
Preskušanje urejenega kabliranja za komunikacije v skladu s standardom EN 50173 – 1. del: Kabelska inštalacija (IEC 61935-1:2005, spremenjen)

Testing of balanced communication cabling in accordance with standards series EN 50173 - Part 1: Installed cabling (IEC 61935-1:2005, modified)

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English version

**Testing of balanced communication cabling
in accordance with standards series EN 50173
Part 1: Installed cabling
(IEC 61935-1:2005, modified)**

Essais de câblages de
télécommunications symétriques
selon la série de normes EN 50173
Partie 1: Câblages installés
(CEI 61935-1:2005, modifiée)

Prüfung der symmetrischen
Kommunikationsverkabelung
nach der Normenreihe EN 50173
Teil 1: Installierte Verkabelung
(IEC 61935-1:2005, modifiziert)

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This European Standard was approved by CENELEC on 2005-10-01. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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

Foreword

The text of document 46A/717/FDIS, future edition 2 of IEC 61935-1, prepared by SC 46A, Coaxial cables, of IEC TC 46, Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61935-1 on 2005-10-01.

This European Standard supersedes EN 61935-1:2000 + corrigendum February 2001 + A1:2002.

This new edition was written to describe Level IV testers in support of ISO/IEC 11801:2002 and the series EN 50173.

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) 2006-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2008-10-01

Annex ZA has been added by CENELEC.

iTeh STANDARD PREVIEW (standards.iteh.ai) Endorsement notice

The text of the International Standard IEC 61935-1:2005 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

Title page

Replace "ISO/IEC 11801" by "standards series EN 50173".

General

Replace all other occurrences of "ISO/IEC 11801" and "ISO/IEC 11801 (or equivalent)" by "EN 50173".

This replacement is to be made in the introduction and in (Sub)Clauses 3, 3.1, 4.2.4 (twice), 5.1 (four times), 5.3.1, 5.3.2.2, 5.3.3, 5.3.4 (twice), 5.3.5, 5.3.6, 5.3.8, 5.3.9, 5.3.10, 5.5.1, 6.2 and 6.8.1.

Clause 1, Scope

Replace the first paragraph by:

This part of EN 61935 specifies reference measurement procedures for cabling parameters and the requirements for field tester accuracy to measure cabling parameters identified in EN 50173.

Clause 2, Normative references

Add:

EN 50173, series, *Information technology - Generic cabling systems*

Clause 3. Terms and definitions

Replace definitions 3.2 and 3.3 by:

3.2

reflection coefficient

ratio of the voltage of the reflected wave to the voltage of the incident wave at the port or transverse cross-section to a cable assembly when the cable assembly is terminated with its application or nominal impedances, Z_{cnom} .

$$C_r = \frac{Z_{\text{cnom}} - Z_{\text{in}}}{Z_{\text{cnom}} + Z_{\text{in}}} \quad (1)$$

3.3

return loss

ratio in decibels of the voltage delivered to a cable assembly terminated at the far end with its nominal characteristic impedance, to the reflected voltage at the input port of the cable assembly.

$$R_l = 20 \log \left| \frac{u_i}{u_r} \right|$$

or

$$R_l = 20 \log \left| \frac{Z_{\text{cnom}} + Z_{\text{in}}}{Z_{\text{cnom}} - Z_{\text{in}}} \right| \quad (2)$$

where

u_i is the incident voltage;

u_r is the reflected voltage.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
	–	Information technology - Generic cabling systems	EN 50173	Series
IEC 60169-16	– ¹⁾	Radio-frequency connectors Part 16: R.F. coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling - Characteristic impedance 50 ohms (75 ohms) (Type N)	–	–
IEC 60169-22	– ¹⁾	Part 22: R.F. two-pole bayonet coupled connectors for use with shielded balanced cables having twin inner conductors (Type BNO)	–	–
IEC 60603-7	1996	Connectors for frequencies below 3 MHz for use with printed boards Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality	EN 60603-7	1997
IEC 61076-3-104	– ¹⁾	Connectors for electronic equipment Part 3-104: Rectangular connectors - Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 600 MHz minimum	EN 61076-3-104	2003 ²⁾
ISO/IEC 14763-1 ³⁾	– ¹⁾	Information technology – Implementation and operation of customer premises cabling Part 1: Administration	–	–
ITU-T Rec. G.117	1996	Transmission aspects of unbalance about earth	–	–
ITU-T Rec. O.9	1988	Measuring arrangements to assess the degree of unbalance about earth	–	–

1) Undated reference.

