



IEC 61935-2

Edition 4.1 2026-03

# INTERNATIONAL STANDARD

CONSOLIDATED VERSION

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

## CONTENTS

|   |    |
|---|----|
| FOREWORD .....  | 4  |
| INTRODUCTION .....  | 6  |
| INTRODUCTION to the Amendment .....   | 6  |
| 1 Scope .....   | 7  |
| 2 Normative references .....  | 7  |
| 3 Terms and definitions .....   | 10 |
| 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 .....  | 12 |
| 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 .....        | 13 |
| 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) .....  | 14 |
| 5.4 Pair-to-pair NEXT and PS NEXT (balanced cords) .....                                      | 14 |
| 5.5 Insertion loss and attenuation (balanced and coaxial cords) .....                         | 14 |
| 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) .....                                     | 15 |
| 5.12 Delay skew (balanced cords) .....  | 15 |
| 5.13 DC resistance (balanced and coaxial cords) .....   | 15 |
| 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 .....  | 16 |
| 6.2.4 Detail specification .....  | 17 |
| 6.3 Flexure .....   | 17 |
| 6.3.1 Object .....  | 17 |
| 6.3.2 Procedure .....   | 17 |
| 6.3.3 Requirements .....  | 17 |
| 6.3.4 Information to be given in the detail specification .....                               | 17 |
| 6.4 Bending .....   | 18 |

|                     |   |    |
|---------------------|---|----|
| 6.4.1               | Object.....   | 18 |
| 6.4.2               | Procedures.....   | 18 |
| 6.5                 | Twisting.....   | 18 |
| 6.5.1               | Object.....   | 18 |
| 6.5.2               | Procedures.....   | 19 |
| 6.5.3               | Requirements.....   | 19 |
| 6.6                 | Crushing.....   | 19 |
| 6.6.1               | Object.....   | 19 |
| 6.6.2               | Procedure.....  | 20 |
| 6.6.3               | Requirements.....   | 20 |
| 6.6.4               | Information to be given in the detail specification.....      | 20 |
| 6.7                 | Dust test.....  | 21 |
| 6.7.1               | Object.....   | 21 |
| 6.7.2               | Procedure.....  | 21 |
| 6.7.3               | Requirements.....   | 21 |
| 6.7.4               | Information to be given in the detail specification.....      | 21 |
| 6.7.5               | Test chamber.....   | 21 |
| 6.8                 | Climatic sequence.....  | 22 |
| 6.8.1               | General.....  | 22 |
| 6.8.2               | Object.....   | 22 |
| 6.8.3               | Procedure.....  | 23 |
| 6.8.4               | Requirements.....   | 23 |
| 6.8.5               | Information to be given in the detail specification.....      | 23 |
| Annex A (normative) | Coaxial cord transmission requirements.....                   | 24 |
| A.1                 | General.....  | 24 |
| A.2                 | Coaxial cord transmission requirements.....                   | 24 |
| A.2.1               | Coaxial cord return loss.....                                 | 24 |
| A.2.2               | Coaxial cord screening attenuation.....                       | 24 |
| A.3                 | Coaxial cord testing.....                                     | 25 |
| A.3.1               | Cable and connector design.....                               | 25 |
| A.3.2               | Coaxial cord test procedure.....                              | 25 |
| A.3.3               | Coaxial cords reference test connectors.....                  | 25 |
| Annex B (normative) | Balanced cord transmission requirements.....                  | 26 |
| B.1                 | General requirements.....                                     | 26 |
| B.1.1               | General.....  | 26 |
| B.1.2               | Cable and connector types.....                                | 26 |
| B.1.3               | Balanced cord connector backward compatibility.....           | 26 |
| B.2                 | Balanced cord test configuration.....                         | 26 |
| B.2.1               | Cable and connector design.....                               | 26 |
| B.2.2               | Test configuration and equipment.....                         | 27 |
| B.2.3               | Network analyser test configuration.....                      | 28 |
| B.2.4               | Balanced cords test head requirements.....                    | 28 |
| Annex C (normative) | Balanced single-pair cord transmission requirements.....      | 31 |
| C.1                 | General.....  | 31 |
| C.2                 | Balanced single-pair cord transmission requirements.....      | 31 |
| C.2.1               | Balanced single-pair cords specified in ISO/IEC 11801-1.....  | 31 |
| C.2.2               | Balanced single-pair cords specified for general purpose..... | 31 |
| C.3                 | Balanced single-pair cord transmission testing.....           | 32 |

