

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**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**

**Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information –
Partie 1: Câblages symétriques installés conformément à l'ISO/IEC 11801 et normes associées**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**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**

**Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information –
Partie 1: Câblages symétriques installés conformément à l'ISO/IEC 11801 et normes associées**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XE

ICS 33.120.10

ISBN 978-2-88912-117-5

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references.....	12
3 Terms and definitions.....	13
4 Reference measurement procedures for electrical properties.....	15
4.1 General.....	15
4.2 Test equipment considerations.....	15
4.2.1 General.....	15
4.2.2 Network analyzer test requirements.....	15
4.2.3 Termination of conductor pairs.....	16
4.2.4 Reference loads for calibration.....	17
4.2.5 Test configurations.....	17
4.2.6 Coaxial cables and test leads for network analyzers.....	18
4.2.7 Balun requirements.....	19
4.2.8 Network analyzer measurement precautions.....	20
4.2.9 Data reporting and accuracy.....	21
4.3 DC loop resistance.....	21
4.3.1 Objective.....	21
4.3.2 Test method.....	22
4.3.3 Test equipment and set-up.....	22
4.3.4 Procedure.....	22
4.3.5 Test report.....	22
4.3.6 Uncertainty.....	23
4.4 Direct current (d.c.) resistance unbalance.....	23
4.4.1 Objective.....	23
4.4.2 Test method.....	23
4.4.3 Test equipment and set-up.....	23
4.4.4 Procedure.....	23
4.4.5 Test report.....	24
4.4.6 Uncertainty.....	24
4.5 Insertion loss.....	24
4.5.1 Objective.....	24
4.5.2 Test method.....	24
4.5.3 Test equipment and set-up.....	25
4.5.4 Procedure.....	25
4.5.5 Test report.....	26
4.5.6 Temperature correction.....	26
4.5.7 Uncertainty.....	26
4.6 Propagation delay and delay skew.....	26
4.6.1 Objective.....	26
4.6.2 Test method.....	26
4.6.3 Test equipment and set-up.....	27
4.6.4 Procedure.....	27
4.6.5 Test report.....	27
4.6.6 Uncertainty.....	27

4.7	Near-end cross-talk (NEXT) and power sum NEXT	28
4.7.1	Objective	28
4.7.2	Test method	28
4.7.3	Test equipment and set-up	28
4.7.4	Procedure.....	28
4.7.5	Test report.....	29
4.7.6	Uncertainty.....	30
4.8	Attenuation to crosstalk ratio, near end (ACR-N) and power sum ACR-N.....	30
4.8.1	Objective	30
4.8.2	Test method	30
4.8.3	Test equipment and set-up	30
4.8.4	Procedure.....	30
4.8.5	Test report.....	30
4.8.6	Uncertainty.....	30
4.9	Far-end cross-talk (FEXT) and power sum FEXT.....	31
4.9.1	Objective	31
4.9.2	Test method	31
4.9.3	Test equipment and set-up	31
4.9.4	Procedure.....	32
4.9.5	Test report.....	32
4.9.6	Uncertainty of FEXT measurements	32
4.10	Equal level far end crosstalk (ELFEXT) and attenuation to crosstalk ratio, far end (ACR-F).....	32
4.10.1	Objective.....	32
4.10.2	Calculation	33
4.10.3	Test report.....	33
4.10.4	Uncertainty.....	33
4.11	Return loss.....	33
4.11.1	Objective.....	33
4.11.2	Test method	33
4.11.3	Test equipment and set-up	34
4.11.4	Procedure.....	34
4.11.5	Test report.....	35
4.11.6	Uncertainty.....	35
4.12	PS alien near end crosstalk (PS ANEXT – Exogenous crosstalk).....	35
4.12.1	Objective	35
4.12.2	Test method	35
4.12.3	Test equipment and set-up	35
4.12.4	Procedure.....	36
4.13	PS attenuation to alien crosstalk ratio, far end crosstalk (PS AACR-F – Exogenous crosstalk)	38
4.13.1	Objective	38
4.13.2	Test method	38
4.13.3	Test equipment and set-up	38
4.13.4	Procedure.....	40
4.14	Unbalance attenuation, near end.....	42
4.14.1	Objective	42
4.14.2	Test method	42
4.14.3	Test equipment and set-up	42

