



IEC 61935-2

Edition 4.0 2022-02
COMMENTED VERSION

INTERNATIONAL STANDARD



**Specification for the testing of balanced and coaxial information technology cabling –
Part 2: Cords as specified in ISO/IEC 11801-1 and related standards**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.040.20; 33.120.20

ISBN 978-2-8322-1075-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	11
4 General Requirements and test configuration	11
4.1 Cable and connector design	
4.2 Balanced cord, cable and connector tests	
4.3 Test configuration and equipment	
4.4 Balanced cord tests requirements	
4.1 Cord components: cable and connector	14
4.2 Cord tests	14
4.2.1 General	14
4.2.2 Acceptance tests	15
4.2.3 Periodic tests	15
4.3 Cord test procedure	16
4.3.1 General	16
4.3.2 Electrical transmission parameters, test fixtures and reference test heads	16
5 Acceptance tests and additional optional tests	16
5.1 Visual inspection (balanced and coaxial cords)	16
5.2 Wire map (balanced cords)	17
5.3 Propagation delay	
5.4 Delay skew	
5.5 Insertion loss	
5.6 Return loss	
5.7 Near end crosstalk (NEXT)	
5.8 Assumptions used in the development of cord requirements	
5.3 Return loss (balanced and coaxial cords)	23
5.4 Pair-to-pair NEXT and PS NEXT (balanced cords)	23
5.5 Insertion loss and attenuation (balanced and coaxial cords)	23
5.6 Pair-to-pair ACRF and PS ACRF (balanced cords)	23
5.7 Alien crosstalk, PS ANEXT and PS AACRF, (balanced cords)	23
5.8 Unbalance attenuation, TCL and EL TCTL, (balanced cords)	23
5.9 Coupling attenuation (screened balanced cords)	23
5.10 Screening attenuation and transfer impedance (screened balanced and coaxial cords)	23
5.11 Propagation delay (balanced and coaxial cords)	23
5.12 Delay skew (balanced cords)	24
5.13 DC resistance (balanced and coaxial cords)	24
5.14 DC resistance unbalance within pairs (balanced cords)	24
5.15 DC resistance unbalance between pairs (balanced cords)	24
6 Balanced cord test procedure – Network analyser test configuration	
6 Periodic tests, procedures	24
6.1 General	24
6.2 Tensile strength	24

6.2.1	Object.....	24
6.2.2	Procedure.....	24
6.2.3	Requirements	25
6.2.4	Detail specification	25
6.3	Flexure	25
6.3.1	Object.....	25
6.3.2	Procedure.....	26
6.3.3	Requirements	26
6.3.4	Information to be given in the detail specification.....	26
6.4	Bending	26
6.4.1	Object.....	26
6.4.2	Procedures	27
6.5	Twisting	27
6.5.1	Object.....	27
6.5.2	Procedures	27
6.5.3	Requirements	28
6.6	Crushing	28
6.6.1	Object.....	28
6.6.2	Procedure.....	28
6.6.3	Requirements	29
6.6.4	Information to be given in the detail specification.....	29
6.7	Dust test	29
6.7.1	Object.....	29
6.7.2	Procedure.....	29
6.7.3	Requirements	30
6.7.4	Information to be given in the detail specification.....	30
6.7.5	Test chamber.....	30
7.8	Coupling attenuation	31
6.8	Climatic sequence.....	31
6.8.1	General	31
6.8.2	Object.....	32
6.8.3	Procedure.....	32
6.8.4	Requirements	32
6.8.5	Information to be given in the detail specification.....	32
8	Test head requirements	33
8.1	General.....	33
8.2	Minimum requirements for all test head designs.....	33
8.3	Additional FEXT requirements for balanced connector compatible test heads	33
8.4	Additional return loss requirements for balanced connector compatible test heads.....	33
8.5	NEXT loss centering requirements for balanced connector compatible test heads.....	33
Annex A (normative)	Coaxial cord transmission requirements	35
A.1	General.....	35
A.2	Coaxial cord transmission requirements.....	35
A.2.1	Coaxial cord return loss	35
A.2.2	Coaxial cord screening attenuation	35
A.3	Coaxial cord testing	36
A.3.1	Cable and connector design	36

A.3.2	Coaxial cord test procedure	36
A.3.3	Coaxial cords reference test connectors	36
Annex B (normative)	Balanced cord transmission requirements	37
B.1	General requirements	37
B.1.1	General	37
B.1.2	Cable and connector types	37
B.1.3	Balanced cord connector backward compatibility	37
B.2	Balanced cord test configuration	37
B.2.1	Cable and connector design	37
B.2.2	Test configuration and equipment	38
B.2.3	Network analyser test configuration	39
B.2.4	Balanced cords test head requirements	39
Bibliography		42
List of comments		43

