

Overhead lines — Requirements and tests for spacers

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British Standard

ICS 29.240.20

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 30 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

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English version

Overhead lines — Requirements and tests for spacers

(IEC 61854:1998)

Lignes aériennes — Exigences et essais
applicables aux entretoises
(CEI 61854:1998)

Freileitungen — Anforderungen und
Prüfungen für Abstandhalter
(IEC 61854:1998)

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Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Foreword

The text of document 11/141/FDIS, future edition 1 of IEC 61854, prepared by IEC TC 11, Overhead lines, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61854 on 1998-10-01.

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) 1999-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-07-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex A and Annex ZA are normative and Annex B, Annex C and Annex D are informative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61854:1998 was approved by CENELEC as a European Standard without any modification.

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1 Scope

This International Standard applies to spacers for conductor bundles of overhead lines. It covers rigid spacers, flexible spacers and spacer dampers.

It does not apply to interphase spacers, hoop spacers and bonding spacers.

NOTE This standard is written to cover the line design practices and spacers most commonly used at the time of writing. There may be other spacers available for which the specific tests reported in this standard may not be applicable.

In many cases, test procedures and test values are left to agreement between purchaser and supplier and are stated in the procurement contract. The purchaser is best able to evaluate the intended service conditions, which should be the basis for establishing the test severity.

In Annex A, the minimum technical details to be agreed between purchaser and supplier are listed.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication of this standard, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(466):1990, *International Electrotechnical vocabulary (IEV) — Chapter 466: Overhead lines*.

IEC 61284:1997, *Overhead lines — Requirements and tests for fittings*.

IEC 60888:1987, *Zinc-coated steel wires for stranded conductors*.

ISO 34-1:1994, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces*.

ISO 34-2:1996, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 2: Small (Delft) test pieces*.

ISO 37:1994, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*.

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests*.

ISO 812:1991, *Rubber, vulcanized — Determination of low temperature brittleness*.

ISO 815:1991, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures*.

ISO 868:1985, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*.

ISO 1183:1987, *Plastics — Methods for determining the density and relative density of non-cellular plastics*.

ISO 1431-1:1989, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: static strain test*.

ISO 1461, — *Hot dip galvanized coatings on fabricated ferrous products — Specifications*¹⁾.

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids*.

ISO 2781:1988, *Rubber, vulcanized — Determination of density*.

ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection*.

ISO 2859-2:1985, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality level (LQ) for isolated lot inspection*.

ISO 2921:1982, *Rubber, vulcanized — Determination of low temperature characteristics — Temperature-retraction procedure (TR test)*.

ISO 3417:1991, *Rubber — Measurement of vulcanization characteristics with the oscillating disc curemeter*.

ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent nonconforming*.

ISO 4649:1985, *Rubber — Determination of abrasion resistance using a rotating cylindrical drum device*.

ISO 4662:1986, *Rubber — Determination of rebound resilience of vulcanizates*.

3 Definitions

For the purpose of this International Standard the definitions of the *International Electrotechnical Vocabulary (IEV)* apply, in particular IEC 60050(466). Those which differ or do not appear in the IEV are given below.

3.1 rigid spacer

spacer allowing no relative movement between the subconductors at the spacer location

¹⁾ To be published.

3.2 flexible spacer

spacer allowing relative movements between the subconductors at the spacer location

3.3 spacer system

complex of spacers and the relevant in-span distribution

4 General requirements

4.1 Design

The spacer shall be designed as to

- maintain subconductor spacing (at spacer locations), within any prescribed limits, under all conditions of service excluding short-circuit currents;
- prevent, in subspans between spacers, physical contact between subconductors, except during the passage of short circuit currents when the possibility of contact is accepted provided that the specified spacing is restored immediately following fault clearance;
- withstand mechanical loads imposed on the spacer during installation, maintenance and service (including short circuit conditions) without any component failure or unacceptable permanent deformation;
- avoid damage to the subconductor under specified service conditions;
- be free from unacceptable levels of corona and radio interference under specified service conditions;
- be suitable for safe and easy installation. For the bolted and latching clamp the design shall retain all parts when opened for attachment to the conductor;
- ensure that individual components will not become loose in service;
- be capable of being removed and re-installed on the subconductors without damage to the spacer or subconductors;
- maintain its function over the entire service temperature range;
- avoid audible noise.

NOTE Other desirable characteristics, which are not essential to the basic functions of the spacer but which may be advantageous to the purchaser, include:

- verification of proper installation from the ground,
- ease of installation and removal from energized lines.

4.2 Materials

4.2.1 General

Spacers shall be made of any materials suitable for their purpose. Unless additional requirements are stated, the material shall conform to the requirements of IEC 61284.

