



IEC 61156-10

Edition 1.0 2016-04

INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-3351-1

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

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 Installation considerations.....	7
5 Materials and cable construction	7
6 Characteristics and requirements	7
6.1 General remarks	7
6.2 Electrical characteristics and tests.....	8
6.2.1 Conductor resistance	8
6.2.2 Resistance unbalance	8
6.2.3 Dielectric strength	8
6.2.4 Insulation resistance	8
6.2.5 Mutual capacitance	8
6.2.6 Capacitance unbalance	8
6.2.7 Transfer impedance	8
6.2.8 Coupling attenuation	8
6.2.9 Current-carrying capacity	9
6.3 Transmission characteristics	9
6.3.1 Velocity of propagation (phase velocity).....	9
6.3.2 Phase delay and differential delay (delay skew).....	9
6.3.3 Attenuation (α)	9
6.3.4 Unbalance attenuation (TCL).....	10
6.3.5 Near-end crosstalk (NEXT).....	10
6.3.6 Far-end crosstalk (ACR-F)	11
6.3.7 Alien (exogenous) near-end crosstalk (ANEXT)	11
6.3.8 Alien (exogenous) far-end crosstalk (AFEXT).....	12
6.3.9 Alien (exogenous) crosstalk of bundled cables.....	12
6.3.10 Impedance.....	12
6.3.11 Return loss (RL).....	12
6.4 Mechanical and dimensional characteristics and requirements	13
6.4.1 Dimensional requirements	13
6.4.2 Elongation at break of the conductors.....	13
6.4.3 Tensile strength of the insulation	13
6.4.4 Elongation at break of the insulation	13
6.4.5 Adhesion of the insulation to the conductor.....	13
6.4.6 Elongation at break of the sheath	13
6.4.7 Tensile strength of the sheath	13
6.4.8 Crush test of the cable	13
6.4.9 Impact test of the cable	13
6.4.10 Bending under tension	13
6.4.11 Repeated bending of the cable	13
6.4.12 Tensile performance of the cable.....	14
6.4.13 Shock-test requirements of the cable.....	14
6.4.14 Bump-test requirements of the cable	14
6.4.15 Vibration-test requirements of a cable	14

6.5	Environmental characteristics	14
6.5.1	Shrinkage of insulation.....	14
6.5.2	Wrapping test of insulation after thermal ageing.....	14
6.5.3	Bending test of insulation at low temperature	14
6.5.4	Elongation at break of the sheath after ageing	14
6.5.5	Tensile strength of the sheath after ageing	14
6.5.6	Sheath pressure test at high temperature	14
6.5.7	Cold bend test of the cable.....	14
6.5.8	Heat shock test.....	14
6.5.9	Damp heat steady state.....	14
6.5.10	Solar radiation (UV test).....	14
6.5.11	Solvents and contaminating fluids.....	15
6.5.12	Salt mist and sulphur dioxide.....	15
6.5.13	Water immersion.....	15
6.5.14	Hygroscopicity	15
6.5.15	Wicking.....	15
6.5.16	Flame propagation characteristics of a single cable	15
6.5.17	Flame propagation characteristics of bunched cables.....	15
6.5.18	Halogen gas evolution.....	15
6.5.19	Smoke generation	15
6.5.20	Toxic gas emission	15
6.5.21	Integrated fire test.....	15
7	Bundled cables requirements	15
8	Introduction to the blank detail specification	16
	Bibliography	17
	Table 1 – Coupling attenuation.....	9
	Table 2 – Attenuation equation constants	10
	Table 3 – TCL requirements.....	10
	Table 4 – ELTCTL requirements.....	10
	Table 5 – NEXT and PS NEXT requirements	11
	Table 6 – ACR-F and PS ACR-F requirements.....	11
	Table 7 – PS ANEXT requirements.....	11
	Table 8 – PS AACR-F requirements	12
	Table 9 – RL requirements.....	12

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES
FOR DIGITAL COMMUNICATIONS –**
**Part 10: Cables for cords with transmission characteristics
up to 2 GHz – Sectional specification**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61156-10 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.

The text of this standard is based on the following documents:

FDIS	Report on voting
46C/1038/FDIS	46C/1042/RVD

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

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

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 publication will remain unchanged until the stability date indicated on the IEC website 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.

MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 10: Cables for cords with transmission characteristics up to 2 GHz – Sectional specification

1 Scope

This part of IEC 61156 describes cables primarily intended for work area cords as defined in ISO/IEC 11801 and in ISO/IEC TR 11801-9901 which is planned to be included in the next edition of ISO/IEC 11801-1. It covers overall screened cables with screened (X/FTP) or unscreened (X/UTP) pairs, where X stands for F, S or SF, as well as pair-screened cables without overall screen (U/FTP). The transmission characteristics of these cables are specified up to a frequency of 2 000 MHz and at a temperature of 20 °C. Two categories of cables are recognised:

- Category 8.1 for use in Class I according to ISO/IEC TR 11801-9901;
- Category 8.2 for use in Class II according to ISO/IEC TR 11801-9901.

These cables can be used for various communication channels which use as many as four pairs simultaneously.

The cables covered by this International Standard 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, e.g. the electric power supplies of public utility mains, they are intended to be used to support the delivery of low voltage remote powering applications such as IEEE 802.3af (Power over Ethernet) or further developments e.g. according to IEEE 802.3at or IEEE 802.3bt. More information on the capacity to support these applications according to the installation practices are given in IEC PAS 61156-1-4, IEC TR 61156-1-6 and ISO/IEC TR 29125.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61156-1:2007/AMD 1:2009

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 TR 61156-1-5, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-5: Correction procedures for the measurement results of return loss and input impedance*

IEC TR 61156-1-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-6: Exploratory DC-resistance values of floor-wiring and work-area cables for digital communications*¹

IEC 61156-6:2010, *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 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*

¹ Under consideration.