Figure 1 — Test configuration for balanced cord for NEXT and return loss measurements	
Figure 2 — Correct pairing	
Figure 3 — Incorrect pairing	
Figure 4 — Initial marking of the cable sheath	
Figure 5 — Final visual inspection	
Figure 1 – Fixture for balanced cord flexure test	26
Figure 2 – Bending test: assembly in U shape	27
Figure 3 – Twisting test: assembly in U shape	28
Figure 4 – Fixture for cable crushing test	29
Figure 5 – Measuring device, dust test chamber	31
Figure 11 — Centering of NEXT properties of the balanced connector test head	
Figure B.1 – Example NEXT loss measurement circuit	38
Figure B.2 – Example IEC 60603-7 series 8 pole RJ45 connector type "modular" cord NEXT loss balunless test configuration	39

Table 1 — Return loss requirements	
Table 2 — Balanced cord return loss requirements at key frequencies	
Table 3 — Category 5 balanced cord NEXT requirements at key frequencies	
Table 4 — Category 6 balanced cord NEXT requirements at key frequencies	
Table 5 — Category 6_A balanced cord NEXT requirements at key frequencies	
Table 6 — Category 7 balanced cord NEXT requirements at key frequencies	
Table 7 — Category 7_A balanced cord NEXT requirements at key frequencies	
Table 8 — Assumptions for cabling components used in the development of NEXT and return loss requirements	
Table 9 — Coupling attenuation limits	
Table 1 – Test procedure standards for cords	14
Table B.1 – IEC 60603-7 series 8-pole RJ45 connector types standards and respective connector test procedures standards	40

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SPECIFICATION FOR THE TESTING OF BALANCED AND
COAXIAL INFORMATION TECHNOLOGY CABLING –****Part 2: Cords as specified in ISO/IEC 11801-1 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.

This commented version (CMV) of the official standard IEC 61935-2:2022 edition 4.0 allows the user to identify the changes made to the previous IEC 61935-2:2010 edition 3.0. Furthermore, comments from IEC TC 46 experts are provided to explain the reasons of the most relevant changes.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 61935-2 has been prepared by IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) inclusion of cords up to category 8.1 and category 8.2, as defined in ISO/IEC 11801-1.

The text of this International Standard is based on the following documents:

Draft	Report on voting
46/868/FDIS	46/869/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document 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

~~Balanced cords are constructed for connecting equipment using free connectors according to IEC 60603-7 series, IEC 61076-3-104 and IEC 61076-3-110. It is known that connecting hardware performance is subject to influence by the properties of the free connector termination and therefore balanced cords should be tested to determine the quality of the assembly. Moreover, the performance of balanced cords may differ due to the performances of the involved separate components depending upon the efficiency of the manufacturing procedure. Manufacturing procedures also impact upon the reliability of these balanced cords. Therefore, the primary object of this standard is to provide test methods to ensure compatibility of balanced cords to be used in cabling according to ISO/IEC 11801. Another object is to provide test methods and associated requirements to demonstrate the performance and reliability of these balanced cords during their operational lifetime.~~

~~The test methods described in this standard may also be used for any balanced cords that include twisted pairs terminated at each end.~~

This part of IEC 61935 covers testing of balanced and coaxial cords, for use as equipment cords, patch cords, and CP cords, as specified in ISO/IEC 11801-1 and related standards.

The test methods described in this document are suitable for any balanced or coaxial cords or cable assemblies that include connector terminations at each end. **1**

Coaxial cords for connecting equipment are constructed using cable conforming to the IEC 61196-1 series and connectors conforming to the IEC 61169-1 series.

Balanced cords for connecting equipment are constructed using cable conforming to the IEC 61156-1 series and connectors conforming to the IEC 60603-7 series, IEC 61076-3-104, IEC 61076-3-110, IEC 61076-2-101, and IEC 61076-2-109.

Therefore, an object of this document is to provide test methods to ensure compatibility of cords to be used in cabling in accordance with ISO/IEC 11801-1 and to demonstrate their performance and reliability during their operational lifetime.

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

Part 2: Cords as specified in ISO/IEC 11801-1 and related standards

1 Scope

~~This International Standard provides methods to ensure compatibility of balanced cords to be used in cabling according to ISO/IEC 11801 and provides test methods and associated requirements to demonstrate the performance and reliability of these balanced cords during their operational lifetime. This International Standard may also be used for providing test methods for assessing the behaviour of other balanced cords.~~

This part of IEC 61935 specifies test methods for balanced and coaxial cords, which are used as equipment cords, patch cords, and CP cords, within cabling systems, in accordance with ISO/IEC 11801-1. The test methods and associated requirements are provided to demonstrate performance and reliability and to ensure compatibility of these balanced and coaxial cords during their operational lifetime. This document may also be used for providing test methodology for assessing the performance of other cords. **2**

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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. **3**

IEC 60068-2-61, *Environmental testing – Part 2-61: Test methods – Test Z/AMBABDM: Climatic sequence*

IEC 60512-26-100, *Connectors for electronic equipment – Tests and measurements – Part 26-100: Measurement setup, test and reference arrangement and measurements for connectors according to IEC 60603-7 – Tests 26a to 26g*

