

**Specification for the testing of balanced and coaxial
information technology cabling - Part 1: Installed
balanced cabling as specified in the standards series
EN 50173**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61935-1:2010 sisaldab Euroopa standardi EN 61935-1:2009 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 28.02.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

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This Estonian standard EVS-EN 61935-1:2010 consists of the English text of the European standard EN 61935-1:2009.

This standard is ratified with the order of Estonian Centre for Standardisation dated 28.02.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 23.12.2009.

The standard is available from Estonian standardisation organisation.

ICS 33.120.10

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English version

**Specification for the testing of balanced
and coaxial information technology cabling -
Part 1: Installed balanced cabling as specified
in the standards series EN 50173
(IEC 61935-1:2009, modified)**

Spécification relative aux essais
de câblages symétriques et coaxiaux
propres aux technologies de l'information -
Partie 1: Câblages symétriques installés
selon la série de normes EN 50173
(CEI 61935-1:2009, modifiée)

Spezifikation für die Prüfung
der symmetrischen und coaxialen
informationstechnischen Verkabelung -
Teil 1: Installierte symmetrische
Verkabelung nach EN 50173
und entsprechenden Normen
(IEC 61935-1:2009, modifiziert)

This European Standard was approved by CENELEC on 2009-10-01. 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, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 46/323/FDIS, future edition 3 of IEC 61935-1, prepared by 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 2009-10-01 with common modifications prepared by the German national committee to have the standard refer to the relevant European Standards.

This European Standard supersedes EN 61935-1:2005.

This new edition includes test methods for exogenous (alien) crosstalk. It also includes a new annex for uncertainty and variability of field test results.

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) | 2010-07-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2012-10-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61935-1:2009 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

Title page

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

General

Replace "ISO/IEC 11801" and "ISO/IEC 11801 (or equivalent)" by "EN 50173-1" in Subclauses 3.2, 4.2.5 (twice), 4.13.4.3, 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, 5.4.7.2, 5.4.7.3, 5.4.8.1, 5.5.5 and 6.2

Replace all other occurrences of "ISO/IEC 11801" and "ISO/IEC 11801 (or equivalent)" by "series EN 50173", i.e. in the introduction and in (Sub)Clauses 3, 3.1, and 6.11.1.

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 series EN 50173. This standard does not apply to EN 50173-4.

Clause 2, Normative references

Replace "ISO/IEC 11801" by:

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

Replace ISO/IEC/TR 14763-2 by:

EN 50174-1, *Information technology - Cabling installation - Part 1: Installation specification and quality assurance*

Subclause 5.4.8.1, Selection of disturbed links

Replace "ISO/IEC/TR 14763-2" by "EN 50174-1".

Subclause 5.1, General

Replace paragraphs 1 to 3 by:

This clause applies to field test specifications for post-installation performance measurements of installed cabling designed in accordance with series EN 50173.

The information contained in this clause uses the links defined in series EN 50173 and specifies parameters for field testers, test methods and interpretations of test results, leading to a practical solution to the issues related to field testing. Classes of twisted pair cabling links referred to herein correspond with those described in EN 50173-1.

Field test equipment is classified by performance level. Currently levels I, II, IIE, III, IIIE and IV are used in the industry. This clause specifies requirements for field test equipment used to certify class D, E, E_A, F and F_A cabling as defined in EN 50173-1.

Subclause 5.5.8, Administration system applicability

Replace “ISO/IEC 14763-1” by “EN 50174-1”.

Bibliography

Add the following note under IEC 61935-3:

NOTE Harmonized as EN 61935-3:2009.

Delete reference to ISO/IEC 14763-1.

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 When 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
–	–	Information technology - Cabling installation - Part 1: Installation specification and quality assurance	EN 50174-1	– ¹⁾
–	–	Communication cables - Specifications for test methods - Part 1-15: Electromagnetic performance - Coupling attenuation of links and channels (Laboratory conditions)	EN 50289-1-15	– ¹⁾
IEC 60169-22	– ¹⁾	Radio-frequency connectors - Part 22: R.F. two-pole bayonet coupled connectors for use with shielded balanced cables having twin inner conductors (Type BNO)	–	–
IEC 60512-25-9	– ¹⁾	Connectors for electronic equipment - Tests and measurements - Part 25-9: Signal integrity tests - Test 25i: Alien crosstalk	EN 60512-25-9	2008 ²⁾
IEC 60603-7	– ¹⁾	Connectors for electronic equipment - Part 7: Detail specification for 8-way, unshielded, free and fixed connectors	EN 60603-7	2009
IEC 60603-7-X	Series	Connectors for electronic equipment - Part 7-X: Detail specification for 8-way, shielded free and fixed connectors	EN 60603-7-X	Series
IEC 60603-7-4	– ¹⁾	Connectors for electronic equipment - Part 7-4: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz	EN 60603-7-4	200X ³⁾
IEC 60603-7-5	– ¹⁾	Connectors for electronic equipment - Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz	EN 60603-7-5	2009

