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Overhead lines – Requirements and tests for ~~stockbridge-type~~ aeolian vibration dampers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**OVERHEAD LINES –
REQUIREMENTS AND TESTS FOR AEOLIAN VIBRATION DAMPERS****FOREWORD**

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International Standard IEC 61897 has been prepared by Technical Committee 11: Overhead lines.

This second edition cancels and replaces the first edition published in 1998. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Consider, in addition to Stockbridge type aeolian vibration dampers, also spiral aeolian vibration dampers and elastomeric aeolian vibration dampers.
- b) Consider the application of dampers on high temperature conductors, specifying additional high temperature tests in clamp slip tests.
- c) Simplify the procedure of the damper effectiveness evaluation.
- d) Introduce test at low temperature on fastener components such as break away bolts and conical spring washers.
- e) Include figures showing the test arrangements for the main mechanical tests.

The text of this standard is based on the following documents:

FDIS	Report on voting
11/266/FDIS	11/273/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended

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OVERHEAD LINES – REQUIREMENTS AND TESTS FOR ~~STOCKBRIDGE TYPE~~ AEOLIAN VIBRATION DAMPERS

1 Scope

This document applies to ~~Stockbridge type~~ aeolian vibration dampers intended for single conductors or earth wires or conductor bundles where dampers are directly attached to each subconductor.

The purchaser may adopt part(s) of this document when specifying requirements for ~~other types of aeolian vibration dampers or for Stockbridge dampers used on conductors or~~ cables different from those mentioned above (e.g. optical ground wires (OPGW), all dielectric self-supporting optical cables (ADSS)).

In ~~many~~ some cases, test procedures and test values are left to agreement between the purchaser and the supplier and are stated in the procurement contract.

Annex A lists the minimum technical details to be agreed between purchaser and supplier.

Throughout this document, the word “conductor” is used when the test applies to ~~Stockbridge~~ dampers for conductors or earth wires.

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 60050(466):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 466: Overhead lines*

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

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

IEC 61854, *Overhead lines – Requirements and tests for spacers*

IEC 62567:2013, *Overhead lines – Methods for testing self-damping characteristics of conductors*

ISO 1461:2009, *Hot dip galvanized coatings on fabricated ~~ferrous products~~ iron and steel articles – Specifications and test methods* ¹⁾

ISO 2859-1:1989/1999/AMD1:2011, *Sampling procedures for inspection by attributes – Part 1: Sampling ~~plans~~ schemes indexed by acceptable quality ~~level~~ limit (AQL) for lot-by-lot inspection*

¹⁾ ~~To be published.~~

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

ISO 3951-1:2013, *Sampling procedures for inspection by variables – Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL*

ISO 3951-2:2013, *Sampling procedures for inspection by variables – Part 2: General specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection of independent quality characteristics*

ISO 9001:2015, *Quality management systems – Requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-466 apply, as well as the following.

ISO and IEC maintain terminological 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

stockbridge-type aeolian vibration damper

device comprising a ~~messenger~~ steel cable with a weight at each end and one bolted clamp or a helical rod attachment, attachable to a conductor, for the purpose of damping aeolian vibration

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3.2

spiral aeolian vibration damper

SVD

device made of helical plastic which wraps around the conductor for purposes of damping aeolian vibration (these are commonly used on earth wires, OPGW and ADSS cables)

3.3

elastomeric aeolian vibration damper

device comprising suspended weights connected to elastomeric articulations and one bolted clamp or a helical rod attachment, attachable to a conductor for the purpose of damping aeolian vibration

3.4

high temperature conductors

HTC

conductors which are designed to have a maximum continuous operating temperature over 95 °C

3.5

maximum continuous operating temperature

conductor temperature specified by the manufacturer and measured at the outer wire layers

4 General requirements

4.1 Design

The damper shall be designed so as to

- damp aeolian vibration;
- withstand mechanical loads imposed during installation, maintenance and specified service conditions;
- avoid damage to the conductor under specified service conditions;
- be capable of being removed and re-installed without damage to the conductor;
- be free from unacceptable levels of corona and radio interference under all service conditions, *when installed on phase conductors*;
- be suitable for safe and easy installation. The clamp design shall retain all parts when opened for attachment to conductor. Furthermore, the clamp design shall be such that the damper, during installation, can be suspended on the conductor before tightening the clamp;
- ensure that individual components will not become loose in service;
- maintain its function over the entire service temperature range;
- avoid audible noise;
- prevent water collection.

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

- verification of proper installation from the ground;
- easy installation and removal from energized lines.

In the case of vibration dampers for conductors or earth wires containing integral fibre optic elements (or an externally applied optical cable wrapped around the earth wire) ~~account should be made of~~ the possible effects of the damper on these fibre optic elements should be accounted for.

4.2 Materials

The materials shall conform to the requirements of IEC 61284.

4.3 Mass, dimensions and tolerances

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

4.4 Protection against corrosion

In addition to the applicable requirements of IEC 61284, the messenger cable (including cut ends ~~if applicable~~ *when exposed*) shall be protected against corrosion, e.g. in accordance with IEC 60888 for hot dip galvanized steel wire.

4.5 Manufacturing appearance and finish

The dampers shall be free of defects and irregularities; they shall have all outside surfaces 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. On spiral dampers, the markings should be on the plastic rod.