IEC 60512-27-100, *Connectors for electronic equipment – Tests and measurements – Part 27-100: Signal integrity tests up to 500 MHz on 60603-7 series connectors – Tests 27a to 27g*

IEC 60512-28-100, *Connectors for electronic equipment – Tests and measurements – Part 28-100: Signal integrity tests up to 2 000 MHz – Tests 28a to 28g* **4**

IEC 60512-29-100, *Connectors for electronic equipment – Tests and measurements – Part 29-100: Signal integrity tests up to 500 MHz on M12 style connectors – Tests 29a to 29g*

~~IEC 60603-7 (all parts), *Connectors for electronic equipment – Part 7: Detail specifications*~~

IEC 60603-7:2008, *Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors*

IEC 60603-7-1, *Connectors for electronic equipment – Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors*

IEC 60603-7-2, *Connectors for electronic equipment – Part 7-2: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-3, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*

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 60603-7-7, *Connectors for electronic equipment – Part 7-7: Detail specification for 8-way, shielded, free and fixed connectors for data transmission with frequencies up to 600 MHz*

IEC 60603-7-41, *Connectors for electronic equipment – Part 7-41: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60603-7-51, *Connectors for electronic equipment – Part 7-51: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60603-7-71, *Connectors for electronic equipment – Part 7-71: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 1 000 MHz*

IEC 60603-7-81, *Connectors for electronic equipment – Part 7-81: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 2 000 MHz* **5**

IEC 60603-7-82, *Connectors for electronic equipment – Part 7-82: Detail specification for 8-way, 12 contacts, shielded, free and fixed connectors, for data transmission with frequencies up to 2 000 MHz* **5**

IEC 60966-1, *Radio frequency and coaxial cable assemblies – Part 1: Generic specification – General requirements and test methods*

IEC 61076-2-101, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61076-2-109, *Connectors for electronic equipment – Product requirements – Part 2-109: Circular connectors – Detail specification for connectors with M 12 × 1 screw-locking, for data transmission frequencies up to 500 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 ~~1000~~ 2 000 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 ~~1000~~ 3 000 MHz*

~~IEC 61156 (all parts), Multicore and symmetrical pair/quad cables for digital communications~~

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

IEC TR 61156-1-2, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-2: Electrical transmission characteristics and test methods of symmetrical pair/quad cables*

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 61156-9, *Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification* **6**

IEC 61156-10, *Multicore and symmetrical pair/quad cables for digital communications – Part 10: Cables for cords with transmission characteristics up to 2 GHz – Sectional specification* **6**

IEC 61169-1, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

IEC 61169-1 (all parts), *Radio-frequency connectors – Part 1*

IEC 61169-2, *Radio-frequency connectors – Part 2: Sectional specification – Radio frequency coaxial connectors of type 9,52*

IEC 61169-24, *Radio-frequency connectors – Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)*

IEC 61196-1 (all parts), *Coaxial communication cables – Part 1*

IEC 61935-1:~~2009~~, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801-1 and related standards*

IEC 61935-1-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1-1: Additional requirements for the measurement of transverse conversion loss and equal level transverse conversion transfer loss*

IEC 61935-1-2, *Specification for the testing of balanced and coaxial information technology cabling – Part 1-2: Installed balanced cabling as specified in ISO/IEC 11801 – Additional requirements for measurement of resistance unbalance with field test instrumentation*

IEC 62153-4-11, *Metallic communication cable test methods – Part 4-11: Electromagnetic compatibility (EMC) – Coupling attenuation or screening attenuation of patch cords, coaxial cable assemblies, pre-connectorized cables – Absorbing clamp method*

IEC 62153-4-15, *Metallic communication cable test methods – Part 4-15: Electromagnetic compatibility (EMC) – Test method for measuring transfer impedance and screening attenuation – or coupling attenuation with triaxial cell*

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 14763-4, *Information technology – Implementation and operation of customer premises cabling – Part 4: Measurement of end-to-end (E2E) links*

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Specification for the testing of balanced and coaxial information technology cabling –

