IEC 61156-9

Edition 1.0 2016-04

INTERNATIONAL STANDARD

Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification

IEC 61156-9:2016-04(en)

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 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 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: csc@iec.ch.

IEC 61156-9

Edition 1.0 2016-04

INTERNATIONAL STANDARD

Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-3350-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 9: Cables for channels 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 61156-9 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/1037/FDIS	46C/1041/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 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification

1 Scope

This part of IEC 61156 describes cables primarily intended for the fixed part of channels 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 are intended to be used for communication channels which use at least 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 is 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 61156-5:2009, *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*

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

For the purposes of this document, the respective requirements of IEC 61156-5 apply.

5 Materials and cable construction

For the purposes of this document, the respective requirements of IEC 61156-5 apply.

6 Characteristics and requirements

6.1 General remarks

Clause 6 lists the characteristics and minimum requirements of a cable complying with this standard. Test methods shall be in accordance with Clause 6 of IEC 61156-1:2007/AMD1:2009, except that the length of the cable under test shall be as specified below. In addition to all requirements specified in this Clause 6, the two categories shall meet all requirements specified for the respective categories in IEC 61156-5:

- Category 8.1: Category 6_A;
- Category 8.2: Category 7_A.

NOTE By these requirements it is assured that Category 8.1 is backward compatible to Category 6_A and Category 8.2 is backward compatible to Category 7_A.

The computed requirements in dB, rounded to one decimal place, shall be used to determine compliance.

The tests for electrical characteristics according to 6.2 shall be carried out on a cable length of not less than 100 m, unless otherwise specified.

---

1 Under consideration.

The tests for transmission characteristics according to 6.3 shall be carried out on a cable length of 30 m, unless otherwise specified. The following parameters are proportional to length and therefore the requirements for 30 m can be calculated from the requirements per 100 m by multiplying by 0,3:

- phase delay and differential delay;
- attenuation.

6.2 Electrical characteristics and tests

6.2.1 Conductor resistance

The maximum conductor resistance at or corrected to 20 °C shall not exceed 7,0 Ω for 100 m of cable.

6.2.2 Resistance unbalance

6.2.2.1 Resistance unbalance within a pair

The resistance unbalance shall not exceed 2,0 %.

6.2.2.2 Resistance unbalance between pairs

The pair-to-pair resistance unbalance shall not exceed 5,0 %.

6.2.3 Dielectric strength

The respective requirement of IEC 61156-5 applies.

6.2.4 Insulation resistance

The requirement shall apply to:

- conductor/conductor;
- conductor/screen.

The minimum insulation resistance at or corrected to 20 °C shall be not less than 5 GΩ·km.

6.2.5 Mutual capacitance

The respective requirement of IEC 61156-5 applies.

6.2.6 Capacitance unbalance

The maximum capacitance unbalance pair to ground shall not exceed 1 200 pF/km at a frequency of 800 Hz or 1 000 Hz.

6.2.7 Transfer impedance

The respective requirement of IEC 61156-5 applies.

6.2.8 Coupling attenuation

Three performance types for coupling attenuation are recognised. When measured using the absorbing clamp method (IEC 62153-4-5) or the triaxial method (IEC 62153-4-9) the coupling attenuation in the frequency range from f = 30 MHz to 2 000 MHz shall meet one of the requirements indicated in Table 1.

Table 1 – Coupling attenuation

Coupling attenuation type	Frequency range	Coupling attenuation
	MHz	dB
Type I	30 to 100	≥ 85
	100 to 2 000	≥ 85 – 20 $\log_{10}$ (f /100); f in MHz
Type Ib	30 to 100	≥ 70
	100 to 2 000	≥ 70 – 20 $\log_{10}$ (f /100); f in MHz
Type II	30 to 100	≥ 55
	100 to 2 000	≥ 55 – 20 $\log_{10}$ (f /100); f in MHz

6.2.9 Current-carrying capacity

See 6.2.9 of IEC 61156-5:2009. Further guidance with respect to current carrying capacity is provided by ISO/IEC TR 29125.

6.3 Transmission characteristics

6.3.1 Velocity of propagation (phase velocity)

See 6.3.1 of IEC 61156-5:2009.