4.14.4	Procedure.....	43
4.14.5	Test report.....	45
4.14.6	Uncertainty.....	46
4.15	Unbalance attenuation, far end.....	46
4.15.1	Objective.....	46
4.15.2	Test method.....	46
4.15.3	Test equipment and set-up.....	46
4.15.4	Procedure.....	47
4.15.5	Test report.....	48
4.15.6	Uncertainty.....	48
4.16	Coupling attenuation.....	48
5	Field test measurement requirements for electrical properties.....	48
5.1	General.....	48
5.2	Cabling configurations tested.....	49
5.3	Field test parameters.....	49
5.3.1	General.....	49
5.3.2	Inspection of workmanship and connectivity testing.....	50
5.3.3	Propagation delay and delay skew.....	51
5.3.4	Length.....	51
5.3.5	Insertion loss.....	52
5.3.6	NEXT, power sum NEXT.....	52
5.3.7	ACR-N and power sum ACR-N.....	53
5.3.8	ELFEXT, power sum ELFEXT, ACR-F, power sum ACR-F.....	54
5.3.9	Return loss.....	55
5.3.10	Direct current (d.c.) loop resistance.....	55
5.4	Power sum alien crosstalk.....	55
5.4.1	Objective.....	55
5.4.2	Test method.....	56
5.4.3	Test equipment and set-up.....	56
5.4.4	Measuring ANEXT loss.....	56
5.4.5	Measuring AFEXT loss.....	57
5.4.6	Procedure.....	57
5.4.7	Calculation of PS ANEXT and PS AACR-F from measured data.....	57
5.4.8	Selection of test ports.....	60
5.4.9	Test report.....	62
5.4.10	Uncertainty of PS alien crosstalk measurements.....	62
5.5	Data reporting and accuracy.....	62
5.5.1	General.....	62
5.5.2	Detailed results.....	64
5.5.3	Summary results.....	64
5.5.4	Reporting requirements for power sum alien crosstalk.....	68
5.5.5	General.....	68
5.5.6	Consistency checks for field testers.....	68
5.5.7	Evaluation of consistency tests.....	69
5.5.8	Administration system applicability.....	69
5.5.9	Test equipment adapter cords for link testing.....	69
5.5.10	User cords and channel testing.....	69
6	Field tester measurement accuracy requirements.....	69
6.1	General.....	69

6.2	Measurement accuracy specifications common to level IIE, level III, level IIIE, and level IV field testers.....	73
6.3	Accuracy performance requirements for level IIE field testers.....	73
6.4	Accuracy performance requirements for level III field testers.....	75
6.5	Accuracy performance requirements for level IIIE field testers.....	77
6.6	Accuracy performance requirements for level IV field testers.....	79
6.7	Accuracy performance requirements for level IV field testers over 600 MHz.....	81
6.8	Field tester requirements applicable to alien crosstalk measurements.....	81
6.9	Procedures for determining field tester parameters.....	81
6.9.1	General.....	81
6.9.2	Output signal balance (<i>OSB</i>).....	82
6.9.3	Common mode rejection (<i>CMR</i>).....	82
6.9.4	Residual NEXT.....	83
6.9.5	Dynamic accuracy.....	84
6.9.6	Source/load return loss.....	85
6.9.7	Random noise floor.....	85
6.9.8	Residual FEXT.....	85
6.9.9	Directivity.....	86
6.9.10	Tracking.....	87
6.9.11	Source match.....	87
6.9.12	Return loss of remote termination.....	87
6.9.13	Constant error term of the propagation delay measurement function.....	88
6.9.14	Error constant term proportional to propagation delay of the propagation delay measurement function.....	88
6.9.15	Constant error term of the delay skew measurement function.....	88
6.9.16	Constant error term of the length measurement function.....	88
6.9.17	Error constant proportional to length of the length measurement function.....	88
6.9.18	Constant error term of the d.c. resistance measurement function.....	88
6.9.19	Error constant term proportional to d.c. resistance of the d.c. resistance measurement function.....	89
6.9.20	Measurement floor for alien crosstalk testing during field testing.....	89
6.9.21	Measurement floor of the test device for the channel test configuration.....	89
6.10	Measurement error models.....	90
6.10.1	General.....	90
6.10.2	Error model for the insertion loss measurement function.....	90
6.10.3	Error model for the NEXT measurement function.....	91
6.10.4	Error model for the power sum NEXT measurement function.....	91
6.10.5	Error model for the ACR-N measurement function.....	91
6.10.6	Error model for the power sum ACR-N measurement function.....	92
6.10.7	Error model for the ELFEXT or ACR-F measurement function.....	92
6.10.8	Error model for the power sum ELFEXT and PS ACR-F measurement functions.....	93
6.10.9	Error model for the return loss measurement function.....	93
6.10.10	Error model for the propagation delay measurement function.....	94
6.10.11	Error model for the delay skew measurement function.....	95
6.10.12	Error model for the length measurement function.....	95
6.10.13	Error model for the d.c. loop resistance measurement function.....	95
6.11	Network analyzer measurement comparisons.....	95