Part 2: Cords as specified in ISO/IEC 11801-1 and related standards

Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information –

Partie 2: Cordons tels que spécifiés dans l'ISO/IEC 11801-1 et normes associées

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	11
4 Requirements	11
4.1 Cord components: cable and connector	11
4.2 Cord tests	12
4.2.1 General	12
4.2.2 Acceptance tests	13
4.2.3 Periodic tests	13
4.3 Cord test procedure	13
4.3.1 General	13
4.3.2 Electrical transmission parameters, test fixtures and reference test heads	14
5 Acceptance tests and additional optional tests	14
5.1 Visual inspection (balanced and coaxial cords)	14
5.2 Wire map (balanced cords)	14
5.3 Return loss (balanced and coaxial cords)	15
5.4 Pair-to-pair NEXT and PS NEXT (balanced cords)	15
5.5 Insertion loss and attenuation (balanced and coaxial cords)	15
5.6 Pair-to-pair ACRF and PS ACRF (balanced cords)	15
5.7 Alien crosstalk, PS ANEXT and PS AACRF, (balanced cords)	15
5.8 Unbalance attenuation, TCL and EL TCTL, (balanced cords)	15
5.9 Coupling attenuation (screened balanced cords)	15
5.10 Screening attenuation and transfer impedance (screened balanced and coaxial cords)	15
5.11 Propagation delay (balanced and coaxial cords)	16
5.12 Delay skew (balanced cords)	16
5.13 DC resistance (balanced and coaxial cords)	16
5.14 DC resistance unbalance within pairs (balanced cords)	16
5.15 DC resistance unbalance between pairs (balanced cords)	16
6 Periodic tests, procedures	16
6.1 General	16
6.2 Tensile strength	16
6.2.1 Object	16
6.2.2 Procedure	16
6.2.3 Requirements	17
6.2.4 Detail specification	17
6.3 Flexure	17
6.3.1 Object	17
6.3.2 Procedure	17
6.3.3 Requirements	18
6.3.4 Information to be given in the detail specification	18
6.4 Bending	18
6.4.1 Object	18

6.4.2	Procedures	18
6.5	Twisting	19
6.5.1	Object.....	19
6.5.2	Procedures	19
6.5.3	Requirements	20
6.6	Crushing	20
6.6.1	Object.....	20
6.6.2	Procedure.....	20
6.6.3	Requirements	21
6.6.4	Information to be given in the detail specification	21
6.7	Dust test	21
6.7.1	Object.....	21
6.7.2	Procedure.....	22
6.7.3	Requirements	22
6.7.4	Information to be given in the detail specification	22
6.7.5	Test chamber.....	22
6.8	Climatic sequence.....	23
6.8.1	General	23
6.8.2	Object.....	23
6.8.3	Procedure.....	24
6.8.4	Requirements	24
6.8.5	Information to be given in the detail specification	24
Annex A	(normative) Coaxial cord transmission requirements	25
A.1	General.....	25
A.2	Coaxial cord transmission requirements.....	25
A.2.1	Coaxial cord return loss	25
A.2.2	Coaxial cord screening attenuation	25
A.3	Coaxial cord testing	26
A.3.1	Cable and connector design	26
A.3.2	Coaxial cord test procedure	26
A.3.3	Coaxial cords reference test connectors	26
Annex B	(normative) Balanced cord transmission requirements	27
B.1	General requirements	27
B.1.1	General	27
B.1.2	Cable and connector types	27
B.1.3	Balanced cord connector backward compatibility	27
B.2	Balanced cord test configuration	27
B.2.1	Cable and connector design	27
B.2.2	Test configuration and equipment.....	28
B.2.3	Network analyser test configuration	29
B.2.4	Balanced cords test head requirements	29
Bibliography		32
Figure 1	– Fixture for cord flexure test	18
Figure 2	– Bending test: assembly in U shape.....	19
Figure 3	– Twisting test: assembly in U shape	20
Figure 4	– Fixture for cable crushing test	21
Figure 5	– Measuring device, dust test chamber	23

Figure B.1 – Example NEXT loss measurement circuit.....	28
Figure B.2 – Example IEC 60603-7 series 8 pole RJ45 connector type "modular" cord NEXT loss balunless test configuration	29
Table 1 – Test procedure standards for cords	12
Table B.1 – IEC 60603-7 series 8-pole RJ45 connector types standards and respective connector test procedures standards	30

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SPECIFICATION FOR THE TESTING OF BALANCED AND
COAXIAL INFORMATION TECHNOLOGY CABLING –****Part 2: Cords as specified in ISO/IEC 11801-1 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.

IEC 61935-2 has been prepared by IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) inclusion of cords up to category 8.1 and category 8.2, as defined in ISO/IEC 11801-1.

The text of this International Standard is based on the following documents:

Draft	Report on voting
46/868/FDIS	46/869/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document 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

This part of IEC 61935 covers testing of balanced and coaxial cords, for use as equipment cords, patch cords, and CP cords, as specified in ISO/IEC 11801-1 and related standards.

The test methods described in this document are suitable for any balanced or coaxial cords or cable assemblies that include connector terminations at each end.

Coaxial cords for connecting equipment are constructed using cable conforming to the IEC 61196-1 series and connectors conforming to the IEC 61169-1 series.

Balanced cords for connecting equipment are constructed using cable conforming to the IEC 61156-1 series and connectors conforming to the IEC 60603-7 series, IEC 61076-3-104, IEC 61076-3-110, IEC 61076-2-101, and IEC 61076-2-109.

Therefore, an object of this document is to provide test methods to ensure compatibility of cords to be used in cabling in accordance with ISO/IEC 11801-1 and to demonstrate their performance and reliability during their operational lifetime.