6.3.2 Phase delay and differential delay (delay skew)

6.3.2.1 Phase delay

The phase delay τ shall not exceed the value obtained from equation (1) in the frequency range from 4 MHz to the maximum referenced frequency.

$$\tau = 534 + \frac{36}{\sqrt{f}} \tag{1}$$

where

τ is the phase delay in ns/100 m;

f is the frequency in MHz.

6.3.2.2 Differential delay (delay skew)

When the phase delay is measured at (20 ± 1) °C, the maximum delay skew between any two pairs at a given temperature shall be not greater than 45 ns/100 m for Category 8.1 cables and 25 ns/100 m for Category 8.2 cables in the frequency range from 4 MHz to the maximum referenced frequency.

6.3.3 Attenuation (α)

6.3.3.1 Attenuation at 20 °C operating temperature

The maximum attenuation α of any pair in the frequency range indicated in Table 2 shall not exceed the value obtained from equation (2).

$$\alpha = a\sqrt{f} + bf + c/\sqrt{f} \tag{2}$$

where

α is the attenuation expressed in dB/100 m;

a, b, c are constants indicated in Table 2;

f is the frequency expressed in MHz.

Table 2 – Attenuation equation constants

Frequency range MHz	Constants		
	a	b	c
1 to 2 000	1,800	0,005	0,250

The cable performance between 1 MHz and 4 MHz is achieved by design only and it is therefore not necessary to test for this performance below 4 MHz.

6.3.3.2 Category 5e special consideration

Not applicable.

6.3.3.3 Attenuation at elevated operating temperature

The respective requirement of IEC 61156-5 applies.

6.3.4 Unbalance attenuation (TCL)

The minimum near-end unbalance attenuation (transverse conversion loss or TCL) shall not be less than obtained from Table 3.

Table 3 – TCL requirements

Frequency range MHz	x/UTP type cables dB	x/FTP type cables dB
1 to 2 000	60 – 15 $\log_{10}$ (f); f in MHz; 40 dB maximum	50 – 15 $\log_{10}$ (f); f in MHz; 40 dB maximum; 7 dB minimum

The minimum equal-level far-end unbalance attenuation (equal-level transverse conversion transfer loss or ELTCTL) shall not be less than the value obtained from Table 4.

Table 4 – ELTCTL requirements

Frequency range MHz	x/UTP type cables dB	x/FTP type cables dB
1 to 2 000	50 – 20 $\log_{10}$ (f); f in MHz; 10 dB minimum	40 – 20 $\log_{10}$ (f); f in MHz; 5 dB minimum

For calculation of ELTCTL, the TCTL and the attenuation measurements of the test specimen shall be used.

6.3.5 Near-end crosstalk (NEXT)

The worst near end crosstalk shall not be less than the values indicated in Table 5.

Table 5 – NEXT and PS NEXT requirements

Cable designation	Frequency range MHz	NEXT requirement dB	PS NEXT requirement dB
Category 8.1	1 to 2 000	$75{,}3 - 15 \log_{10}(f)$; f in MHz	$72{,}3 - 15 \log_{10}(f)$; f in MHz
Category 8.2	1 to 2 000	$105{,}4 - 15 \log_{10}(f)$; f in MHz	$102{,}4 - 15 \log_{10}(f)$; f in MHz

For those frequencies where the calculated value of NEXT is greater than 78 dB, the requirement shall be 78 dB. For those frequencies where the calculated value of PS NEXT is greater than 75 dB, the requirement shall be 75 dB.

The cable performance between 1 MHz and 4 MHz is achieved by design only and it is therefore not necessary to test for this performance below 4 MHz.

6.3.6 Far-end crosstalk (ACR-F)

The pair-to-pair ACR-F in dB for any combination shall be greater or equal than obtained from Table 6.

Table 6 – ACR-F and PS ACR-F requirements

Cable designation	Frequency range MHz	ACR-F requirement dB	PS ACR-F requirement dB
Category 8.1	1 to 2 000	$79{,}0 - 20 \log_{10}(f)$; f in MHz	$76{,}0 - 20 \log_{10}(f)$; f in MHz
Category 8.2	1 to 2 000	$100{,}6 - 20 \log_{10}(f)$; f in MHz	$97{,}6 - 20 \log_{10}(f)$; f in MHz
NOTE If FEXT loss is greater than 90 dB up to 1 000 MHz and greater than 80 dB up to 2 000 MHz, ACR-F loss may not be calculated.			

