

# INTERNATIONAL STANDARD

**Multicore and symmetrical pair/quad cables for digital communications –  
Part 11: Symmetrical single pair cables with transmission characteristics  
up to 600 MHz – Horizontal floor wiring – Sectional specification**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2019 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

**About the IEC**

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

**IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

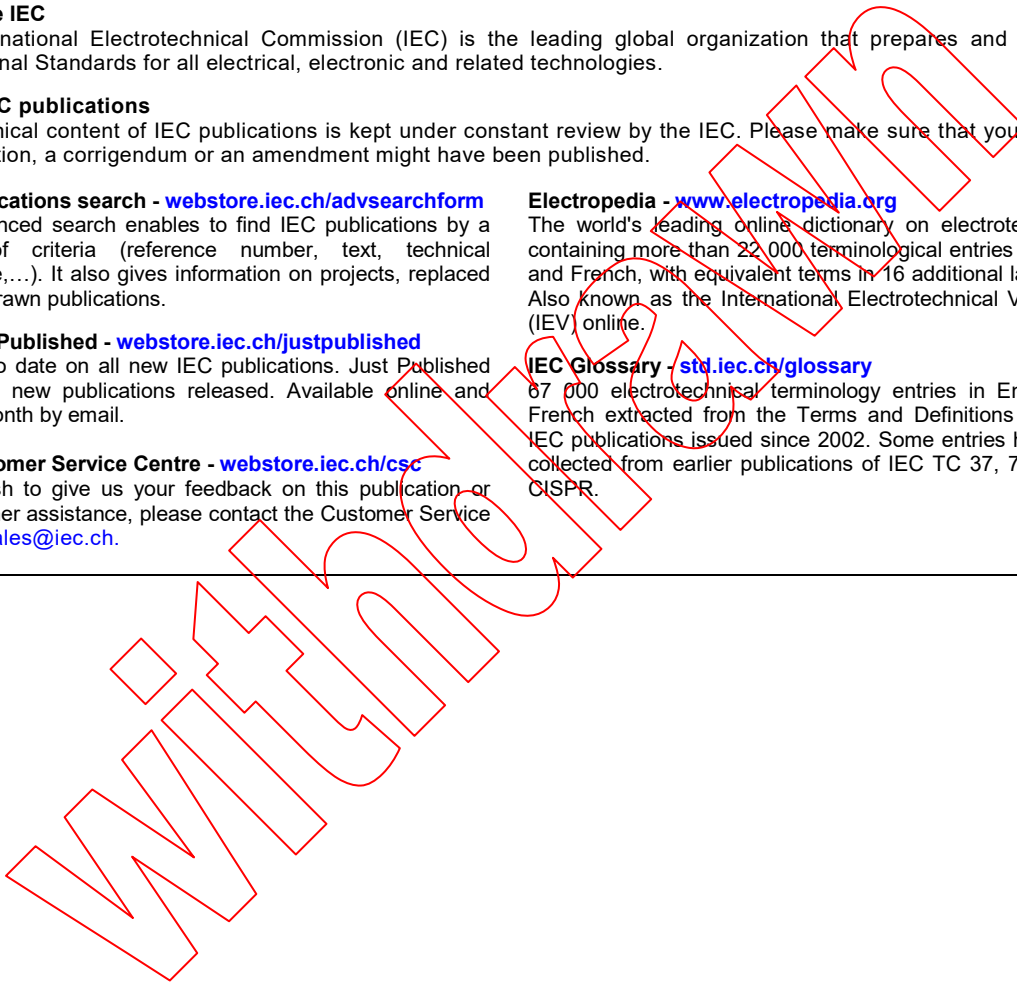
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

**Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.



# INTERNATIONAL STANDARD

**Multicore and symmetrical pair/quad cables for digital communications –  
Part 11: Symmetrical single pair cables with transmission characteristics  
up to 600 MHz – Horizontal floor wiring – Sectional specification**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-6678-6

