



**NSAI**  
Standards

Irish Standard  
I.S. EN 61935-1:2009

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 (MOD))

## I.S. EN 61935-1:2009

*Incorporating amendments/corrigenda issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

<i>This document replaces:</i> EN 61935-1:2005	<i>This document is based on:</i> EN 61935-1:2009 EN 61935-1:2005	<i>Published:</i> 23 December, 2009 21 December, 2005
This document was published under the authority of the NSAI and comes into effect on:  5 July, 2010		ICS number: 33.120.10
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Údarás um Chaighdeáin Náisiúnta na hÉireann		

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 koaxialen  
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.

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## 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<sub>A</sub>, F and F<sub>A</sub> 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.

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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 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	– <sup>1)</sup>
–	–	Communication cables - Specifications for test methods - Part 1-15: Electromagnetic performance - Coupling attenuation of links and channels (Laboratory conditions)	EN 50289-1-15	– <sup>1)</sup>
IEC 60169-22	– <sup>1)</sup>	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	– <sup>1)</sup>	Connectors for electronic equipment - Tests and measurements - Part 25-9: Signal integrity tests - Test 25i: Alien crosstalk	EN 60512-25-9	2008 <sup>2)</sup>
IEC 60603-7	– <sup>1)</sup>	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	– <sup>1)</sup>	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 <sup>3)</sup>
IEC 60603-7-5	– <sup>1)</sup>	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

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1) Undated reference.

2) Valid edition at date of issue.

3) To be published

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EN 61935-1:2009

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61076-3-104	- <sup>1)</sup>	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 <sup>2)</sup>
IEC 61076-3-110	- <sup>1)</sup>	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 <sup>2)</sup>
IEC 61156-1	- <sup>1)</sup>	Multicore and symmetrical pair/quad cables for digital communications - Part 1: Generic specification	-	-
IEC 61156-5	- <sup>1)</sup>	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	- <sup>1)</sup>	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	- <sup>1)</sup>	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	- <sup>1)</sup>	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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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**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**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The objective 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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- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61935-1 has been prepared by IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2005, and constitutes a technical revision.

This edition differs from the second edition in that it includes test methods for exogenous (alien) crosstalk. It also includes a new annex for uncertainty and variability of field test results.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

**I.S. EN 61935-1:2010**

61935-1 © IEC:2009(E)

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

FDIS	Report on voting
46/323/FDIS	46/332/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61935 series, under the general title: *Specification for the testing of balanced and coaxial information technology cabling*, can be found on the IEC website.

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.

A bilingual version of this publication may be issued at a later date.



## 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  $\Omega$  cabling. For 120  $\Omega$  or 150  $\Omega$  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 1394b<sup>1)</sup>). 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.

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

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