

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Multicore and symmetrical pair/quad cables for digital communications –
Part 1: Generic specification

(standards.iteh.ai)

Câbles multiconducteurs à paires symétriques et quartes pour transmissions
numériques –
Partie 1: Spécification générique

<https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-5b0bc8/iec-61156-1-2007>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

[IEC 61156-1:2007](#)

- Electropedia: www.electropedia.org www.iec.ch/catalog/standards/sist/1e4b6288-b607-403c-a813-

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00



IEC 61156-1

Edition 3.0 2007-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Multicore and symmetrical pair/quad cables for digital communications –
Part 1: Generic specification**

**Câbles multiconducteurs à paires symétriques et quartes pour transmissions
numériques –
Partie 1: Spécification générique**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 33.120.20

ISBN 2-8318-9638-X

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	9
4 Installation considerations	12
5 Materials and cable construction	12
5.1 General remarks.....	12
5.2 Cable construction	12
5.2.1 Conductor.....	13
5.2.2 Insulation.....	13
5.2.3 Cable element	13
5.2.4 Cable make-up	14
5.2.5 Screening of the cable core	14
5.2.6 Sheath.....	14
5.2.7 Identification.....	15
5.2.8 Finished cable	15
6 Characteristics and requirements	15
6.1 General remarks – Test configurations	15
6.2 Electrical characteristics and tests	16
6.2.1 Conductor resistance.....	16
6.2.2 Resistance unbalance.....	16
6.2.3 Dielectric strength.....	16
6.2.4 Insulation resistance.....	16
6.2.5 Mutual capacitance.....	17
6.2.6 Capacitance unbalance to earth	17
6.2.7 Transfer impedance.....	17
6.2.8 Coupling attenuation.....	17
6.2.9 Current-carrying capacity.....	17
6.3 Transmission characteristics	18
6.3.1 Velocity of propagation (phase velocity)	18
6.3.2 Phase delay and differential delay (delay skew)	18
6.3.3 Attenuation	19
6.3.4 Unbalance attenuation.....	21
6.3.5 Near-end crosstalk	26
6.3.6 Far-end crosstalk.....	28
6.3.7 Alien (exogenous) near-end crosstalk.....	31
6.3.8 Alien (exogenous) far-end crosstalk.....	35
6.3.9 Alien (exogenous) crosstalk of bundled cables	35
6.3.10 Mean characteristic impedance and input impedance	36
6.3.11 Return loss	37
6.4 Mechanical and dimensional characteristics and requirements	38
6.4.1 Measurement of dimensions	38
6.4.2 Elongation at break of the conductor	38
6.4.3 Tensile strength of the insulation	38
6.4.4 Elongation at break of the insulation.....	38

ITEH STANDARD PREVIEW
(standards.iteh.ai)

[IEC 61156-1:2007](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007)

[https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007)

[3419295b0bc8/iec-61156-1-2007](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007)

6.4.5	Adhesion of the insulation to the conductor	38
6.4.6	Elongation at break of the sheath	38
6.4.7	Tensile strength of the sheath	38
6.4.8	Crush test of the cable	38
6.4.9	Impact test of the cable	39
6.4.10	Bending under tension.....	39
6.4.11	Repeated bending of the cable	41
6.4.12	Tensile performance of the cable.....	43
6.4.13	Shock test of the cable	43
6.4.14	Bump test of the cable.....	43
6.4.15	Vibration test of the cable.....	43
6.5	Environmental characteristics.....	43
6.5.1	Shrinkage of the insulation	43
6.5.2	Wrapping test of the insulation after thermal ageing	43
6.5.3	Bending test of the insulation at low temperature.....	43
6.5.4	Elongation at break of the sheath after ageing.....	43
6.5.5	Tensile strength of the sheath after ageing	43
6.5.6	Sheath pressure test at high temperature	44
6.5.7	Cold bend test of the cable.....	44
6.5.8	Heat shock test.....	44
6.5.9	Damp heat steady state.....	44
6.5.10	Solar radiation.....	45
6.5.11	Solvents and contaminating fluids.....	45
6.5.12	Salt mist and sulphur dioxide.....	45
6.5.13	Water immersion.....	45
6.5.14	Hygroscopicity.....	45
6.5.15	Wicking	45
6.5.16	Flame propagation characteristics of a single cable.....	46
6.5.17	Flame propagation characteristics of bunched cables	46
6.5.18	Halogen gas evolution	46
6.5.19	Smoke generation	46
6.5.20	Toxic gas emission	46
6.5.21	Integrated fire test method for cables in environmental air handling spaces.....	46
	Bibliography.....	47
	Figure 1 – Test set-up for the measurement of attenuation, velocity of propagation and phase delay	19
	Figure 2 – Test set-up for the measurement of the differential-mode loss of the baluns	23
	Figure 3 – Test set-up for the measurement of the common-mode loss of the baluns.....	23
	Figure 4 – Test set-up for unbalance attenuation at near end (<i>TCL</i>).....	25
	Figure 5 – Test set-up for unbalance attenuation at far end (<i>TCTL</i>)	25
	Figure 6 – Test set-up for near-end crosstalk.....	27
	Figure 7 – Test set-up for far-end crosstalk.....	29
	Figure 8 – Test set-up for alien (exogenous) near-end crosstalk	32
	Figure 9 – Test assembly cross-section; six cables around one cable	34
	Figure 10 – Test assembly layout; six cables around one cable	34

