD
SIST EN 50483-6:2009

01-julij-2009

**Zahteve za preskušanje pribora za nizkonapetostne izolirane nadzemne kable - 6.
del: Okoljsko preskušanje**

Test requirements for low voltage aerial bundled cable accessories -- Part 6:
Environmental testing

Prüfanforderungen für Bauteile für isolierte Niederspannungsfreileitungen – Teil 6:
Umweltprüfungen

Prescriptions relatives aux essais des accessoires pour réseaux aériens basse tension
torsadés -- Partie 6: Essais d'environnement

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EUROPEAN STANDARD
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Test requirements for low voltage aerial bundled cable accessories - Part 6: Environmental testing

Prescriptions relatives aux essais
des accessoires pour réseaux aériens
basse tension torsadés -
Partie 6: Essais d'environnement

Prüfanforderungen für Bauteile für isolierte
Niederspannungsfreileitungen -
Teil 6: Umweltprüfungen

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This European Standard was approved by CENELEC on 2008-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CENELEC

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

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

Foreword

This European Standard was prepared by a sub-group of WG 11 of the Technical Committee CENELEC TC 20, Electric cables.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50483-6 on 2008-12-01.

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) 2009-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2011-12-01

This is Part 6 of CENELEC standard EN 50483 “*Test requirements for low voltage aerial bundled cable accessories*”, which has six parts:

- Part 1: Generalities;
- Part 2: Tension and suspension clamps for self supporting system;
- Part 3: Tension and suspension clamps for neutral messenger system;
- Part 4: Connectors;
- Part 5: Electrical ageing test;
- Part 6: Environmental testing

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Contents

| | | |
|-----|--|----|
| 1 | Scope..... | 4 |
| 2 | Normative references | 4 |
| 3 | Terms and definitions | 4 |
| 4 | Symbols | 5 |
| 5 | Marking | 5 |
| 6 | (Spare)..... | 5 |
| 7 | (Spare)..... | 5 |
| 8 | Type tests | 6 |
| 8.1 | Number of test samples and number of cycles..... | 6 |
| 8.2 | Requirements | 6 |
| 8.3 | Cleaning..... | 6 |
| 8.4 | Corrosion ageing tests | 6 |
| 8.5 | Climatic ageing test..... | 10 |
| | Annex A (informative) Salt mist and gas atmosphere corrosion test justification..... | 18 |
| | Annex B (informative) Example of specific reaction to obtain sulphur dioxide..... | 19 |
| | Annex C (informative) Climatic areas | 20 |
| | Annex D (informative) Test equipment | 21 |
| | Bibliography..... | 24 |

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Figures

| | | |
|--|---|----|
| | Figure 1 – Suggested arrangement for connections – Optional immersion test Method 1 | 9 |
| | Figure 2 – Informative diagram of the conditioning cycle – Weekly cycle..... | 15 |
| | Figure 3 – Temperature – Radiation – Time relationships | 17 |
| | Figure D.1 – Typical test arrangement | 21 |

Tables

| | | |
|--|---|----|
| | Table 1 – Quantities for acid solution components | 10 |
| | Table 2 – Spectral energy distribution and permitted tolerances | 17 |
| | Table C.1 – Climatic conditions – Appropriate tests | 20 |

1 Scope

EN 50483 series applies to overhead line fittings for tensioning, supporting and connecting aerial bundled cables (ABC) of rated voltage U_0/U (U_m): 0,6/1 (1,2) kV.

The objective is to provide a method of testing the suitability of accessories when used under normal operating conditions with low voltage aerial bundled cables complying with HD 626.

This Part 6 defines the environmental tests in particular the climatic and corrosion ageing tests. The objective of these tests is to predict the behaviour of ABC accessories when subjected to sun radiation, to weather conditions (humidity, spraying water, heat, cold) and pollution. EN 50483-1, EN 50483-2, EN 50483-3 and EN 50483-4 specify which type tests included in this part of the standard are needed.

Climate differs across Europe and in order to meet the differing geographic climatic conditions it is necessary to provide a range of tests to meet these variations. A range of optional, additional tests is provided to meet the varying climatic needs and these should be agreed between the customer and the supplier (see Annex C).

NOTE This European Standard does not invalidate existing approvals of products achieved on the basis of national standards and specifications and/or the demonstration of satisfactory service performance. However, products approved according to such national standards or specifications cannot directly claim approval to this European Standard. It may be possible, subject to agreement between supplier and purchaser, and/or the relevant conformity assessment body, to demonstrate that conformity to the earlier standard can be used to claim conformity to this standard, provided an assessment is made of any additional type testing that may need to be carried out. Any such additional testing that is part of a sequence of testing cannot be done separately.

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.