For calculation of ACR-F, the FEXT and the attenuation measurements of the test specimen shall be used.

For those frequencies where the calculated value of ACR-F is greater than 78 dB, the requirement shall be 78 dB. For those frequencies where the calculated value of PS ACR-F is greater than 75 dB, the requirement shall be 75 dB.

The cable performance between 1 MHz and 4 MHz is achieved by design only and it is therefore not necessary to test for this performance below 4 MHz.

6.3.7 Alien (exogenous) near-end crosstalk (ANEXT)

The PS ANEXT (power sum alien (exogenous) near-end crosstalk) of cable when tested in accordance with 6.3.7.1 of IEC 61156-1:2007 shall be not less than the values obtained from Table 7.

Table 7 – PS ANEXT requirements

Frequency range MHz	Requirement dB
1 to 2 000	$117{,}5 - 15 \log_{10}(f)$; f in MHz

Calculated values greater than 80 dB are reverted to a value of 80 dB.

For screened cables meeting the requirements according to 6.2.7 and 6.2.8 (minimum Type Ib), ANEXT is proven by design.

6.3.8 Alien (exogenous) far-end crosstalk (AFEXT)

The PS AACR-F (power-sum alien attenuation to crosstalk ratio far-end) of the cable when tested in accordance with 6.3.8 of IEC 61156-1:2007 shall not be less than the values obtained from Table 8.

Table 8 – PS AACR-F requirements

Frequency range MHz	Requirement dB
1 – 2 000	$102{,}2 - 20 \log_{10} (f)$; f in MHz
NOTE If AFEXT is greater than 90 dB up to 1 000 MHz and greater than 80 dB up to 2 000 MHz, AACR-F loss may not be calculated.	

For calculation of AACR-F, the AFEXT and the attenuation measurements of the test specimen shall be used. Calculated values greater than 80 dB are reverted to a value of 80 dB.

For screened cables meeting the requirements according to 6.2.7 and 6.2.8 (minimum Type Ib), AFEXT is proven by design.

6.3.9 Alien (exogenous) crosstalk of bundled cables

The respective requirements of this document – especially according to 6.3.7 and 6.3.8 – as well as those of IEC 61156-5 apply.

6.3.10 Impedance

The fitted or mean characteristic impedance measured in accordance with 6.3.10.2 or 6.3.10.3 of IEC 61156-1:2007 shall be 100 Ω ± 5 Ω at 100 MHz. In combination with the return loss requirement this ensures that the input impedance falls between the limits calculated by equations (8) to (10) of IEC 61156-5:2009. A measurement of the input impedance is not sufficient to ensure return loss limits.

NOTE Recommendations of IEC TR 61156-1-2 and IEC TR 61156-1-5 for improvement of measurement uncertainty can be considered.

6.3.11 Return loss (RL)

The minimum return loss of any pair in the frequency range indicated in Table 9 shall not be less than the values in Table 9.

Table 9 – RL requirements

Frequency range MHz	Requirement dB
1 to 10	$20 + 5 \log_{10} (f)$; f in MHz
10 to 40	25
40 to 2 000	$25 - 7 \log_{10} (f/40)$; f in MHz

The cable performance between 1 MHz and 4 MHz is achieved by design only and it is therefore not necessary to test for this performance below 4 MHz.

Measurements and limits of 30 m and 100 m (according to IEC 61156-5) samples are independent. Limits for 30 m below 40 MHz are for information only (for further study).

NOTE 1 When using balun-less measurement technique, respective descriptions of IEC TR 61156-1-2 can be considered.

NOTE 2 Recommendations of IEC TR 61156-1-5 for improvement of measurement uncertainty by correction technique can be considered.

6.4 Mechanical and dimensional characteristics and requirements

6.4.1 Dimensional requirements

See 6.4.1 of IEC 61156-5.

6.4.2 Elongation at break of the conductors

See 6.4.2 of IEC 61156-5.