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

³⁾ To be published

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61076-3-104	– ¹⁾	Connectors for electronic equipment - Product requirements - Part 3-104: Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 1 000 MHz	EN 61076-3-104	2006 ²⁾
IEC 61076-3-110	– ¹⁾	Connectors for electronic equipment - Product requirements - Part 3-110: Rectangular connectors - Detail specification for shielded, free and fixed connectors for data transmission with frequencies up to 1 000 MHz	EN 61076-3-110	2008 ²⁾
IEC 61156-1	– ¹⁾	Multicore and symmetrical pair/quad cables for digital communications - Part 1: Generic specification	–	–
IEC 61156-5	– ¹⁾	Multicore and symmetrical pair/quad cables for digital communications - Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz - Horizontal floor wiring - Sectional specification	–	–
IEC 61156-6	– ¹⁾	Multicore and symmetrical pair/quad cables for digital communications - Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz - Work area wiring - Sectional specification	–	–
IEC 61156-7	– ¹⁾	Multicore and symmetrical pair/quad cables for digital communications - Part 7: Symmetrical pair cables with transmission characteristics up to 1 200 MHz - Sectional specification for digital and analog communication cables	–	–
IEC 61156-8	– ¹⁾	Multicore and symmetrical pair/quad cables for digital communications - Part 8: Symmetrical pair/quad cables with transmission characteristics up to 1 200 MHz - Work area wiring - Sectional specification	–	–
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	–	–

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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 cables.

SPECIFICATION FOR THE TESTING OF BALANCED AND COAXIAL INFORMATION TECHNOLOGY CABLING –

Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards

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 International Standard applies when the cable assemblies are constructed of cables complying with the IEC 61156 family of standards, and connecting hardware as specified in IEC 60603-7 family of standards or IEC 61076-3-104 and IEC 61076-3-110. 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 on cabling topologies 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 and IEC 61076-3-110 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 or IEC 61076-3-110, are 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.

Field tester types include certification, qualification and verification. Certification testing is performed for the rigorous needs of commercial/industrial buildings to this standard. Qualification testing is described in IEC 61935-3. Qualification testing determines whether the cabling will support certain network technologies (e.g., 1000BASE-T, 100BASE-TX, IEEE 1394b¹⁾). Qualification testers do not have traceable accuracy to national standards and provide confidence that specific applications will work. Verification testers only verify connectivity.

Throughout this document, 4-pair cabling is assumed. The test procedures described in this standard may also be used to evaluate 2-pair balanced cabling. However, 2-pair cabling links that share the same sheath with other links are tested as 4-pair cabling.

1) IEEE 1394b: 2002, *High Performance Serial Bus (High Speed Supplement)*

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

IEC 60512-25-9, *Connectors for electronic equipment – Tests and measurements – Part 25-9: Signal integrity tests – Test 25i: Alien crosstalk*

IEC 60603-7, *Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors*

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IEC 61156-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Sectional specification*

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

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3 Terms and definitions

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

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)

NOTE Examples are: patch cord, work area cable, link.

3.2 certification

measurements of installed cabling specified in ISO/IEC 11801 (e.g., class D, class E, class E_A, class F, class F_A)

This requires field testers with traceable accuracy to national standards.

3.3 comparative test

test that is performed to check the deviation between the results obtained with the reference test method and those obtained with another test set-up (i.e. field test equipment)

3.4 d.c. resistance

measure of the sum total of the d.c. resistance of the wires of a pair

3.5 delay skew

worst case value of the phase delay difference between any pair in the same cable assembly

3.6 electrical length

equivalent free-space length of the cable assembly

3.7 far-end cross-talk

FEXT

decrease in magnitude of power of a signal that propagates between disturbing and disturbed pairs contained within the same link measured at the far end

NOTE 1 When the power decrease is referenced to the near end of the disturbing pair, the characteristic is named input output crosstalk (IO FEXT).

NOTE 2 When the power decrease is referenced to the far end of the disturbing pair, the characteristic is named equal level far end crosstalk (ELFEXT).

NOTE 3 When the power decrease is referenced to the far end of the disturbed pair, the characteristic is named attenuation-to-crosstalk ratio, far end (ACR-F).

NOTE 4 FEXT is expressed in dB.