EN 50483 series, *Test requirements for low voltage aerial bundled cable accessories*

EN 60068-2-5, *Environmental testing – Part 2: Tests – Test Sa: Simulated solar radiation at ground level* (IEC 60068-2-5)

EN 60068-2-9:1999, *Environmental testing – Part 2: Tests – Guidance for solar radiation testing* (IEC 60068-2-9:1975 + A1:1984)

EN 60068-2-11:1999, *Environmental testing – Part 2: Tests – Test Ka: Salt mist* (IEC 60068-2-11:1981)

EN ISO 3231, *Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide* (ISO 3231)

IEC 60050-461, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-461 and the following apply.

3.1

aerial bundled cable (ABC)

aerial cable consisting of a group of insulated conductors which are twisted together including, or not, a non insulated conductor

[IEV 461-08-02, modified]

NOTE The terms bundled conductors, bundled cables, bundled cores, conductor bundles and bundle could be used as equivalent to the term aerial bundled cable (ABC).

3.2**aerial-insulated-cable**

insulated cable designed to be suspended overhead and outdoors
[IEV 461-08-01]

3.3**conductor (of a cable)**

part of a cable which has the specific function of carrying current
[IEV 461-01-01]

3.4**core**

assembly comprising conductor and its own insulation
[IEV 461-04-04, modified]

3.5**fixture (or fitting)**

device for attaching ABC tension or/and suspension clamps to a pole or to a wall

3.6**insulation (of a cable)**

insulating materials incorporated in a cable with the specific function of withstanding voltage
[IEV 461-02-01]

3.7**type test**

test required to be made before supplying a type of material covered by this standard on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application

NOTE These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made to the accessory materials, design or type of manufacturing process which might change the performance characteristics.

4 Symbols

| | |
|-----------------------------|---|
| λ_1 and λ_2 | wavelength of UV light source |
| E_m | mean energy received by the samples |
| E | radiated energy of the lamp |
| n | number of cycles (defined in appropriate part of this standard) |
| θ | temperature measured by the black standard thermometer |
| θ_E | temperature of the chamber |

5 Marking

See Clause 6 of EN 50483-1.

6 (Spare)**7 (Spare)**

8 Type tests

8.1 Number of test samples and number of cycles

The number of samples and number of cycles for each of the following tests are included in each relevant part of EN 50483.

8.2 Requirements

The requirements for the following tests shall be as given in the relevant parts of this standard.

8.3 Cleaning

On completion of the environmental tests, and between different environmental tests when carried out as a sequence, the samples shall, unless otherwise specified, be cleaned using running tap water for 5 min to 10 min and then by using demineralised water for the same period. The temperature of the water shall not exceed 35 °C. The samples shall be dried either by shaking by hand or using air blast to remove droplets of water.

8.4 Corrosion ageing tests

These tests shall be carried out when the products contain metallic parts (or parts protected with a metallic coating), which are exposed to the atmosphere.

A justification of the tests is given in Annex A.

8.4.1 Salt mist test

8.4.1.1 Principle

This test exposes samples to a neutral salt spray (concentration of NaCl: 5 %).

8.4.1.2 Test equipment

The test equipment is defined in Clause 3 of EN 60068-2-11:1999.

8.4.1.3 Test arrangement

The preparation and use of the salt solution is defined in Clause 4 of EN 60068-2-11:1999.

8.4.1.4 Procedure

The test procedure is defined in Clause 7 of EN 60068-2-11:1999.

The connectors or accessories shall be installed as defined in the relevant parts of EN 50483.

The cycle duration prescribed, in accordance with EN 60068-2-11:1999, 7.6 shall be 7 days.

No cleaning of the samples shall be carried out between cycles.

8.4.1.5 Test reports

The test report shall include the duration of exposure and the concentration and pH of the salt solution.

8.4.2 Gas atmosphere tests

NOTE 1 Two methods of testing are provided to meet the requirements of the gas atmosphere test. The first, Method 1, is based on the test procedure that has been used for many years in some countries. These countries have gained experience of both the procedures and outcomes of the test. The second, Method 2 is provided as an alternative as it requires a less complicated test environment and is based on ASTM G85.

NOTE 2 This test may be necessary for accessories that are used in areas subjected to heavy industrial pollution.

8.4.2.1 Gas atmosphere test (Method 1)

A justification of the tests is given in Annex A.

8.4.2.1.1 Principle

This test exposes samples to a humidity-saturated atmosphere rich with sulphur dioxide (initial concentration SO_2 : 0,066 7 % (667 parts per million by volume)) with defined conditions of temperature and pressure.

8.4.2.1.2 Test equipment

The samples and supports shall be installed in a hermetic test chamber, with a humidity-saturated atmosphere in the presence of sulphur dioxide.