6.4.3 Tensile strength of the insulation

See 6.4.3 of IEC 61156-5.

6.4.4 Elongation at break of the insulation

See 6.4.4 of IEC 61156-5.

6.4.5 Adhesion of the insulation to the conductor

See 6.4.5 of IEC 61156-5.

6.4.6 Elongation at break of the sheath

See 6.4.6 of IEC 61156-5.

6.4.7 Tensile strength of the sheath

See 6.4.7 of IEC 61156-5.

6.4.8 Crush test of the cable

See 6.4.8 of IEC 61156-5.

6.4.9 Impact test of the cable

See 6.4.9 of IEC 61156-5.

6.4.10 Bending under tension

See 6.4.10 of IEC 61156-5.

6.4.11 Repeated bending of the cable

See 6.4.11 of IEC 61156-5.

6.4.12 Tensile performance of the cable

See 6.4.12 of IEC 61156-5.

6.4.13 Shock-test requirements of the cable

See 6.4.13 of IEC 61156-5.

6.4.14 Bump-test requirements of the cable

See 6.4.14 of IEC 61156-5.

6.4.15 Vibration-test requirements of a cable

See 6.4.15 of IEC 61156-5.

6.5 Environmental characteristics

6.5.1 Shrinkage of insulation

See 6.5.1 of IEC 61156-5.

6.5.2 Wrapping test of insulation after thermal ageing

See 6.5.2 of IEC 61156-5.

6.5.3 Bending test of insulation at low temperature

See 6.5.3 of IEC 61156-5.

6.5.4 Elongation at break of the sheath after ageing

See 6.5.4 of IEC 61156-5.

6.5.5 Tensile strength of the sheath after ageing

See 6.5.5 of IEC 61156-5.

6.5.6 Sheath pressure test at high temperature

See 6.5.6 of IEC 61156-5.

6.5.7 Cold bend test of the cable

See 6.5.7 of IEC 61156-5.

6.5.8 Heat shock test

See 6.5.8 of IEC 61156-5.

6.5.9 Damp heat steady state

See 6.5.9 of IEC 61156-5.

6.5.10 Solar radiation (UV test)

See 6.5.10 of IEC 61156-5.

6.5.11 Solvents and contaminating fluids

See 6.5.11 of IEC 61156-5.

6.5.12 Salt mist and sulphur dioxide

See 6.5.12 of IEC 61156-5.

6.5.13 Water immersion

See 6.5.13 of IEC 61156-5.

6.5.14 Hygroscopicity

See 6.5.14 of IEC 61156-5.

6.5.15 Wicking

See 6.5.15 of IEC 61156-5.

6.5.16 Flame propagation characteristics of a single cable

See 6.5.16 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

6.5.17 Flame propagation characteristics of bunched cables

See 6.5.17 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

6.5.18 Halogen gas evolution

See 6.5.18 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

6.5.19 Smoke generation

See 6.5.19 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

6.5.20 Toxic gas emission

See 6.5.20 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

6.5.21 Integrated fire test

See 6.5.21 of IEC 61156-5 unless regional or local regulations (e.g. CPR in Europe) apply.

7 Bundled cables requirements

For further study.

8 Introduction to the blank detail specification

The blank detail specification for cables described in this standard is published as IEC 61156-9-1 and should be used to identify a specific product.

When completing the detail specification, the following information shall be supplied:

a) conductor size;
b) number of elements;
c) cable construction details;
d) cable category (Category 8.1, Category 8.2) to describe basic performance requirements;
e) mechanical requirements;
f) environmental requirements;
g) fire performance.

Bibliography

IEC PAS 61156-1-4, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-4: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Conductor heating of bundled data grade cables for limited power transmission based on IEEE 802.3*

IEC 61156-9-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Blank detail specification*[2]

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC TR 11801-9901, *Information technology – Generic cabling for customer premises – Part 9901: Guidance for balanced cabling in support of at least 40 Gbit/s data transmission*

ISO/IEC TR 29125, *Information technology – Telecommunications cabling requirements for remote powering of terminal equipment*

_____

2 Under consideration.

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3, rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

Tel: + 41 22 919 02 11
Fax: + 41 22 919 03 00
info@iec.ch
www.iec.ch