2) Valid edition at date of issue.

3) EN 50174-1, *Information technology - Cabling installation -- Part 1: Specification and quality assurance*, which is related to, but not directly equivalent with ISO/IEC 14763-1, applies instead.

NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC

61935-1

Deuxième édition
Second edition
2005-08

**Essais de câblages de télécommunications
symétriques selon l'ISO/IEC 11801 –**

**Partie 1:
Câblages installés**

iTeh STANDARD PREVIEW

**Testing of balanced communication
cabling in accordance with ISO/IEC 11801 –**

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**Part 1:
Installed cabling**

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International Electrotechnical Commission
Международная Электротехническая Комиссия

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For price, see current catalogue*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TESTING OF BALANCED COMMUNICATION
CABLING IN ACCORDANCE WITH ISO/IEC 11801 –****Part 1: Installed cabling**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61935-1 has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories.

This second edition cancels and replaces the first edition published in 2000 and amendment 1 (2002). It constitutes a technical revision.

This second edition was written to describe Level IV testers in support of the second edition of ISO/IEC 11801.

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

FDIS	Report on voting
46A/717/FDIS	46A/734/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.

IEC 61935 consists of the following parts, under the general title *Testing of balanced communication cabling in accordance with ISO/IEC 11801*:

Part 1: Installed cabling

Part 2: Patch cords and work area cords

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

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

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INTRODUCTION

Telecommunication cabling, once specified uniquely by each telecommunications application, has evolved into a generic cabling system. Telecommunications applications now use the ISO/IEC 11801 cabling standard to meet their cabling requirements. Formerly, connectivity tests and visual inspection were deemed sufficient to verify a cabling installation. Now users need more comprehensive testing in order to ensure that the link will support telecommunications applications that are designed to operate on the generic cabling system. This part of IEC 61935 addresses reference laboratory and field test methods and provides a comparison of these methods.

Transmission performance depends on cable characteristics, connecting hardware, patch cords and cross-connect cabling, the total number of connections, and the care with which they are installed and maintained. This standard provides test methods for installed cabling and pre-fabricated cable assemblies. These test methods, where appropriate, are based on those used for components of the cable assembly.

This part 1 contains the test methods required for installed cabling. Part 2 contains the test methods required for patch cords and work area cords.

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TESTING OF BALANCED COMMUNICATION CABLING IN ACCORDANCE WITH ISO/IEC 11801 –

Part 1: Installed cabling

1 Scope

This part of IEC 61935 specifies reference measurement procedures for cabling parameters and the requirements for field tester accuracy to measure cabling parameters identified in ISO/IEC 11801. References in this standard to ISO/IEC 11801 mean ISO/IEC 11801 or equivalent cabling standards.

This standard applies when the cable assemblies are constructed of cables complying with IEC 61156 -1, IEC 61156-2, IEC 61156-3 IEC 61156-4, IEC 61156-5 or IEC 61156-6, and connecting hardware as specified in IEC 60603-7 or IEC 61076-3-104. In the case where cables and/or connectors do not comply with these standards then additional tests may be required.

This standard is organized as follows:

- reference laboratory measurement procedures are specified in Clause 4. In some cases, these procedures may be used in the field;
- descriptions and requirements for measurements in the field are specified in Clause 5;
- performance requirements for field testers and procedures to verify performance are specified in Clause 6.