Figure 11 – Test assembly cross-section; four parallel cables 35

Figure 12 – Test assembly on drum; four parallel cables 35

Figure 13 – Test set-up for mean characteristic impedance, input impedance and return loss 36

Figure 14 – U-bend test configuration 40

Figure 15 – S-bend test configuration 40

Figure 16 – Repeated bending test configuration 42

Figure 17 – Wicking test configuration 46

Table 1 – Test balun performance characteristics 22

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 61156-1:2007](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007)

<https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES
FOR DIGITAL COMMUNICATIONS –****Part 1: Generic 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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 61156-1 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.

The cables are classified in the study of generic cabling for information technology being produced by ISO/IEC JTC1/SC 25.

This third edition cancels and replaces the second edition published in 2002 and it includes its Corrigendum 1 (2004) This edition constitutes a technical revision.

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

- a) inclusion of definitions and test methods in support of the MICE table in ISO 24702;
- b) inclusion of definitions and test methods in support of new cable categories 6_A and 7_A;
- c) inclusion of definitions in support of PoEP.

This bilingual version, published in 2008-03, corresponds to the English version.

The text of this standard is based on the second edition, its Amendment 3 and on the following documents:

FDIS	Report on voting
46C/815/FDIS	46C/823/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.

The French version of this standard has not been voted upon.

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

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The contents of the corrigendum of August 2015 have been included in this copy.

IEC 61156-1:2007
<https://standards.iteh.ai/catalog/standards/sist/1e4b6288-6607-403c-a813-3419295b0bc8/iec-61156-1-2007>

MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 1: Generic specification

1 Scope

This part of IEC 61156 is applicable to communication systems such as ISDN, local area networks and data communication systems and specifies the definitions, requirements and test methods of multicore, symmetrical pair and quad cables.

This standard is also applicable to cables used for customer premises wiring.

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 60028, *International standard of resistance for copper*

IEC 60050-726, *International Electrotechnical Vocabulary (IEV) – Part 726: Transmission lines and wave guides*

IEC 60068-2-1, *Environmental testing – Part 2: Tests – Tests A: Cold*

IEC 60169-22, *Radio-frequency connectors – Part 22: RF two-pole bayonet coupled connectors for use with shielded balanced cables having twin inner conductors (Type BNO)*

IEC 60189-1:1986, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*¹⁾

IEC 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60332-1-1, *Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus*

IEC 60332-2-1, *Tests on electric and optical fibre cables under fire conditions – Part 2-1: Test for vertical flame propagation for a single small insulated wire or cable – Apparatus*

IEC 60332-3-10, *Tests on electric cables under fire conditions – Part 3-10: Test for vertical flame spread of vertically-mounted bunched wires or cables – Apparatus*

IEC 60332-3-24, *Tests on electric cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C*

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

¹⁾ There exists a 2007 edition of 60189-1.

IEC 60754-2, *Test on gases evolved during combustion of electric cables – Part 2: Determination of the degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity*

IEC 60794-1-2:2003, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables and optical cables – Part 1: Methods for general application – Section 1: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*

IEC 60811-1-3:1993, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1: Methods for general application – Section Three: Methods for determining the density – Water absorption tests – Shrinkage test*

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1: Methods for general application – Section Four: Test at low temperature*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking*

IEC 60811-4-2:2004, *Insulating and sheathing materials of electric cables – Common test methods – Part 4-2: Methods specific to polyethylene and polypropylene compounds – Tensile strength and elongation at break after conditioning at elevated temperature – Wrapping test after conditioning at elevated temperature – Wrapping test after thermal ageing in air – Measurement of mass increase – Long-term stability test – Test method for copper-catalyzed oxidative degradation*

IEC 61034 (all parts), *Measurement of smoke density of cables burning under defined conditions*

IEC 61196-1-105, *Coaxial communication cables – Part 1-105: Electrical test methods – Test for withstand voltage of cable dielectric*