4.7 Installation instructions

The supplier shall provide a clear and complete description of the recommended installation procedure including in-span positions.

5 Quality assurance

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

Detailed information on the use of quality assurance is given in ~~ISO 9000-1 [1], ISO 9001 [2], ISO 9002 [3], ISO 9003 [4] and ISO 9004-1 [5]~~ a system as per ISO 9001 or similar.

It is recommended that test equipment used to verify compliance to this document 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 damper components is changed. The results of type tests are recorded as evidence of compliance with design requirements.

6.1.2 Application

Dampers shall be subjected to type tests as per Table 1.

Unless otherwise specified, each type test shall be performed on three test samples which are identical in all essential respects with dampers to be supplied under contract to the purchaser.

All units shall pass the tests.

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

6.2 Sample tests

6.2.1 General

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

6.2.2 Application

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

6.2.3 Sampling, 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 the purchaser and the 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 appropriate to measure on some continuous scale the characteristic(s) under consideration. In the case of failure load tests and similar expensive tests, better distinction 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 purchaser 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 he is concerned with gradual trends or changes which may affect his 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 vibration dampers to specific requirements and are made on every damper. The tests shall not damage the dampers.

6.3.2 Application and acceptance criteria

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

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6.4 Table of tests to be applied

The following 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 test shall be excluded from the delivery to the customer.

Table 1 – Tests on dampers

Subclause	Test	Type test	Sample test	Routine test
7.1	Visual examination	X	X	O
7.2	Verification of dimensions, materials and mass	X	X	
7.3	Corrosion protection tests	X	X	
7.4	Non-destructive tests	O	O	O
7.5	Clamp slip test	X	O	
7.6	Breakaway bolt test ⁺	X	X	
7.7	Clamp bolt tightening test	X	X	
7.8	Attachment of weights to messenger cable	X	X	
7.9	Attachment of clamp to messenger cable test	X	X	
7.10	Corona and radio interference voltage (RIV) tests ¹⁾	X ⁺		
7.11	Damper performance tests			
7.11.2	– Damper characteristic test	X	O	
7.11.3	– Damper effectiveness evaluation	X		
7.12	Damper fatigue test	X		
1) Not applicable for earth wire dampers.				
<p>NOTE</p> <ul style="list-style-type: none"> The supplier should state in the tender quality plan, or other tender documentation, which testing is already complete (i.e. which type tests) and which tests (sample or routine) are included in the tender, subject to the approval or change required by the purchaser. If conical washers are used on bolted clamps, embrittlement tests shall be performed in accordance with clause 7.5.2.2 of IEC 61854:2019. 				

7 Test methods

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7.1 Visual examination

Type tests shall include visual examination to ascertain conformity of the dampers in all essential respects, with the manufacturing or contract drawings. Deviations from the drawings shall be subject to the approval of the purchaser and shall be appropriately documented as an agreed concession.

Sample tests and, if required, routine tests shall include visual examination to ensure conformity of manufacturing process, shape, coating and surface finish of the damper with the contract drawings. Particular attention shall be given to markings required and to the finish of surfaces which come into contact with the conductor. The sample test procedure and acceptance criteria shall be agreed between the purchaser and the supplier.

For dampers subjected to corona type test, the sample test shall include a comparison of shape and surface finish with one of the corona type test samples when specified by the purchaser.

7.2 Verification of dimensions, materials and mass

Type and sample tests shall include verification of dimensions to ensure that dampers are within the dimensional tolerances stated on contract drawings. The purchaser may choose to witness the measurement of selected dimensions or may inspect the supplier's documentation when this is available.

Type and sample tests shall also include verification of materials to ensure that they are in accordance with contract drawings and documents. This verification shall normally be carried out by the purchaser inspecting the supplier's documentation relating to material specifications, certificates of conformity or other quality documentation.

The total mass of the damper complete with all its components shall comply with the mass shown on the contract drawing (within given tolerances).

7.3 Corrosion protection tests

7.3.1 Hot dip galvanized components (other than messenger cable wires)

Hot dip galvanized components other than messenger cable wires shall be tested in accordance with the requirements specified in ISO 1461.

The coating thicknesses shall conform to Tables 23 and 34 of ISO 1461:2009, unless otherwise agreed between purchaser and supplier. However, for the purpose of this document, Tables 23 and 34 in ISO 1461:2009 shall apply to the following categories of items (and not to the categories specified in ISO 1461).

Table 23: Coating thickness on all samples except

- washers;
- threaded components;
- small parts which are centrifuged (significant surface area <1 000 mm²).

Table 34: Coating thickness on

- washers;
- threaded components;
- small parts which are centrifuged (significant surface area <1 000 mm²).

7.3.2 Ferrous components protected from corrosion by methods other than hot dip galvanizing

Ferrous components protected from corrosion by methods other than hot dip galvanizing shall be tested in accordance with the requirements of relevant IEC/ISO standards agreed between purchaser and supplier.

7.3.3 Hot dip galvanized messenger cable wires

Hot dip galvanized messenger cable wires shall be tested in accordance with the requirements specified in IEC 60888.

7.4 Non-destructive tests

The purchaser shall specify or agree to relevant test methods (ISO or other) and acceptance criteria. Examples of non-destructive tests are as follows:

- magnetic test;
- eddy current test;
- radiographic test;
- ultrasonic test;
- proof load test;
- dye penetrant test;
- hardness test.