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

Part 2: Cords as specified in ISO/IEC 11801-1 and related standards

1 Scope

This part of IEC 61935 specifies test methods for balanced and coaxial cords, which are used as equipment cords, patch cords, and CP cords, within cabling systems, in accordance with ISO/IEC 11801-1. The test methods and associated requirements are provided to demonstrate performance and reliability and to ensure compatibility of these balanced and coaxial cords during their operational lifetime. This document may also be used for providing test methodology for assessing the performance of other cords.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-61, *Environmental testing – Part 2-61: Test methods – Test Z/ABDM: Climatic sequence*

IEC 60512-26-100, *Connectors for electronic equipment – Tests and measurements – Part 26-100: Measurement setup, test and reference arrangement and measurements for connectors according to IEC 60603-7 – Tests 26a to 26g*

IEC 60512-27-100, *Connectors for electronic equipment – Tests and measurements – Part 27-100: Signal integrity tests up to 500 MHz on 60603-7 series connectors – Tests 27a to 27g*

IEC 60512-28-100, *Connectors for electronic equipment – Tests and measurements – Part 28-100: Signal integrity tests up to 2 000 MHz – Tests 28a to 28g*

IEC 60512-29-100, *Connectors for electronic equipment – Tests and measurements – Part 29-100: Signal integrity tests up to 500 MHz on M12 style connectors – Tests 29a to 29g*

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

IEC 60603-7-1, *Connectors for electronic equipment – Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors*

IEC 60603-7-2, *Connectors for electronic equipment – Part 7-2: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 100 MHz*

IEC 60603-7-3, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*

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 60603-7-7, *Connectors for electronic equipment – Part 7-7: Detail specification for 8-way, shielded, free and fixed connectors for data transmission with frequencies up to 600 MHz*

IEC 60603-7-41, *Connectors for electronic equipment – Part 7-41: Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60603-7-51, *Connectors for electronic equipment – Part 7-51: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60603-7-71, *Connectors for electronic equipment – Part 7-71: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 1 000 MHz*

IEC 60603-7-81, *Connectors for electronic equipment – Part 7-81: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 2 000 MHz*

IEC 60603-7-82, *Connectors for electronic equipment – Part 7-82: Detail specification for 8-way, 12 contacts, shielded, free and fixed connectors, for data transmission with frequencies up to 2 000 MHz*

IEC 60966-1, *Radio frequency and coaxial cable assemblies – Part 1: Generic specification – General requirements and test methods*

IEC 61076-2-101, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61076-2-109, *Connectors for electronic equipment – Product requirements – Part 2-109: Circular connectors – Detail specification for connectors with M 12 × 1 screw-locking, for data transmission frequencies up to 500 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 2 000 MHz*

IEC 61076-3-110, *Connectors for electronic equipment – Product requirements – Part 3-110: Detail specification for free and fixed connectors for data transmission with frequencies up to 3 000 MHz*

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

IEC TR 61156-1-2, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-2: Electrical transmission characteristics and test methods of symmetrical pair/quad cables*

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 61156-9, *Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification*

IEC 61156-10, *Multicore and symmetrical pair/quad cables for digital communications – Part 10: Cables for cords with transmission characteristics up to 2 GHz – Sectional specification*

IEC 61169-1, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

IEC 61169-1 (all parts), *Radio-frequency connectors – Part 1*

IEC 61169-2, *Radio-frequency connectors – Part 2: Sectional specification – Radio frequency coaxial connectors of type 9,52*

IEC 61169-24, *Radio-frequency connectors – Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)*

IEC 61196-1 (all parts), *Coaxial communication cables – Part 1*

IEC 61935-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801-1 and related standards*

IEC 61935-1-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1-1: Additional requirements for the measurement of transverse conversion loss and equal level transverse conversion transfer loss*

IEC 61935-1-2, *Specification for the testing of balanced and coaxial information technology cabling – Part 1-2: Installed balanced cabling as specified in ISO/IEC 11801 – Additional requirements for measurement of resistance unbalance with field test instrumentation*

IEC 62153-4-11, *Metallic communication cable test methods – Part 4-11: Electromagnetic compatibility (EMC) – Coupling attenuation or screening attenuation of patch cords, coaxial cable assemblies, pre-connectorized cables – Absorbing clamp method*

IEC 62153-4-15, *Metallic communication cable test methods – Part 4-15: Electromagnetic compatibility (EMC) – Test method for measuring transfer impedance and screening attenuation – or coupling attenuation with triaxial cell*

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 14763-4, *Information technology – Implementation and operation of customer premises cabling – Part 4: Measurement of end-to-end (E2E) links*

