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Kommunikationskabel - Spezifikationen für Prüfverfahren Teil 3-13: Mechanische Prüfverfahren - Seilschwingen

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CENELEC

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 46X, Communication cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was accepted by CENELEC as EN 50289-3-13 on 2003-04-01.

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)	2004-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2006-04-01

This European Standard has been prepared under the European Mandate M/212 given to CENELEC by the European Commission and the European Free Trade Association.

Contents

1 Scope

This Part 3-13 of EN 50289 details the method of test to determine the ability of exposed overhead cables used in analogue and digital communication systems to withstand dynamic stresses similar to those imposed by laminar wind flow induced vibrations in overhead lines.

It is to be read in conjunction with Part 3-1 of EN 50289, which contains essential provisions for its application.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50289-3-1	2001	Communication cables – Specifications for test methods — Part 3-1: Mechanical test methods – General requirements
EN 50290-1-2 [1)]		Communication cables — Part 1-2: Definitions

3 Definitions

For the purposes of this European Standard the definitions of EN 50290-1-2 apply.

4 Test method

4.1 Sample

The minimum length of the test sample shall be 50 m unless otherwise define in the relevant specification. The cable ends are prepared in order to allow transmitted electrical or optical power control in one or several fibres (as specified in the relevant specification) or in conductors during the test.

The minimum test length of the optical fibres shall be 100 m. If necessary, fibres have to be spliced at the cable ends.

4.2 Equipment

The apparatus consists of

- test set up (a typical arrangement is shown in Figure 1),
- electronically controlled shaker,
- dynamometer, load cell, calibrated beam or other device to measure cable tension.

1) At draft stage.

Optical cables

– Light source with a nominal wavelength of 1 550 nm or 1 310 nm in conjunction with a light power meter, able to perform optical power measurements.

– Light source with a nominal wavelength of 1 550 nm or 1 310 nm in conjunction with a light power meter, able to measure power oscillation in the bandwidth range of 0 Hz to 300 Hz minimum.

– OTDR, if required in the detail specification.

Copper cables

– Network analyser in the frequency range of interest.

– Tester for continuity.

4.3 Procedure

The test sample shall be terminated at both ends prior to tensioning in a manner such that the cable elements are maintained in a condition representative of the normal installation conditions.

A dynamometer, load cell, calibrated beam or other device shall be used to measure cable tension. Some means should be provided to maintain constant tension to allow for temperature fluctuations during the testing.

The cable shall be loaded to approximately 15 % to 25 % of the rated maximum tensile load for the cable as given in the relevant specification unless otherwise stated in accordance with particular use conditions.

The overall span between system terminations shall be a minimum of 30 m. The minimum active span should be approximately 20 m, with a suitable suspension assembly located approximately two thirds of the distance between the two dead-end assemblies. Longer active and / or back spans may be used. It shall be supported at a height such that the static sag angle of the cable to horizontal is (1,5 ± 0,5)° in the active span.

Means shall be provided for measuring and monitoring the mid-loop (antinode) vibration amplitude at a free loop, not a support loop.

An electronically controlled shaker shall be used to excite the cable in the vertical plane. The shaker armature shall be securely fastened to the cable so it is perpendicular to the cable in the vertical plane. The shaker should be located in the span to allow for a minimum of six vibration loops between the suspension assembly and the shaker.

The test shall be carried out at one or more resonance frequencies in the frequency range for the given wind conditions. Aeolian vibration is normally experienced under laminar wind flows of 0,5 m/s to 7 m/s. The following equations (1) and (2) apply.

The frequency of vibration f (Hz) is proportional to the wind velocity v (m/s) and inversely proportional to the cable diameter D (m) and is given by the formula:

$$f = k\, v/D \qquad \text{Hz} \qquad (1)$$

where

k is Strouhal constant (0,2 for aerial cables and conductors).

The wavelength (λ) of vibration (equal to 2 loop lengths) is given by:

$$\lambda = 1/f \sqrt{T/m} \qquad \text{m} \qquad (2)$$

where

T is the cable tension (N);

m is the mass / unit length (kg/m).

NOTE If required due to the nature of cable design an overtension should be applied to ensure the cable is free of initial stresses. Therefore, in the initial stages the test span requires continuous attention and monitoring of the test parameters until the test span is stabilised.

4.4 Details to be specified

The detail specification shall include the following:

a) length of spans;

b) characteristics of the suspension and anchoring devices used;

c) cable installation tension, including any overtension if applied during the first phase;

d) frequency or wavelength at which optical monitoring is conducted;

e) mass / unit length and diameter of the cable.

5 Requirements

The acceptance criteria for the test shall be stated in the relevant specification. Typical failure modes include any temporary or permanent damage to the cable or any of the component parts, or change, in optical or electrical characteristics greater than the value specified in the relevant specification.

6 Test report

The test report shall include the following:

- characteristics of the vibration test stand;
- length of spans;
- characteristics of the suspension and anchoring devices used;
- cable installation tension, including any overtension coefficient if applied during the first phase;
- length of cable and fibres tested (characteristics of the splices between fibres if they exist);
- frequency or wavelength at which power monitoring is conducted;

- vibration mode / characteristics maintained during the test;
- preparation of ends;
- characteristics of measuring equipment including the type of measuring sets and launching conditions;
- ambient temperature and humidity during the test;
- pass/fail criteria.