This test chamber shall be made of inert material. The test shall be made in accordance with EN ISO 3231.

8.4.2.1.3 Preparation of SO_2 atmosphere

After closing the chamber, sulphur dioxide (concentration = 0,066 7 %) shall be introduced from either a gas bottle or using a specific reaction in the chamber as described in Annex B.

8.4.2.1.4 Procedure

Each period, or basic module, shall comprise a weekly sequence.

7 cycles of 24 h (168 h total), each cycle includes an 8 h exposure with saturated humidity and high sulphur dioxide atmosphere (a total exposure of 56 h), and a 16 h exposure at the laboratory atmosphere (a total exposure of 112 h).

NOTE Exposure to laboratory atmosphere may be achieved by opening the chamber door. It is the intention of this phase to allow clean air to circulate around the test samples.

During the 8 h period, the temperature is raised to $(40 \pm 3)^\circ\text{C}$. During the 16 h period the chamber remains at ambient temperature and finally the water and sulphur dioxide atmosphere is renewed to the concentration as specified in 8.4.2.1.3.

8.4.2.1.5 Cleaning

When the specimens are exposed successively to a neutral salt spray and then to a humidity saturated atmosphere with sulphur dioxide, the procedure shall be

- 7 cycles of 24 h in salt,
- no cleaning,
- 7 cycles of 24 h in sulphur dioxide,
- cleaning in accordance with 8.3.

8.4.2.2 Gas atmosphere test (Method 2)

8.4.2.2.1 Procedure

The test samples shall be subjected to a cyclic corrosion test consisting of 1 h period of drying and 1 h period of fog. The test shall consist of 500 cycles (1 000 h). The fog period shall be at ambient temperature, while the drying time shall be at a higher temperature.

NOTE Experience indicates that longer cycle times may produce slower degradation.

8.4.2.2.2 Test equipment

The apparatus for salt spray (fog) testing consists of a fog chamber, a salt solution reservoir, a supply of suitable conditioned compressed air, one or more atomising nozzles, specimen supports, provision for heating the chamber, and necessary means of control. The size and detailed construction of the cabinet are optional, provided the conditions obtained meet the requirements of this standard. The material of construction shall be such that it will not be affected by the corrosiveness of the fog. The chamber shall be designed so that drops of solution that accumulate on the ceiling or cover of the chamber do not fall on the specimen being tested. The nozzle or nozzles shall be directed so that none of the spray can impinge directly on the test specimen.

The solution shall not be recycled.

8.4.2.2.3 Atomisation and quantity of fog

At least two clean fog collectors shall be placed within the exposure zone so that drops of solution from the test specimen or any other source are not collected. The collectors shall be positioned in the proximity of the specimens, one near to a nozzle and the other, as far as possible from all nozzles. It shall be secured so that, for each 80 cm² of horizontal collecting area, fog accumulates in each collector at a rate between 1,0 ml to 2,0 ml of solution per hour, based on an average run of at least 16 h continuous spray.

NOTE Suitable collecting devices are glass funnels with the stems inserted through stoppers into graduated cylinders or crystallising dishes. Funnels and dishes with a diameter of 100 mm have an area of about 80 cm².

8.4.2.2.4 Salt solution

The salt solution shall consist of 0,05 % sodium chloride (NaCl) and 0,35 % ammonium sulphate (NH₄)₂(SO₄) by mass. The water shall be distilled or de-ionised water. The sodium chloride shall be substantially free of nickel and copper and shall contain, on the dry basis, not more than 0,1 % of sodium iodide and not more than 0,3 % of total impurities. The ammonium sulphate shall contain not more than 0,3 % total impurities. Some salts contain additives that may act as corrosion inhibitors; careful attention shall be given to the chemical content of the salt.

The pH of the collected solution shall be between 5,0 and 5,4.

8.4.2.2.5 Air supply

The compressed air supply to the nozzle or nozzles, for atomising the salt solution, shall be free of oil and dirt and maintain the air supply between 70 kPa and 170 kPa.

8.4.2.2.6 Procedure

The test shall consist of cycles of a 1 h drying period and a 1 h fog period. The electrolyte shall be a solution of sodium chloride and ammonium sulphate. The fog period shall be performed at ambient temperature, while the drying-off shall be at higher temperature. The solution atomising air shall not be saturated with water.

During the fog period, no heating shall be applied to the cabinet. The fog exposure shall be at (24 ± 3) °C.

During the drying-off period the temperature throughout the exposure zone shall reach and remain at (35 ± 2) °C within 45 min of switching from the fog period to the dry period. The drying-off shall be achieved by purging the chamber with fresh air so that within 45 min all visible moisture shall be dried off the specimen. Humidified air shall not be used for drying.