SOMMAIRE

AVANT-PROPOS	37
INTRODUCTION	39
1 Domaine d'application	40
2 Références normatives	40
3 Termes et définitions	43
4 Exigences.....	43
4.1 Composants de cordon: câble et connecteur	43
4.2 Essais des cordons	44
4.2.1 Généralités	44
4.2.2 Essais d'acceptation	45
4.2.3 Essais périodiques	46
4.3 Procédure d'essai des cordons	46
4.3.1 Généralités	46
4.3.2 Paramètres de transmission électrique, dispositifs d'essai et têtes d'essai de référence	46
5 Essais d'acceptation et essais supplémentaires facultatifs.....	47
5.1 Examen visuel (cordons à paires symétriques et coaxiaux)	47
5.2 Table de correspondance des fils (cordons à paires symétriques).....	47
5.3 Affaiblissement de réflexion (cordons à paires symétriques et coaxiaux).....	47
5.4 NEXT et PS NEXT paire à paire (cordons à paires symétriques)	47
5.5 Perte d'insertion et affaiblissement (cordons à paires symétriques et coaxiaux)	48
5.6 ACRF et PS ACRF paire à paire (cordons à paires symétriques).....	48
5.7 Diaphonie exogène, PS ANEXT et PS AACRF (cordons à paires symétriques)	48
5.8 Affaiblissement de symétrie, TCL et EL TCTL (cordons à paires symétriques)	48
5.9 Affaiblissement de couplage (cordons à paires symétriques écrantés)	48
5.10 Affaiblissement de l'écrantage et impédance de transfert (cordons à paires symétriques et coaxiaux écrantés)	48
5.11 Temps de propagation (cordons à paires symétriques et coaxiaux).....	48
5.12 Différence des temps de propagation (cordons à paires symétriques)	48
5.13 Résistance en courant continu (cordons à paires symétriques et coaxiaux).....	49
5.14 Dissymétrie de résistance en courant continu dans des paires (cordons à paires symétriques).....	49
5.15 Dissymétrie de résistance en courant continu entre des paires (cordons à paires symétriques).....	49
6 Essais périodiques, procédures	49
6.1 Généralités	49
6.2 Résistance à la traction.....	49
6.2.1 Objet	49
6.2.2 Procédure.....	49
6.2.3 Exigences.....	50
6.2.4 Spécification particulière.....	50
6.3 Flexion.....	50
6.3.1 Objet	50
6.3.2 Procédure.....	50

6.3.3	Exigences.....	51
6.3.4	Informations à indiquer dans la spécification particulière	51
6.4	Courbure.....	51
6.4.1	Objet	51
6.4.2	Procédures	51
6.5	Torsion	52
6.5.1	Objet	52
6.5.2	Procédures	52
6.5.3	Exigences.....	53
6.6	Ecrasement.....	53
6.6.1	Objet	53
6.6.2	Procédure.....	53
6.6.3	Exigences.....	54
6.6.4	Informations à indiquer dans la spécification particulière	54
6.7	Essai de poussière.....	54
6.7.1	Objet	54
6.7.2	Procédure.....	55
6.7.3	Exigences.....	55
6.7.4	Informations à indiquer dans la spécification particulière	55
6.7.5	Enceinte d'essai	55
6.8	Séquence climatique.....	56
6.8.1	Généralités	56
6.8.2	Objet	56
6.8.3	Procédure.....	57
6.8.4	Exigences.....	57
6.8.5	Informations à indiquer dans la spécification particulière	57
Annexe A (normative)	Exigences relatives à la transmission des cordons coaxiaux	58
A.1	Généralités	58
A.2	Exigences relatives à la transmission des cordons coaxiaux	58
A.2.1	Affaiblissement de réflexion des cordons coaxiaux	58
A.2.2	Affaiblissement de l'écrantage des cordons coaxiaux.....	58
A.3	Essais des cordons coaxiaux	59
A.3.1	Conception du câble et du connecteur	59
A.3.2	Procédure d'essai des cordons coaxiaux	59
A.3.3	Connecteurs d'essai de référence des cordons coaxiaux	59
Annexe B (normative)	Exigences relatives à la transmission des cordons à paires symétriques	60
B.1	Exigences générales.....	60
B.1.1	Généralités	60
B.1.2	Types de câbles et de connecteurs.....	60
B.1.3	Rétrocompatibilité des connecteurs de cordons à paires symétriques	60
B.2	Configuration d'essai des cordons à paires symétriques	61
B.2.1	Conception du câble et du connecteur	61
B.2.2	Configuration et équipement d'essai	61
B.2.3	Configuration d'essai de l'analyseur de réseau	63
B.2.4	Exigences relatives aux têtes d'essai des cordons à paires symétriques	64
Bibliographie.....		67

Figure 1 – Dispositif d'essai de flexion du cordon	51
Figure 2 – Essai de courbure: assemblage en forme de U.....	52
Figure 3 – Essai de torsion: assemblage en forme de U.....	53
Figure 4 – Dispositif d'essai d'écrasement de câble	54
Figure 5 – Dispositif de mesure, enceinte d'essai de poussière	56
Figure B.1 – Circuit de mesure de la perte par paradiaphonie	62
Figure B.2 – Exemple de configuration d'essai sans symétriseur de perte par paradiaphonie de cordon "modulaire" des types de connecteurs RJ45 à 8 pôles définis dans la série IEC 60603-7.....	63
Tableau 1 – Normes de procédures d'essai applicables aux cordons	44
Tableau B.1 – Normes des types de connecteurs RJ45 à 8 pôles de la série IEC 60603-7 et normes respectives de procédures d'essai des connecteurs	64

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**SPÉCIFICATION RELATIVE AUX ESSAIS DES CÂBLAGES SYMÉTRIQUES
ET COAXIAUX DES TECHNOLOGIES DE L'INFORMATION –****Partie 2: Cordons tels que spécifiés dans l'ISO/IEC 11801-1 et normes
associées****AVANT-PROPOS**

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 61935-2 a été établie par le comité d'études 46 de l'IEC: Câbles, fils, guides d'ondes, connecteurs, composants passifs pour micro-onde et accessoires. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2010. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) inclusion des cordons des catégories 8.1 et 8.2 tels qu'ils sont définis dans l'ISO/IEC 11801-1.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
46/868/FDIS	46/869/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Une liste de toutes les parties de la série IEC 61935, publiées sous le titre général *Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information*, peut être consultée sur le site web de l'IEC.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Le comité a décidé que le contenu du présent document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer le présent document en utilisant une imprimante couleur.