NOTE 1 This standard does not include tests that are normally performed on the cables and connectors separately. These tests are described in IEC 61156-1 and IEC 60603-7 or IEC 61076-3-104 respectively.

NOTE 2 Wherever possible, cables and connectors used in cable assemblies, even if they are not described in IEC 61156 or IEC 60603-7/IEC 61076-3-104 shall be tested separately according to the tests given in the relevant generic specification. In this case, most of the environmental and mechanical tests described in this standard may be omitted.

NOTE 3 Users of this standard are advised to consult with applications standards, equipment manufacturers and system integrators to determine the suitability of these requirements for specific networking applications

This standard relates to performance with respect to 100 Ω cabling. For 120 Ω or 150 Ω cabling, the same principles apply but the measurement system should correspond to the nominal impedance level.

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.

IEC 60169-16, *Radio-frequency connectors – Part 16: R.F. coaxial connectors with inner diameter of outer conductor 7 mm (0.276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (Type N)*

IEC 60169-22, *Radio-frequency connectors – Part 22: RF two-pole bayonet coupled connectors for use with shielded balanced cables having twin inner conductors (Type BNO)*

IEC 60603-7:1996 *Connectors for frequencies below 3 MHz for use with printed boards – Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality*

IEC 61076-3-104, *Connectors for electronic equipment – Part 3-104: Rectangular connectors – Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 600 MHz minimum*

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC 14763-1, *Information technology – Implementation and operation of customer premises cabling – Part 1: Administration*

ITU-T Recommendation G.117:1996, *Transmission aspects of unbalance about earth*

ITU-T Recommendation O.9:1999, *Measuring arrangements to assess the degree of unbalance about earth*

3 Terms and definitions

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For the purposes of this document, the terms and definitions in ISO/IEC 11801 and the following apply.

3.1

cable assembly

combination of cable(s) and connector(s) with specified performance, used as a single unit intended to be a part of a cabling link as defined in ISO/IEC 11801 (or equivalent). Examples: patch cord, work area cord, link

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3.2

reflection coefficient

ratio of the complex square root of wave amplitude of the reflected wave to the complex square root of wave amplitude of the incident wave at a port or transverse cross-section of a cable assembly when the cable assembly is terminated with its application or nominal impedances, Z_{nom}

$$C_r = \left(\frac{|Z_{in} + Z_{cnom}|}{|Z_{in} - Z_{cnom}|} \right) \quad (1)$$

3.3

return loss

ratio of the power delivered to a cable assembly terminated at the far end with its nominal characteristic impedance, to the reflected power at the input port of the cable assembly

$$R_1 = 20 \log \left(\frac{u_i}{u_r} \right)$$

or

$$R_1 = 20 \log \left(\frac{|Z_{in} - Z_{cnom}|}{|Z_{in} + Z_{cnom}|} \right) \quad (2)$$

where

u_i is the incident voltage;

u_r is the reflection voltage.

3.4 electrical length

equivalent free-space length of the cable assembly

3.5 propagation delay

phase delay at each frequency in the frequency range of interest for the propagation of a transverse electromagnetic mode (TEM) wave between the reference planes of the cable assembly, expressed in nanoseconds per metre (ns/m)

3.6 minimum static bending radius

radius used in climatic tests which is the minimum permissible for fixed installations of the cable

3.7 dynamic bending radius

bending radius used for the insertion loss stability, stability of electrical length and flexing endurance tests. It is the minimum bending radius for applications where the cable assembly is flexed. Larger bending radii will allow an increase in the maximum number of flexures

3.8 screening attenuation (of the cable assembly)

ratio of the common mode square root of power wave inside a screened cable assembly to the total square root of power that radiates outside the cable assembly

3.9 unbalanced attenuation

ratio of the common mode square root of signal power to the differential mode square root of signal power in a pair due to unbalanced properties of the given pair

3.10 near-end crosstalk

NEXT

near end measurement of the square root of signal power coupling from one circuit to another within a cable assembly when a square root of signal power is fed and measured at the same end. It is expressed in dB relative to the incident square root of signal power