

INTERNATIONAL STANDARD

**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**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 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
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

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 It also gives information on projects, replaced and withdrawn publications.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

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

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

Electropedia - 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

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.



IEC 61156-5

Edition 3.0 2020-04

INTERNATIONAL STANDARD

**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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-7970-0

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
5.2.1 Conductor.....	9
5.2.2 Insulation.....	9
5.2.3 Cable element	9
5.2.4 Cable make-up	9
5.2.5 Screening of the cable core	9
5.2.6 Sheath.....	9
5.2.7 Identification.....	10
5.2.8 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 (α).....	12
6.3.4 Unbalance attenuation (TCL)	13
6.3.5 Near-end crosstalk ($NEXT$).....	14
6.3.6 Far-end crosstalk ($ACR-F$).....	15
6.3.7 Alien (exogenous) near-end crosstalk ($ANEXT$)	15
6.3.8 Alien (exogenous) far-end crosstalk ($AACR-F$)	16
6.3.9 Alien (exogenous) crosstalk of bundled cables	16
6.3.10 Impedance.....	16
6.3.11 Return loss (RL).....	16
6.4 Mechanical and dimensional characteristics and requirements.....	17
6.4.1 Dimensional requirements	17
6.4.2 Elongation at break of the conductors.....	17

6.4.3	Tensile strength of the insulation	17
6.4.4	Elongation at break of the insulation	17
6.4.5	Adhesion of the insulation to the conductor.....	17
6.4.6	Elongation at break of the sheath	17
6.4.7	Tensile strength of the sheath.....	17
6.4.8	Crush test of the cable.....	17
6.4.9	Impact test of the cable	18
6.4.10	Bending under tension	18
6.4.11	Repeated bending of the cable	18
6.4.12	Tensile performance of the cable	18
6.4.13	Shock-test requirements of the cable	18
6.4.14	Bump-test requirements of the cable	18
6.4.15	Vibration-test requirements of the cable.....	18
6.5	Environmental characteristics	18
6.5.1	Shrinkage of insulation	18
6.5.2	Wrapping test of insulation after thermal ageing	18
6.5.3	Bending test of insulation at low temperature.....	18
6.5.4	Elongation at break of the sheath after ageing	18
6.5.5	Tensile strength of the sheath after ageing	18
6.5.6	Sheath pressure test at high temperature	19
6.5.7	Cold bend test of the cable	19
6.5.8	Heat shock test.....	19
6.5.9	Damp heat steady state	19
6.5.10	Solar radiation (UV test)	19
6.5.11	Solvents and contaminating fluids.....	19
6.5.12	Salt mist and sulphur dioxide	19
6.5.13	Water immersion	19
6.5.14	Hygroscopicity	19
6.5.15	Wicking.....	19
6.5.16	Flame propagation characteristics of a single cable	19
6.5.17	Flame propagation characteristics of bunched cables	19
6.5.18	Halogen gas evolution	19
6.5.19	Smoke generation.....	20
6.5.20	Toxic gas emission	20
6.5.21	Integrated fire test	20
7	Category 5e multipair cable	20
7.1	General.....	20
7.2	Transmission	20
8	Introduction to the blank detail specification	20
	Annex A (informative) Blank detail specification.....	22
	Bibliography.....	27
	Table 1 – Cable categories	7
	Table 2 – Transfer impedance	11
	Table 3 – Coupling attenuation in dB	12
	Table 4 – Attenuation equation constants	13
	Table 5 – Near-end unbalance attenuation.....	14
	Table 6 – Worst-pair <i>PS NEXT</i> (1) values.....	15

Table 7 – Worst-pair *PS ACR-F* (1) values 15

Table 8 – *PS ANEXT* 16

Table 9 – *PS AACR-F* 16

Table 10 – Return loss 17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

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 61156-5 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.

This third edition cancels and replaces the second edition published in 2009 and Amendment 1:2012. This edition constitutes a technical revision.

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

- a) additional balance levels with respect to MICE implementation by certain cabling specifications;

- b) reference to current standards and technical reports with respect to measurement techniques and remote powering.

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

FDIS	Report on voting
46C/1140/FDIS	46C/1144/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.

This International Standard is to be used in conjunction with IEC 61156-1:2007 and IEC 61156-1:2007/AMD1:2009.

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.