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Communication cables - Specifications for test methods - Part 1-12: Electrical test methods - Inductance

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Communication cables - Specifications for test methods Part 1-12: Electrical test methods - Inductance

Câbles de communication - Spécifications des méthodes d'essai Partie 1-12: Méthodes d'essais électriques - Inductance

Kommunikationskabel - Spezifikationen für Prüfverfahren Teil 1-12: Elektrische Prüfverfahren - Induktivität

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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 CENELEC Technical Committee TC 46X, Communication cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50289-1-12 on 2004-12-01.

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)	2005-12-01
–	latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-12-01

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 1-12 of EN 50289 details the test methods to determine the inductance characteristics of cables used in analogue and digital communication systems.

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

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 50289-1-1	2001	Communication cables – Specifications for tests methods Part 1-1: Electrical test methods – General requirements
EN 50289-1-2	2001	Communication cables – Specifications for tests methods Part 1-2: Electrical test methods – DC resistance
EN 50289-1-11	2001	Communication cables – Specifications for tests methods Part 1-11: Electrical test methods – Characteristic impedance, input impedance, return loss
EN 50290-1-2	2004	Communication cables – Part 1-2: Definitions

3 Definitions

For the purposes of this European Standard the definitions of EN 50290-1-2 apply in addition to the following ones.

3.1
inductance
the inductance (L) of a pair (or with respect to the side of a quad) is the effective inductance of instrumentation cables. Inductance and mutual capacitance are parameters which describe the possibility of storing electrical energy in this kind of cables

At any (low) frequency, the impedance of a cable can be represented by two components - resistance (R) and reactance (X) - or as a polar function having magnitude (Z) and phase (θ). The impedance may be represented by either a series or parallel circuit. For the series case

$$R = Z * \cos(\theta) \text{ and } X = Z * \sin(\theta)$$

where $Z = \sqrt{(R^2 + X^2)}$

$\tan(\theta) = X/R$

and for inductance $X = 2\,\pi f L$

Inductances have to be measured normally at low frequencies (50 Hz, 800 Hz or 1 000 Hz) as required in the relevant cable specification. For this case the resistance (R) has to be measured as described in EN 50289-1-2. R is the DC-resistance of a pair (= loop resistance = the resistance of the two conductors of the pair) or a side of a quad.

4 Test method

4.1 Equipment

The measurements can be performed using a network analyser (or alternatively a discrete signal generator and receiver), an LCR-meter or an impedance-measuring-bridge (Wheatstone-, Maxwell-Bridge).

Maximum inaccuracy of measuring equipment: 2 % ± 50 nH.

4.2 Test sample

The test sample shall have a length of 10 m up to 100 m. The measuring may be performed at a delivery length, if the attenuation of the cable is small enough. Practically this means that the two values of measuring the input impedance at the near end of the cable are different (ZO/ZS ≥ 2) while the CUT is opened or shorted at the far end.

4.3 Calibration

The influence of the connecting cables, used for connection of the CUT to the equipment, shall be measured at the relevant frequency. The calibration procedure for network analysers (similar for LCR-meters) is given in EN 50289-1-11.

4.4 Test set-up

The test set-up is given in EN 50289-1-11 for measuring the input impedance with open/short method.

4.5 Measuring procedure

The test sample shall be connected to the equipment and the testing has to be performed like described in EN 50289-1-11 for measuring the input impedance with open/short method.

Network analysers or LCR-meters will show the value of inductance directly. In other cases the equation given in 3.1 of this part has to be used to calculate the inductance.

5 Expression of test results

The test results shall be normalized to the refence length of 1 km.

$$L = (Lm/Length) * 1\,000 \text{ (mH/km)}$$

where L = inductance of reference length

Lm = measured inductance in mH

Length = length of sample in m

6 Test report

The test report shall give the test conditions:

– temperature,

– sample length

and record the corrected values for the reference length.

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