NOTE As the specimen cycles from wet to dry it is subjected to a range of solution concentration varying from dilute during the fog period to very concentrated just before the water dries off completely.

8.4.2.2.7 Cleaning

There shall be no cleaning of the test samples between the test cycles.

At completion of the test the samples shall be cleaned in accordance with 8.3.

8.4.3 Immersion tests (optional)

NOTE Two test methods are provided to allow for the different climatic conditions encountered in service. Method 1 is provided to cater for severe salt pollution e.g. western coast of UK. Method 2 simulates a severely corrosive atmosphere e.g. near heavy industry.

8.4.3.1 Immersion test (Method 1)

8.4.3.1.1 Principle

For saline polluted areas an optional additional test shall be carried out when this is agreed between the customer and the supplier. In order to minimise testing, when agreed, this test shall be carried out during the mandatory heat cycle tests as provided in EN 50483-5.

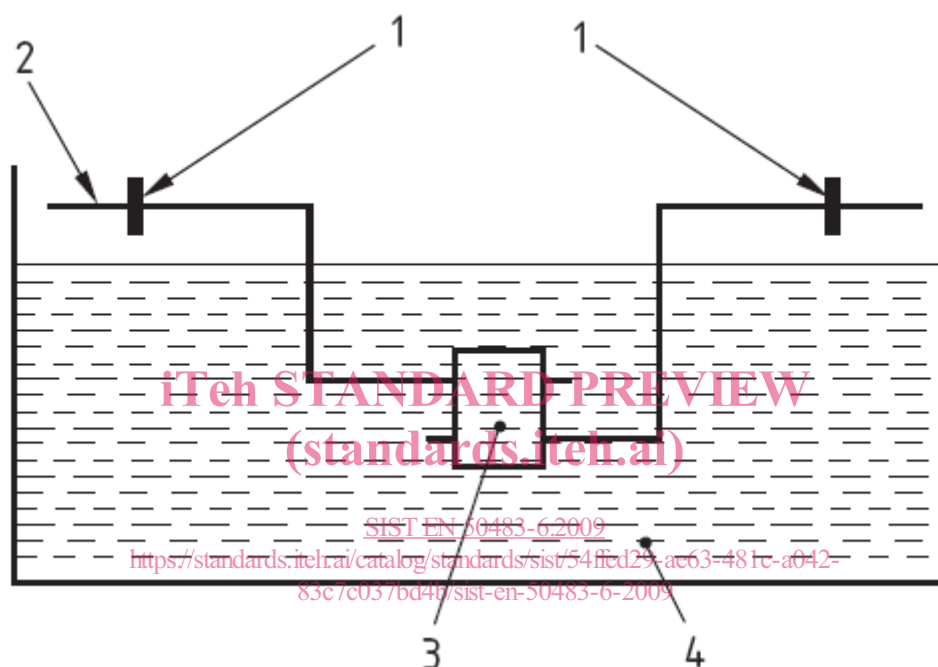
8.4.3.1.2 Test arrangement

This shall be, generally, in accordance with EN 50483-5, 5.2 but in particular the test circuit, as described in EN 50483-5, 5.2.1, shall be modified to allow the samples to be fully immersed in a saline solution during the heat cycle.

The saline solution shall be maintained at 29,22 g/l (approximately 3 % of mass) concentration of NaCl throughout the test.

NOTE 1 A practical arrangement is to place the test samples in a tank and pump the saline solution from a reservoir below. The tank can then be drained back into the reservoir after the required immersion period.

NOTE 2 The test loop may be arranged so that the samples, but not the measurement points, are immersed in the saline solution. Figure 1 shows a typical arrangement.



Key

| | | | |
|---|------------------|---|------------|
| 1 | potential points | 3 | connector |
| 2 | cable core | 4 | salt water |

**Figure 1 – Suggested arrangement for connections –
Optional immersion test Method 1**

8.4.3.1.3 Procedure

The procedure shall, generally, be in accordance with EN 50483-5, 5.2, 5.3, 5.4 and 5.5. However, in particular, the subsequent heat cycles defined in EN 50483-5, 5.5.2 shall be modified to include the immersion of the samples.

Immersion of the test samples shall occur on completion of period t_1 and they shall be fully immersed for a minimum period of 5 min. The time of immersion shall be considered part of the cooling period t_2 . Periods, t_1 and t_2 , are shown in EN 50483-5, Figure 3.

8.4.3.1.4 Assessment of results

The assessment, of the samples, shall be carried out in accordance with EN 50483-5, 5.5.4.

8.4.3.1.5 Requirements

The samples shall meet the requirements of EN 50483-5, 5.6.