6.11.1 General	95
6.11.2 Adapters.....	96
6.11.3 Comparison methods.....	98
Annex A (informative) Uncertainty and variability of field test results.....	102
Annex B (normative) Reference laboratory test configuration for alien crosstalk testing	106
Annex C (informative) General information on power sum alien crosstalk performance of installations	109
Bibliography.....	110
Figure 1 – Resistor load.....	16
Figure 2 – Reference planes for permanent link and channel	18
Figure 3 – 180° hybrid used as a balun	19
Figure 4 – Loop resistance measurement	22
Figure 5 – DC resistance unbalance measurement	24
Figure 6 – Insertion loss test configuration.....	25
Figure 7 – NEXT test configuration	28
Figure 8 – FEXT test configuration.....	31
Figure 9 – Return loss test configuration.....	34
Figure 10 – ANEXT measurement.....	36
Figure 11 – Alien far end crosstalk measurement.....	39
Figure 12 – Unbalance attenuation, near end test configuration	43
Figure 13 – Back-to-back balun differential mode insertion loss measurement.....	44
Figure 14 – Back-to-back balun common mode insertion loss measurement	44
Figure 15 – Unbalance performance test of the measurement balun	45
Figure 16 – Unbalance attenuation far end test configuration.....	47
Figure 17 – Correct pairing.....	50
Figure 18 – Incorrect pairing.....	51
Figure 19 – Schematic diagram to measure channel ANEXT loss	56
Figure 20 – AFEXT loss measurement test configuration	57
Figure 21 – Flow chart of the alien crosstalk test procedure.....	61
Figure 22 – Example of equipment tolerance region (NEXT)	63
Figure 23 – Block diagram for measuring output signal balance.....	82
Figure 24 – Block diagram to measure common mode rejection.....	83
Figure 25 – Block diagram for measuring residual NEXT.....	84
Figure 26 – Block diagram for measuring dynamic accuracy	84
Figure 27 – Principle of measurement of residual NEXT	86
Figure 28 – Principle of alternate measurement of residual FEXT	86
Figure 29 – Alien crosstalk measurement floor test for the channel test configuration	89
Figure 30 – Alien crosstalk measurement floor test for the link test configurations	90
Figure 31 – Construction details of special patch cord adapter.....	96
Figure 32 – Interfaces to channel by field test and laboratory equipment to compare test results.....	97
Figure 33 – Interfaces to link test configuration by field test and laboratory equipment to compare test results	98

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 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 bilingual version, published in 2010-07, corresponds to the English version.

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.

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.

The French version of this standard has not been voted upon.

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 stability 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/75e89ff-7735-4775-9523-edd74e6863e1/iec-61935-1-2009>

<https://standards.iteh.ai/catalog/standards/sist/75e89ff-7735-4775-9523-edd74e6863e1/iec-61935-1-2009>

Withhold

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*

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

IEC 60603-7-4, *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*

IEC 60603-7-5, *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*

IEC 61076-3-104, *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*

IEC 61076-3-110, *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*

IEC 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61156-5, *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, *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, *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, *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*

IEC 61169-16, *Radio-frequency connectors – Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristics impedance 50 ohms (75 ohms) (type N)*

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

ISO/IEC/TR 14763-2, *Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*

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*

EN 50289-1-15, *Communication cables – Specifications for test methods – Part 1-15: Electromagnetic performance – Coupling attenuation of links and channels (Laboratory conditions)*

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).