IEC 62012-1:2004, *Multicore and symmetrical pair/quad cables for digital communications to be used in harsh environments – Part 1: Generic specification*

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

IEC 62153-4-4, *Metallic communication cables test methods – Part 4-4: Electromagnetic compatibility (EMC) – Shielded screening attenuation, test method for measuring of the screening attenuation a_s up to and above 3 GHz*

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

IEC 62255 (all parts), *Multicore and symmetrical pair/quad cables for broadband digital communications (high bit rate digital access telecommunication networks) – Outside plant cables*

ITU-T Recommendation G.117:1996, *Transmission aspects of unbalance about earth*

ITU-T Recommendation O.9:1999, *Measuring arrangements to assess the degree of unbalance about earth*

3 Terms and definitions

For the purposes of this document, the following terms and definitions, as well as those given in IEC 60050-726, apply.

3.1

resistance unbalance

difference in resistance of the conductors within a pair or one side of a quad or between pairs or quads

NOTE Resistance unbalance is expressed as a percentage (%).

3.2

capacitance unbalance to earth

arithmetic difference of the capacitance to earth of the conductors of a pair or one side of a quad

NOTE Capacitance unbalance is expressed in pF/m.

3.3

mutual capacitance

electrical charge storage parameter of a pair of conductors (or with respect to the side of a quad)

[IEC 61156-1:2007](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403e-a813-3419295b0bc8/iec-61156-1-2007)

NOTE 1 Mutual capacitance is one of the four primary transmission line parameters: mutual capacitance, mutual inductance, resistance and conductance. <https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403e-a813-3419295b0bc8/iec-61156-1-2007>

NOTE 2 Mutual capacitance is expressed in pF/m.

3.4

velocity of propagation (phase velocity)

speed at which a sinusoidal signal propagates on a pair in the cable

NOTE Velocity of propagation is expressed in m/s.

3.5

delay (phase delay)

time duration between the instants that the wave front of a sinusoidal travelling wave, defined by a specified phase, passes two given points in a cable

NOTE Phase delay is expressed in s/m.

3.6

differential phase delay (skew)

difference in phase delay between any two pairs in the cable

NOTE Differential phase delay (skew) is expressed in s.

3.7

attenuation

decrease in magnitude of power of a signal that propagates along a pair of a cable

NOTE Attenuation is expressed in dB/m.

3.8

unbalance attenuation

magnitude of power of a signal that propagates between the common-mode circuit and the differential-mode circuit of a cable

NOTE Unbalance attenuation is expressed in dB.

3.9

near-end crosstalk

NEXT

magnitude of the signal power coupling from a disturbing pair at the near end to a disturbed pair measured at the near end

NOTE Near-end crosstalk is expressed in dB.

3.10

far-end crosstalk

FEXT

magnitude of the signal power coupling from a disturbing pair at the near end to a disturbed pair measured at the far end

NOTE Far-end crosstalk is expressed in dB.

3.11

power sum of crosstalk

PS

summation of the crosstalk power from all disturbing pairs into a disturbed pair

NOTE 1 The summation is applicable to near-end and far-end crosstalk.

NOTE 2 The power sum of crosstalk is expressed in dB.

3.12

attenuation to crosstalk ratio, near-end

ACR-N

arithmetic difference between the near-end crosstalk and the attenuation of the disturbed pair

NOTE Attenuation to crosstalk ratio, near-end, is expressed in dB.

3.13

attenuation to crosstalk ratio, far-end

ACR-F

arithmetic difference between the far-end crosstalk and the attenuation of the disturbed pair

NOTE Attenuation to crosstalk ratio, far-end, is expressed in dB.

3.14

alien (exogenous) near-end crosstalk

ANEXT

near-end crosstalk where the disturbing and disturbed pairs are contained in different cables

NOTE Alien (exogenous) near-end crosstalk is expressed in dB.

3.15

alien (exogenous) far-end crosstalk

AFEXT

far-end crosstalk where the disturbing and disturbed pairs are contained in different cables

NOTE Alien (exogenous) far-end crosstalk is expressed in dB.

3.16**power sum of alien (exogenous) crosstalk*****PSA***

summation of the alien (exogenous) crosstalk power from all disturbing pairs into a disturbed pair in different cables

NOTE 1 The summation is applicable to near-end and far-end alien (exogenous) crosstalk.

NOTE 2 The power sum of alien (exogenous) crosstalk is expressed in dB.

3.17**characteristic impedance*****Z_C***

impedance at the input of a homogeneous line of infinite length

NOTE 1 The asymptotic value at high frequencies is denoted as Z_{∞} .