INTRODUCTION

La présente partie de l'IEC 61935 couvre les essais des cordons à paires symétriques et coaxiaux destinés à être utilisés comme cordons d'équipements, cordons de brassage et cordons CP, tels que spécifiés dans l'ISO/IEC 11801-1 et normes associées.

Les méthodes d'essai décrites dans le présent document sont adaptées aux cordons à paires symétriques ou aux cordons coaxiaux, ou aux câbles équipés de même nature, dont chaque extrémité comporte des terminaisons de connecteur.

Les cordons coaxiaux pour connexion d'équipements sont construits au moyen d'un câble conforme à la série IEC 61196-1 et de connecteurs conformes à la série IEC 61169-1.

Les cordons à paires symétriques pour connexion d'équipements sont construits au moyen d'un câble conforme à la série IEC 61156-1 et de connecteurs conformes à la série IEC 60603-7, ainsi qu'aux normes IEC 61076-3-104, IEC 61076-3-110, IEC 61076-2-101 et IEC 61076-2-109.

Par conséquent, un objet du présent document consiste à fournir les méthodes d'essai qui permettent de garantir la compatibilité des cordons à utiliser dans les câblages conformément à l'ISO/IEC 11801-1, et de démontrer les performances et la fiabilité de ces cordons au cours de leur durée de vie opérationnelle.

SPÉCIFICATION RELATIVE AUX ESSAIS DES CÂBLAGES SYMÉTRIQUES ET COAXIAUX DES TECHNOLOGIES DE L'INFORMATION –

Partie 2: Cordons tels que spécifiés dans l'ISO/IEC 11801-1 et normes associées

1 Domaine d'application

La présente partie de l'IEC 61935, spécifie les méthodes d'essai applicables aux cordons à paires symétriques et aux cordons coaxiaux utilisés comme cordons d'équipements, cordons de brassage et cordons CP dans des systèmes de câblage, conformément à l'ISO/IEC 11801-1. Les méthodes d'essai et leurs exigences associées permettent de démontrer les performances et la fiabilité et de garantir la compatibilité de ces cordons à paires symétriques et cordons coaxiaux au cours de leur durée de vie opérationnelle. Le présent document peut également être utilisé en vue de fournir une méthodologie d'essai pour l'évaluation des performances d'autres cordons.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-2-61, *Essais d'environnement – Partie 2-61: Méthodes d'essai – Essai Z/ABDM: Séquence climatique*

IEC 60512-26-100, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 26-100: Montage de mesure, dispositifs d'essai et de référence et mesures pour les connecteurs conformes à la CEI 60603-7 – Essais 26a à 26g*

IEC 60512-27-100, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 27-100: Essais d'intégrité des signaux jusqu'à 500 MHz sur les connecteurs de la série CEI 60603-7 – Essais 27a à 27g*

IEC 60512-28-100, *Connecteurs pour équipements électriques et électroniques – Essais et mesures – Partie 28-100: Essais d'intégrité des signaux jusqu'à 2 000 MHz – Essais 28a à 28g*

IEC 60512-29-100, *Connecteurs pour équipements électroniques – Essais et mesures – Partie 29-100: Essais d'intégrité des signaux jusqu'à 500 MHz sur les connecteurs de type M12 – Essais 29a à 29g*

IEC 60603-7, *Connecteurs pour équipements électroniques – Partie 7: Spécification particulière pour les fiches et les embases non écrantées à 8 voies*

IEC 60603-7-1, *Connecteurs pour équipements électroniques – Partie 7-1: Spécification particulière pour les fiches et les embases écrantées à 8 voies*

IEC 60603-7-2, *Connecteurs pour équipements électroniques – Partie 7-2: Spécification particulière pour les fiches et les embases non blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 100 MHz*

IEC 60603-7-3, *Connecteurs pour équipements électroniques – Partie 7-3: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 100 MHz*

IEC 60603-7-4, *Connecteurs pour équipements électroniques – Partie 7-4: Spécification particulière pour les fiches et les embases non blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 250 MHz*

IEC 60603-7-5, *Connecteurs pour équipements électroniques – Partie 7-5: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 250 MHz*

IEC 60603-7-7, *Connecteurs pour équipements électroniques – Partie 7-7: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 600 MHz*