4.2.2 Non-metallic materials

In addition to the requirements of IEC 61284, the conductivity of the various non-metallic components shall be such that when properly installed

- potential differences between metallic components do not cause damage due to discharge;
- any current flow between subconductors does not degrade spacer materials.

4.3 Mass, dimensions and tolerances

Spacer mass and significant dimensions, including appropriate tolerances, shall be shown on contract drawings.

NOTE Tolerances applied to the mass and to the dimensions should ensure that the spacers meet their specified mechanical and electrical requirements.

4.4 Protection against corrosion

In addition to the applicable requirements of IEC 61284, stranded steel wires, if used, shall be protected against corrosion in accordance with IEC 60888.

4.5 Manufacturing appearance and finish

The spacers shall be free of defects and irregularities; all outside surfaces shall be smooth and all edges and corners well-rounded.

4.6 Marking

The fitting marking requirements of IEC 61284 shall be applied to all clamp assemblies including those using breakaway bolts.

Correct position of the top of the spacer (for example arrows pointing upward), if necessary, shall also be provided.

4.7 Installation instructions

The supplier shall provide a clear and complete description of the installation procedure and, if required, the in-span location of the spacers.

The supplier shall make available any special installation tool that is required.

5 Quality assurance

A quality assurance programme taking into account the requirements of this standard can be used by agreement between the purchaser and the supplier to verify the quality of the spacers during the manufacturing process.

Detailed information on the use of quality assurance is given in the following ISO standards ISO 9000-1 [1]; ISO 9001 [2]; ISO 9002 [3]; ISO 9003 [4] and ISO 9004-1 [5]²⁾.

It is recommended that test equipment used to verify compliance to this standard is routinely maintained and calibrated in accordance with a relevant quality standard.

6 Classification of tests

6.1 Type tests

6.1.1 General

Type tests are intended to establish design characteristics. They are normally made once and repeated only when the design or the material of the spacer is changed. The results of type tests are recorded as evidence of compliance with design requirements.

6.1.2 Application

Spacers shall be subjected to type tests as per Table 1. Each type test shall be performed on three samples which are identical, in all essential respects, with the spacers to be supplied under contract to the purchaser. All units shall pass the tests.

The spacers used for tests during which no damage occurs to the units or their components may be used in subsequent tests.

NOTE The unit subjected to type tests can be either a complete spacer or a component of the spacer as appropriate to the test.

6.2 Sample tests

6.2.1 General

Sample tests are required to verify that the spacers meet the performance specifications of the type test samples. In addition, they are intended to verify the quality of materials and workmanship.

6.2.2 Application

Spacers shall be subjected to sample tests as per Table 1.

The samples to be tested shall be selected at random from the lot offered for acceptance. The purchaser has the right to make the selection.

The spacers used for tests during which no damage occurs to the units or their components may be used in subsequent tests.

NOTE The unit subjected to sample tests can be either a complete spacer or a component of the spacer as appropriate to the test.

6.2.3 Sampling and acceptance criteria

The sampling plan procedures according to ISO 2859-1 and ISO 2859-2 (inspection by attributes) and ISO 3951 (inspection by variables) and the detailed procedures (inspection level, AQL, single, double or multiple sampling, etc.) shall be agreed between purchaser and supplier for each different attribute or variable.

NOTE Sampling inspection by variables is an acceptance sampling procedure to be used in place of inspection by attributes when it is more appropriate to measure on some continuous scale the characteristic(s) under consideration. In the case of failure load tests and similar expensive tests, better discrimination between acceptable quality and objective quality is available with acceptance sampling by variables than by attributes for the same sample size.

The purpose of the sampling process may also be important in the choice between a variables or attributes plan. For example, a customer may choose to use an attributes acceptance sampling plan to assure that parts in a shipment lot are within a required dimensional tolerance; the manufacturer may make measurements under a variables sampling plan of the same dimensions because of concern with gradual trends or changes which may affect the ability to provide shipment lots which meet the AQL.

6.3 Routine tests

6.3.1 General

Routine tests are intended to prove conformance of spacers to specific requirements and are made on every spacer. The tests shall not damage the spacers.

6.3.2 Application and acceptance criteria

Whole lots of spacers may be subjected to routine tests. Any spacer which does not conform to the requirements shall be discarded.

6.4 Table of tests to be applied

Table 1 indicates the tests which shall be performed. These are marked with an "X" in the table.

However, the purchaser may specify additional tests which are included in the table and marked with an "O".

Units or components damaged during the tests shall be excluded from the delivery to the customer.

²⁾ Figures in square brackets refer to the bibliography.