

INTERNATIONAL STANDARD

**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 61156-11:2023

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

FOREWORD

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IEC 61156-11 has been prepared by subcommittee 46C: Wires and symmetric cables, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

This second edition cancels and replaces the first edition published in 2019. This edition constitutes a technical revision.

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

- a) additional cable type in support of T1-C generic single pair cabling up to 1,25 GHz;
- b) introduction of low frequency coupling attenuation as an integral parameter describing screening efficiency at frequencies below 30 MHz.

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

Draft	Report on voting
46C/1254/FDIS	46C/1258/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.

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/publications.

A list of all parts in the IEC 61156 series, published under the general title *Multicore and symmetrical pair/quad cables for digital communications*, can be found on the IEC website.

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,
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- replaced by a revised edition, or
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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

1 Scope

This part of IEC 61156 describes cables intended to be used for single balanced pair (office, home, industrial) applications according to ISO/IEC 11801-1. An example of existing application is 1000BASE-T1, see ISO/IEC TR 11801-9906. The transmission characteristics of these cables are specified up to a frequency of 1,25 GHz and at a temperature of 20 °C. The T1-C type cable is specified up to 600 MHz, the T1-D type cable up to 1,25 GHz. Depending on the MICE environment and the installation conditions either unscreened or screened cables can be used. A blank detail specification can be found in Annex A.

These cables can comprise more than one pair in the event that several systems are operated in parallel. In this case, refer to Clause 7.

The cables covered by this document are intended to operate with voltages and currents normally encountered in communication systems. While these cables are not intended to be used in conjunction with low impedance sources, for example the electric power supplies of public utility mains, they are intended to be used to support the delivery of low-voltage remote powering applications.

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 60708, *Low-frequency cables with polyolefin insulation and moisture barrier polyolefin sheath*

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 62153-4-3, *Metallic communication cable test methods – Part 4-3: Electromagnetic compatibility (EMC) – Surface transfer impedance – Triaxial method*

IEC 62153-4-5, *Metallic communication cables test methods – Part 4-5: Electromagnetic compatibility (EMC) – Screening or coupling attenuation – Absorbing clamp method*

IEC 62153-4-9:2018, *Metallic communication cable test methods – Part 4-9: Electromagnetic compatibility (EMC) – Coupling attenuation of screened balanced cables, triaxial method*
IEC 62153-4-9:2018/AMD1:2020

ISO/IEC TS 29125, *Information technology – Telecommunications cabling requirements for remote powering of terminal equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61156-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Installation considerations

4.1 General remarks

Installation area considerations are defined in IEC 61156-1. Other areas may be considered.

4.2 Bending radius of installed cable

The minimum bending radius of the cable shall be equal to or less than four times the outside diameter of the cable unless otherwise specified.

4.3 Climatic conditions

Under static conditions, the cable shall operate at least in the temperature range of the environment from -20 °C to $+60\text{ °C}$.

The attenuation increase due to the elevated operating temperature (temperature of the environment) is described in 6.3.3.2.

In the case of application of remote powering, the maximum temperature of the conductor shall not exceed the maximum operation temperature under static conditions (60 °C) in order to maintain the integrity of the dielectric material performance which is aligned to the environmental temperature range.

Extended temperature ranges are permitted and shall be specified in the relevant detail specification.

5 Materials and cable construction

5.1 General remarks

For the purposes of this document, the requirements of IEC 61156-5 apply.

The choice of materials and cable construction shall be suitable for the intended application and installation of the cable and in line with the requirements of IEC 61156-1. Ensure that any requirements for EMC and fire performance (such as burning properties, smoke generation, evolution of halogen gas) are met. Regional regulations can apply as well.

5.2 Cable construction

The cable construction shall be in accordance with the details and dimensions given in the relevant detail specification.

5.3 Conductor

The conductor shall be a solid annealed copper conductor in accordance with the requirements of IEC 61156-1 and should have a nominal diameter between 0,4 mm and 0,65 mm. A conductor diameter of up to 1,05 mm may be used.

NOTE The conductor dimensions seen in practice are wider than those dimensions that correspond to the resistance requirements according to 6.2.1 and are therefore relevant for the design of the contact terminals of connecting hardware.

5.4 Insulation

The conductor shall be insulated with a suitable material. Examples of suitable materials are:

- polyolefin;
- fluoropolymer;
- low-smoke halogen-free thermoplastic material.

The colour code shall be in accordance with IEC 60708 if not specified differently in the relevant detail specification.

5.5 Cable element

The cable element shall be a balanced twisted pair. The entire cable may comprise more than one cable element, see 6.3.5 and Clause 7.

5.6 Screening of the cable element

The screen of the cable element (if exists) shall be in accordance with the requirements of IEC 61156-1.

5.7 Cable make-up

Fillers or spacers may be used in the cable elements and to separate cable elements. The cable elements and their screens, if they are screened, may be covered by an intermediate jacket. This jacket shall be in accordance with 5.9. The core of the cable may be wrapped with a protective layer of non-hygroscopic and non-wicking material.

5.8 Screening of the cable core

For screened cables, a screen for the cable core shall be provided. The screen shall be in accordance with the requirements of IEC 61156-1.

5.9 Sheath

The sheath material shall consist of a suitable material. Examples of suitable materials are:

- polyolefin;
- PVC;
- fluoropolymer;
- low-smoke halogen-free thermoplastic material.

The sheath shall be continuous, having a thickness as uniform as possible. A non-metallic ripcord may be provided. When provided, the ripcord shall be non-hygroscopic and non-wicking.

The colour of the sheath is not specified but it should be specified in the relevant detail specification.

5.10 Identification

Each length of cable shall be identified as to the supplier and, when required, a traceability code, using one or a combination of the following methods:

- appropriately coloured threads or tapes;
- with a printed tape;
- printing on the cable core wrapping;
- marking on the sheath.

Additional markings, such as length marking, are permitted. If used, such markings shall refer to this document.

5.11 Finished cable

The finished cable shall be adequately protected for storage and shipment.

6 Characteristics and requirements

6.1 General remarks

Clause 6 lists the characteristics and minimum requirements of a cable complying with this document. Test methods shall be in accordance with the requirements of IEC 61156-1, except for the length of the cable under test which shall be as specified in Clause 6.

The computed requirements in dB, rounded to one decimal place, shall be used to determine compliance.

The tests for electrical characteristics in accordance with 6.2 shall be carried out on a cable length of not less than 100 m, unless otherwise specified.

The tests for transmission characteristics in accordance with 6.3 shall be carried out on a cable length of 100 m, unless otherwise specified. For T1-D type cables a length of 50 m may be used to improve accuracy at high frequencies.

For measurements over a wide frequency range as required for T1-D type cable, a balun-less measurement technique is recommended, see IEC TR 61156-1-2¹.

6.2 Electrical characteristics and tests

6.2.1 Conductor resistance

The maximum conductor resistance at or corrected to 20 °C shall not exceed 72,5 Ω/km.

6.2.2 Resistance unbalance

6.2.2.1 Resistance unbalance within a pair

The resistance unbalance shall not exceed 2,0 %.

6.2.2.2 Resistance unbalance between pairs

If applicable, for example in the case of bundled cables (see Clause 7), the pair-to-pair resistance unbalance shall not exceed 5,0 %.

¹ Currently under revision to become a TS.