NOTE 2 The characteristic impedance of a homogeneous cable pair is given by the quotient of a voltage wave and current wave which are propagating in the same direction, either forwards or backwards.

NOTE 3 Characteristic impedance is expressed in Ω .

3.18**mean characteristic impedance*****Z_{Cm}***

impedance calculated as the geometric mean of the product of the impedances obtained at the input terminals of a cable pair when the far end is terminated by an open- and short-circuit load

NOTE Mean characteristic impedance is expressed in Ω .

3.19**input impedance** [https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-3419295b0bc8/iec-61156-1-2007)***Z_{in}***

impedance at the input terminals of a cable pair

NOTE 1 The pair is terminated with its reference impedance, Z_R (system nominal impedance), at the near and far end. See IEC/TR 62152.

NOTE 2 Input impedance is expressed in Ω .

3.20**fitted input impedance**

impedance calculated from a least squares function fitting algorithm

NOTE Fitted input impedance is expressed in Ω .

3.21**return loss*****RL***

ratio of reflected power to input power at the input terminals of a cable pair

NOTE Return loss is expressed in dB.

3.22**balun**

balanced to unbalanced impedance matching transformer

3.23**bundled cable**

grouping or assembly of several individual cables that are systematically laid up

NOTE Bundled cables are also referred to as speed-wrap, whip, or loomed cables.

3.24

current-carrying capacity

capacity of a conductor that results in a specified increase of the surface temperature of the conductor beyond the ambient temperature

NOTE The conductor may be bare, insulated or enclosed in a cable.

3.25

hygroscopic

characteristic of a material to absorb moisture from the atmosphere

3.26

wicking

longitudinal flow of a liquid in a material due to capillary action

3.27

coupling attenuation

ratio between the transmitted power through the conductors and the maximum radiated peak power, conducted and generated by the exited common-mode currents

4 Installation considerations

The cables shall be designed to meet the installation conditions encountered for each area as follows.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

a) Equipment cables

The cables are used between work stations and peripheral equipment (for example, printer).

[IEC 61156-1:2007](https://standards.iteh.ai/catalog/standards/sist/1e4b6288-b607-403c-a813-341928510181/iec-61156-1-2007)

b) Work area cables

The cables are used between the work station and the communication outlets.

c) Horizontal floor wiring cables

The cables are used between the work area communication outlet and the communication closet.

d) Riser cables and building back-bone cables

The cables are used for horizontal installation or vertically between floors.

e) Campus cables

These cables are used to interconnect buildings and shall be suitable for outdoor installation. The cables should be sheathed and protected in accordance with IEC 62255.

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 (Electromagnetic Compatibility) or fire performance.

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 consist of annealed copper, uniform in quality and free from defects. The properties of the copper shall be in accordance with IEC 60028.

The conductor may be either solid or stranded. The solid conductor shall be circular in section and may be plain or metal-coated. The solid conductor shall be drawn in one piece. Joints in the solid conductor are permitted, provided that the breaking strength of a joint is not less than 85 % of the breaking strength of the unjointed solid conductor.

The stranded conductor shall consist of strands circular in section and assembled without insulation between them by concentric stranding or bunched.

NOTE A bunched strand is not recommended for insulation displacement connection (IDC) application.

The individual strands of the conductor may be plain or metal-coated.

Joints in individual strands are permitted provided that the tensile strength of a joint is not less than 85 % of the breaking strength of the unjointed individual strand. Joints in the complete stranded conductor are not permitted unless allowed and specified in the relevant detail specification.

The conductor of the work area and equipment cables may consist of one or more elements of thin copper or copper alloy tape which shall be applied spirally over a fibrous thread. Joints in the complete element are not permitted.

5.2.2 Insulation

The conductor insulation is composed of one or more suitable dielectric materials. The insulation may be solid, cellular or composite (for example, foam skin).

The insulation shall be continuous, having a uniform thickness.

The insulation shall be applied to fit closely to the conductor.

The insulated conductors may be identified by colours and/or additional ring markings and/or symbols achieved by the use of coloured insulation or by a coloured surface using extrusion, printing or painting. Colours shall be clearly identifiable and shall correspond reasonably with the standard colours shown in IEC 60304.

5.2.2.1 Colour code

The colour code for insulation is given in the relevant detail specification.

5.2.3 Cable element

5.2.3.1 General

The cable element is

- a pair consisting of two insulated conductors twisted together and designated wire "a" and wire "b", or
- a quad consisting of four insulated conductors twisted together and designated wire "a", wire "c", wire "b" and wire "d" in order of rotation.

The choice of the maximum average length of lay in the finished cable shall be made with respect to the specified crosstalk requirements, handling performance and the pair or quad integrity.