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

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Installation considerations .....	8
4.1 General remarks .....	8
4.2 Bending radius of installed cable.....	8
4.3 Climatic conditions.....	8
5 Materials and cable construction .....	8
5.1 General remarks .....	8
5.2 Cable construction .....	9
5.3 Conductor .....	9
5.4 Insulation .....	9
5.5 Cable element.....	9
5.6 Screening of the cable element.....	9
5.7 Cable make-up.....	9
5.8 Screening of the cable core.....	9
5.9 Sheath .....	9
5.10 Identification .....	10
5.11 Finished cable .....	10
6 Characteristics and requirements .....	10
6.1 General remarks .....	10
6.2 Electrical characteristics and tests.....	10
6.2.1 Conductor resistance.....	10
6.2.2 Resistance unbalance.....	10
6.2.3 Dielectric strength.....	11
6.2.4 Insulation resistance.....	11
6.2.5 Mutual capacitance.....	11
6.2.6 Capacitance unbalance .....	11
6.2.7 Transfer impedance .....	11
6.2.8 Coupling attenuation.....	11
6.2.9 Current-carrying capacity.....	12
6.3 Transmission characteristics.....	12
6.3.1 Velocity of propagation (phase velocity).....	12
6.3.2 Phase delay and differential delay (delay skew).....	12
6.3.3 Attenuation ( $\alpha$ ).....	12
6.3.4 Unbalance attenuation ( <i>TCL</i> and <i>EL TCTL</i> ).....	13
6.3.5 Alien (exogenous) near-end crosstalk ( <i>PS ANEXT</i> ) .....	13
6.3.6 Alien (exogenous) far-end crosstalk ( <i>PS AACR-F</i> ).....	14
6.3.7 Alien (exogenous) crosstalk of bundled cables .....	14
6.3.8 Impedance.....	14
6.3.9 Return loss ( <i>RL</i> ).....	14
6.4 Mechanical and dimensional characteristics and requirements.....	15
6.4.1 Dimensional requirements .....	15
6.4.2 Elongation at break of the conductor.....	15
6.4.3 Tensile strength of the insulation .....	15

6.4.4	Elongation at break of the insulation .....	15
6.4.5	Adhesion of the insulation to the conductor.....	15
6.4.6	Elongation at break of the sheath .....	15
6.4.7	Tensile strength of the sheath.....	15
6.4.8	Crush test of the cable.....	15
6.4.9	Impact test of the cable .....	15
6.4.10	Bending under tension.....	16
6.4.11	Repeated bending of the cable .....	16
6.4.12	Tensile performance of the cable.....	16
6.4.13	Shock-test requirements of the cable.....	16
6.4.14	Bump-test requirements of the cable .....	16
6.4.15	Vibration-test requirements of a cable .....	16
6.5	Environmental characteristics .....	16
6.5.1	Shrinkage of the insulation .....	16
6.5.2	Wrapping test of the insulation after thermal ageing .....	16
6.5.3	Bending test of insulation at low temperature.....	16
6.5.4	Elongation at break of the sheath after ageing.....	16
6.5.5	Tensile strength of the sheath after ageing.....	16
6.5.6	Sheath pressure test at high temperature.....	16
6.5.7	Cold bend test of the cable.....	17
6.5.8	Heat shock test.....	17
6.5.9	Damp heat steady state.....	17
6.5.10	Solar radiation .....	17
6.5.11	Solvents and contaminating fluids.....	17
6.5.12	Salt mist and sulphur dioxide.....	17
6.5.13	Water immersion .....	17
6.5.14	Hygroscopicity.....	17
6.5.15	Wicking.....	17
6.5.16	Flame propagation characteristics of a single cable .....	17
6.5.17	Flame propagation characteristics of bunched cables .....	17
6.5.18	Halogen gas evolution .....	17
6.5.19	Smoke generation.....	18
6.5.20	Toxic gas emission .....	18
6.5.21	Integrated fire test method for cables in environmental air handling spaces.....	18
7	Bundled cable requirements .....	18
7.1	General.....	18
7.2	Single pairs sharing one sheath .....	18
7.2.1	General .....	18
7.2.2	Near-end crosstalk ( <i>NEXT</i> ).....	18
7.2.3	Attenuation to crosstalk ratio far-end ( <i>PS ACR-F</i> ) .....	19
	Annex A (informative) Blank Detail Specification.....	20
	Bibliography.....	25
	Table 1 – Transfer impedance .....	11
	Table 2 – Coupling attenuation .....	12
	Table 3 – Attenuation equation constants .....	13
	Table 4 – <i>TCL</i> requirements .....	13

Table 5 – <i>EL TCTL</i> requirements .....	13
Table 6 – <i>PS ANEXT</i> requirements .....	14
Table 7 – <i>PS AACR-F</i> requirements .....	14
Table 8 – <i>RL</i> requirements .....	15
Table 9 – <i>NEXT</i> and <i>PS NEXT</i> requirements .....	18
Table 10 – <i>ACR-F</i> and <i>PS ACR-F</i> requirements .....	19

Withdrawn

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTICORE AND SYMMETRICAL PAIR/QUAD  
CABLES FOR DIGITAL COMMUNICATIONS –****Part 11: Symmetrical single pair cables with  
transmission characteristics up to 600 MHz –  
Horizontal floor wiring – 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 61156-11 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.

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

FDIS	Report on voting
46C/1118/FDIS	46C/1123/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://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.

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

Withdrawn