|                   |  |    |
|-------------------|--|----|
| C.3.1             | Cable and connector design .....   | 32 |
| C.3.2             | Balanced single-pair cords transmission test procedure.....  | 32 |
| C.3.3             | Balanced single-pair cords transmission test connectors and fixtures .....   | 32 |
| Bibliography..... |  | 33 |
|                   |  |    |
| Figure 1          | – Fixture for cord flexure test .....  | 17 |
| Figure 2          | – Bending test: assembly in U shape .....  | 18 |
| Figure 3          | – Twisting test: assembly in U shape .....   | 19 |
| Figure 4          | – Fixture for cable crushing test .....  | 20 |
| Figure 5          | – Measuring device, dust test chamber .....  | 22 |
| Figure B.1        | – Example NEXT loss measurement circuit.....   | 27 |
| Figure B.2        | – Example IEC 60603-7 series 8 pole RJ45 connector type "modular" cord<br>NEXT loss balunless test configuration ..... | 28 |
|                   |  |    |
| Table 1           | – Test procedure standards for cords .....   | 11 |
| Table B.1         | – IEC 60603-7 series 8-pole RJ45 connector types standards and respective<br>connector test procedures standards ..... | 29 |
| Table C.1         | – Transmission parameters requirements and optional specifications .....   | 31 |
| Table C.2         | – Transmission parameters specifications.....  | 32 |

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61935-2 edition 4.1 contains the fourth edition (2022-02) [documents 46/868/FDIS and 46/869/RVD] and its amendment 1 (2026-03) [documents 46/1036/CDV and 46/1063/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

## 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.

### INTRODUCTION to the Amendment

The goal of this amendment is:

- to extend component requirements for balanced and coaxial cords to balanced single-pair cords.
- to extend transmission requirements for balanced and coaxial cords to balanced single-pair cords.
- to extend test procedures for balanced and coaxial cords to balanced single-pair cords.

## 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.

Balanced cords can be one of two types specified in ISO/IEC 11801-1:

- 1) balanced twisted-pair cords, or
- 2) balanced single-pair 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 61156-11, *Multicore and symmetrical pair/quad cables for digital communications - Part 11: Symmetrical single pair cables with transmission characteristics up to 1,25 GHz - Horizontal floor wiring - Sectional specification*

IEC 61156-12, *Multicore and symmetrical pair/quad cables for digital communications - Part 12: Symmetrical single pair cables with transmission characteristics up to 1,25 GHz - Work area wiring - Sectional specification*

IEC 61156-13, *Multicore and symmetrical pair/quad cables for digital communications - Part 13: Symmetrical single pair cables with transmission characteristics up to 20 MHz - Horizontal floor wiring - Sectional specification*

IEC 61156-14, *Multicore and symmetrical pair/quad cables for digital communications - Part 14: Symmetrical single pair cables with transmission characteristics up to 20 MHz - Work area wiring - 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  $\Omega$  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*

## Bibliography

IEC 60068-2-68, *Environmental testing – Part 2-68: Tests – Test L: Dust and sand*

IEC PAS 60512-27-200, *Connectors for electronic equipment – Tests and measurements – Part 27-200: Additional specifications for signal integrity tests up to 2 000 MHz on IEC 60603-7 series connectors – Tests 27a to 27g*

---