IEC 60603-7-41, *Connecteurs pour équipements électroniques – Partie 7-41: Spécification particulière pour les fiches et les embases non blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 500 MHz*

IEC 60603-7-51, *Connecteurs pour équipements électroniques – Partie 7-51: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 500 MHz*

IEC 60603-7-71, *Connecteurs pour équipements électroniques – Partie 7-71: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 1 000 MHz*

IEC 60603-7-81, *Connecteurs pour équipements électroniques – Partie 7-81: Spécification particulière pour les fiches et les embases blindées à 8 voies pour la transmission de données à des fréquences jusqu'à 2 000 MHz*

IEC 60603-7-82, *Connecteurs pour équipements électroniques – Partie 7-82: Spécification particulière pour les fiches et les embases écrantées à 8 voies et 12 contacts pour la transmission de données à des fréquences jusqu'à 2 000 MHz*

IEC 60966-1 *Cordons coaxiaux et cordons pour fréquences radioélectriques - Partie 1: Spécification générique – Exigences générales et méthodes d'essai*

IEC 61076-2-101, *Connecteurs pour équipements électroniques – Exigences de produit – Partie 2-101: Connecteurs circulaires – Spécification particulière pour les connecteurs M12 à vis*

IEC 61076-2-109, *Connecteurs pour équipements électroniques – Exigences de produit – Partie 2-109: Connecteurs circulaires – Spécification particulière relative aux connecteurs avec verrouillage à vis M 12 × 1, pour les transmissions de données à des fréquences jusqu'à 500 MHz*

IEC 61076-3-104, *Connecteurs pour équipements électriques et électroniques – Exigences de produit – Partie 3-104: Spécification particulière pour les fiches et les embases écrantées à 8 voies pour la transmission de données à des fréquences jusqu'à 2 000 MHz*

IEC 61076-3-110, *Connecteurs pour équipements électroniques – Exigences de produit – Partie 3-110: Spécification particulière pour les fiches et les embases pour la transmission de données à des fréquences jusqu'à 3 000 MHz*

IEC 61156-1, *Câbles multiconducteurs à paires symétriques et quartes pour transmissions numériques – Partie 1: Spécification générique*

IEC TR 61156-1-2, *Multicore and symmetrical pair/quad cables for digital communications - Part 1-2: Electrical transmission characteristics and test methods of symmetrical pair/quad cables* (disponible en anglais seulement)

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* (disponible en anglais seulement)

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* (disponible en anglais seulement)

IEC 61156-9, *Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification* (disponible en anglais seulement)

IEC 61156-10, *Multicore and symmetrical pair/quad cables for digital communications – Part 10: Cables for cords with transmission characteristics up to 2 GHz – Sectional specification* (disponible en anglais seulement)

IEC 61169-1, *Connecteurs pour fréquences radioélectriques – Partie 1: Spécification générique – Exigences générales et méthodes de mesure*

IEC 61169-1 (toutes les parties), *Connecteurs pour fréquences radioélectriques – Partie 1*

IEC 61169-2, *Connecteurs pour fréquences radioélectriques – Partie 2: Spécification intermédiaire – Connecteurs coaxiaux pour fréquences radioélectriques de type 9,52*

IEC 61169-24, *Connecteurs pour fréquences radioélectriques – Partie 24: Spécification intermédiaire – Connecteurs coaxiaux pour fréquences radioélectriques avec couplage à vis, typiquement utilisés dans des réseaux de distribution par câbles de 75 Ω (type F)*

IEC 61196-1 (toutes les parties), *Câbles coaxiaux de communication – Partie 1:*

IEC 61935-1, *Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information – Partie 1: Câblages symétriques installés selon les spécifications de l'ISO/IEC 11801-1 et normes associées*

IEC 61935-1-1, *Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information – Partie 1-1: Exigences supplémentaires pour le mesurage de l'affaiblissement de conversion transversale et de l'affaiblissement de transfert de conversion transversale de niveau égal*

IEC 61935-1-2, *Spécification relative aux essais des câblages symétriques et coaxiaux des technologies de l'information – Partie 1-2: Câblages symétriques installés tels que spécifiés dans l'ISO/IEC 11801 – Exigences supplémentaires pour le mesurage de l'asymétrie*

IEC 62153-4-11, *Metallic communication cable test methods – Part 4-11: Electromagnetic compatibility (EMC) – Coupling attenuation or screening attenuation of patch cords, coaxial cable assemblies, pre-connectorized cables – Absorbing clamp method* (disponible en anglais seulement)

IEC 62153-4-15, *Méthodes d'essais des câbles métalliques et autres composants passifs - Partie 4-15: Compatibilité électromagnétique (CEM) – Méthode d'essai pour le mesurage de*

l'impédance de transfert et de l'affaiblissement d'écran – ou de l'affaiblissement de couplage avec cellule triaxiale

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises -- Part 1: General requirements* (disponible en anglais seulement)

ISO/IEC 14763-4, *Information technology – Implementation and operation of customer premises cabling – Part 4: Measurement of end-to-end (E2E) links* (disponible en anglais seulement)