

INTERNATIONAL STANDARD



**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**

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-0562-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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This consolidated version of IEC 61156-6 consists of the third edition (2010) [documents 46C/903/FDIS and 46C/908/RVD] and its amendment 1 (2012) [documents 46C/955/CDV and 46C/968/RVC]. It bears the edition number 3.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 61156-6 has been prepared by subcommittee 46C: Wires and symmetric cables, of IEC technical committee 46: Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories.

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

- a) new requirements for new cables Cat6_A, Cat7_A;
- b) revised requirements and tests for the cables.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard shall be read in conjunction with IEC 61156-1:2007.

The list of all the parts of the IEC 61156 series, 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 the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

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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

1 Scope

This part of IEC 61156 makes reference to IEC 61156-1. The cables described herein are intended primarily for work area wiring as defined in ISO/IEC 11801 and ISO/IEC 24702.

It covers individually screened, common screened and unscreened pairs or quads. The transmission characteristics and the frequency range (see Table 1) of the cables are specified at 20 °C.

Table 1 – Cable categories

Cable designation	Maximum referenced frequency MHz
Category 5e	100
Category 6	250
Category 6 _A	500
Category 7	600
Category 7 _A	1 000

These cables can be used for various communication channels which use as many as four pairs simultaneously. In this sense, this sectional specification provides the cable characteristics required by system developers to evaluate new systems.

The cables covered by this standard are intended to operate with voltages and currents normally encountered in communication systems. 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 and power applications such as IEEE's 802.3af (Power over Ethernet) and 802.3at (Power over Ethernet Plus).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61156-1:2007, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61156-6-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 6-1: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Blank detail specification*

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

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

3 Terms and definitions

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

4 Installation considerations

See Clause 4 of IEC 61156-1.

4.1 Climatic conditions

Under static conditions, the cables shall operate in the temperature range from $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$. The conductor and cable temperature dependence is specified for screened and unscreened cables and should be taken into account for the design of an actual cabling system.

5 Materials and cable construction

5.1 General remarks

The choice of materials and cable construction shall be suitable for the intended application and installation of the cable. Particular care shall be taken to meet any special requirements for EMC and fire performance (such as burning properties, smoke generation, evolution of halogen gas, etc.).

5.2 Cable construction

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

5.2.1 Conductor

The conductor shall be a solid or stranded annealed copper, in accordance with 5.2.1 of IEC 61156-1 and should have a nominal diameter between 0,4 mm and 0,65 mm. A conductor diameter of up to 0,8 mm may be used.

5.2.2 Insulation

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

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

5.2.3 Cable element

The cable element shall be a pair or quad and shall be twisted.

5.2.3.1 Screening of the cable element

When required, the screen for the cable element shall be in accordance with 5.2.3.1 of IEC 61156-1.

5.2.4 Cable make-up

A spacer may be used to separate the cable elements. The cable elements, including spacers, shall be assembled to form the cable core.

The core of the cable may be wrapped with a protective layer of non-hygroscopic and non-wicking material.

5.2.5 Screening of the cable core

When required by the relevant detail specification, a screen for the cable core shall be provided.

The screen shall be in accordance with 5.2.5 of IEC 61156-1.

5.2.6 Sheath

The sheath material shall consist of a suitable material.

Examples of suitable materials are

- polyolefin;
- PVC;
- fluoropolymer;
- low-smoke zero-halogen 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.

5.2.7 Identification

Each length of cable shall be identified as to the supplier and, when required, a traceability code, using one 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, etc., are permitted. If used, such markings shall refer to this specification.

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

6 Characteristics and requirements

6.1 General remarks

This clause lists the characteristics and minimum requirements of a cable complying with this standard. Test methods shall be in accordance with Clause 6 of IEC 61156-1.

6.2 Electrical characteristics and tests

NOTE The tests should be carried out on a cable length of not less than 100 m, unless otherwise specified.

6.2.1 Conductor resistance

The maximum conductor resistance at, or corrected to, 20 °C shall not exceed 14,5 Ω/100 m of cable.

6.2.2 Resistance unbalance

6.2.2.1 Resistance unbalance within a pair

The resistance unbalance shall not exceed 2 %.

~~6.2.2.2 Resistance unbalance between pairs~~

~~The pair to pair resistance unbalance shall not exceed 4 %.~~

6.2.3 Dielectric strength

There shall be no failures when a test is performed on conductor/conductor and, where screen(s) are present, a conductor/screen with 1,0 kV d.c. for 1 min or, alternatively, with 2,5 kV d.c. for 2 s. An a.c. voltage may be used. The a.c. voltage levels in these cases shall be 0,7 kV a.c. for 1 min or, alternatively, 1,7 kV a.c. for 2 s.

6.2.4 Insulation resistance

The test shall be performed on

- conductor/conductor;
- conductor/screen (when present).

The minimum insulation resistance at, or corrected to, 20 °C shall be not less than 5 000 MΩ.m.

6.2.5 Mutual capacitance

The mutual capacitance is not specified but may be indicated in the relevant detail specification.

6.2.6 Capacitance unbalance

The maximum capacitance unbalance pair to ground shall not exceed 1 600 pF/km at a frequency of 800 Hz or 1 000 Hz.

6.2.7 Transfer impedance

For cables containing a screen or screens, two grades of performance are recognized for transfer impedance. The transfer impedance shall not exceed the values shown in Table 2 at the discrete frequencies indicated for each grade.