

TECHNICAL REPORT



Multicore and symmetrical pair/quad cables for digital communications –
Part 1-6: Nominal DC-resistance values of floor-wiring and work-area cables for
digital communications

[IEC TR 61156-1-6:2016](https://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d73f91f6/iec-tr-61156-1-6-2016)

<https://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d73f91f6/iec-tr-61156-1-6-2016>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2016 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
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.

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 It also gives information on projects, replaced and withdrawn publications.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

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.

INTERNATIONAL STANDARDS PREVIEW
(standards.iteh.ai)
IEC TR 61501-6:2016
https://standards.iteh.ai/catalog/standards/iec/41414-8866
3804d7391f6/iec-tr-61501-6-2016

TECHNICAL REPORT



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

[IEC TR 61156-1-6:2016](https://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d73f91f6/iec-tr-61156-1-6-2016)

<https://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d73f91f6/iec-tr-61156-1-6-2016>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.20

ISBN 978-2-8322-3630-7

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

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions	5
4 Overview	5
5 DC-resistance values.....	6
5.1 General.....	6
5.2 Values for horizontal floor wiring cables.....	6
5.3 Values for work area wiring cables	7
5.4 Resistance unbalance	8
Bibliography	11
Figure 1 – Evaluation of resistance unbalance between pairs for certain stranding diameters and lay lengths ranges.....	9
Figure 2 – Evaluation of resistance unbalance between pairs taking into account a resistance unbalance of the pairs of 2 %	10
Table 1 – Nominal conductor-diameter (range) and conductor-resistance (typical) values for horizontal floor wiring cables.....	7
Table 2 – Nominal conductor-diameter (range) and conductor-resistance (typical) values for work area wiring cables.....	8
Table 3 – Nominal (typical) values of resistance unbalance between pairs for horizontal floor wiring cables and work area wiring cable.....	10

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTICORE AND SYMMETRICAL PAIR/QUAD
CABLES FOR DIGITAL COMMUNICATIONS –****Part 1-6: Nominal DC-resistance values of floor-wiring
and work-area cables for digital communications**

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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 61156-1-6, which is a technical report, 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 technical report is based on the following documents:

Enquiry draft	Report on voting
46C/1044/DTR	46C/1051/RVC

Full information on the voting for the approval of this technical report 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.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 1-6: Nominal DC-resistance values of floor-wiring and work-area cables for digital communications

1 Scope

This part of IEC 61156, which is a Technical Report, provides informative values for DC-resistance of typical installed cables at the time of publication to enable further analysis of cable performance mainly influenced by DC-resistance, such as thermal heating.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61156-5, *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*
<http://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d7391f6/iec-tr-61156-1-6-2016>

IEC 61156-6, *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 61156-9, *Multicore and symmetrical pair/quad cables for digital communications – Part 9: Cables for channels with transmission characteristics up to 2 GHz – Sectional specification*

IEC 61156-10, *Multicore and symmetrical pair/quad cables for digital communications – Part 10: Cables for cords with transmission characteristics up to 2 GHz – Sectional specification*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Overview

Measurement of thermal heating /1/ or other analysis of applications such as POE /2/ or other remote powering application requires DC-resistance values reflecting the higher performance of higher categories not explicitly specified in IEC 61156-5, IEC 61156-6, IEC 61156-9 and

IEC 61156-10. This document therefore informatively provides such values for horizontal floor wiring and work area wiring taking into account different possible basic designs.

5 DC-resistance values

5.1 General

IEC 61156-5, IEC 61156-6, IEC 61156-9 and IEC 61156-10 only have a basic DC-resistance requirement each, possible to be fulfilled by cables of the lowest category. As higher categories provide a better attenuation, also the DC-resistance of such a cable is lower, even though not required, as cabling standards also do not require more severe values for higher Classes /3/.

The DC-resistance of a balanced pair is basically dependent on conductivity and diameter of the wires. During the stranding process, the wires are forced on certain trajectories that are defined by lay-lengths, diameter of insulation and the dimensions of possible fillers and foils being applied during stranding. Due to the inevitable forces needed to form the insulated wires, the diameter of the conductors is slightly reduced while being stranded. As the measurement of the resulting conductor diameter is a measurement at a discrete point and thus less representative of the entire length of the cable and, furthermore, achieving a low measurement uncertainty requires a significant technical effort, the following tables only roughly indicate the conductor diameter.

The nominal DC-resistance values given in Tables 1, 2 and 3 below are to be understood as typical values. No requirements therefore can be derived from these values. Continuous progress of technical development might result in cable designs fulfilling all current requirements of IEC 61156-5, IEC 61156-6, IEC 61156-9 or IEC 61156-10 respectively (including the request for copper conductors), but having higher DC-resistance than indicated in Tables 1, 2 and 3 below. The use of cables with a lower DC-resistance than indicated is possible and might provide benefit with respect to thermal heating and possibly further performance parameters.

5.2 Values for horizontal floor wiring cables

Cables for horizontal floor wiring according to IEC 61156-5 and IEC 61156-9 have a design based on solid copper wires. Shorter lay-lengths are necessary to obtain a better crosstalk performance. As shorter lay-lengths lead to increased attenuation, such designs need a larger conductor diameter to achieve attenuation requirements. Also foils e.g. applied as pair shielding add to attenuation and accordingly high category pair-shielded cables need higher conductor diameters, too. Table 1 provides nominal values for the conductor diameter and resistance for horizontal floor wiring cables.

Table 1 – Nominal conductor-diameter (range) and conductor-resistance (typical) values for horizontal floor wiring cables

	U/UTP	F/UTP, SF/UTP	U/FTP, F/FTP, S/FTP
Category 5e	0,49 mm to 0,52 mm 9,5 Ω/100 m	0,51 mm to 0,53 mm 9,0 Ω/100 m	No typical design
Category 6	0,52 mm to 0,55 mm 9,0 Ω/100 m	0,53 mm to 0,55 mm 8,5 Ω/100 m	0,54 mm to 0,56 mm 8,0 Ω/100 m
Category 6A	0,54 mm to 0,56 mm 8,0 Ω/100 m	0,55 mm to 0,57 mm 7,5 Ω/100 m	0,55 mm to 0,57 mm 7,5 Ω/100 m
Category 7	No typical design	No typical design	0,55 mm to 0,57 mm 7,5 Ω/100 m
Category 7A	No typical design	No typical design	0,58 mm to 0,60 mm 6,8 Ω/100 m
Category 8.1 (ffs.)	No typical design	0,61 mm to 0,64 mm 6,5 Ω/100 m (ffs.)	0,61 mm to 0,64 mm 6,5 Ω/100 m (ffs.)
Category 8.2 (ffs.)	No typical design	No typical design	0,61 mm to 0,64 mm 6,5 Ω/100 m (ffs.)

5.3 Values for work area wiring cables

Work area wiring cables typically have designs applying stranded conductors. Nevertheless, solid conductors are an option according IEC 61156-6 and IEC 61156-10. Therefore, both cases are reflected in Table 2. The explanations with respect to the relation between cable design and attenuation made for horizontal floor wiring cable also apply to work area wiring cables.

IEC TR 61156-1-6:2016

<https://standards.iteh.ai/catalog/standards/sist/037ce9e1-1c95-436c-8684-3804d7391f6/iec-tr-61156-1-6-2016>