



ISO/IEC 14763-2

Edition 1.0 2012-02

# INTERNATIONAL STANDARD



---

**Information technology – Implementation and operation of customer premises  
cabling –  
Part 2: Planning and installation**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE **XB**

---

ICS 35.200

ISBN 978-2-88912-897-6

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

## CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	13
2 Normative references .....	14
3 Terms, definitions and abbreviations .....	15
3.1 Terms and definitions .....	15
3.2 Abbreviations .....	21
3.3 Conventions .....	22
4 Conformance.....	22
5 Specification of installations .....	23
5.1 General.....	23
5.2 Installation specification .....	23
5.2.1 Requirements .....	23
5.2.2 Recommendations .....	25
5.3 Technical specification .....	25
5.3.1 General .....	25
5.3.2 Safety requirements .....	26
5.3.3 Security requirements.....	26
5.3.4 Performance and configuration – Requirements.....	26
5.3.5 Environmental conditions.....	27
5.4 Scope of work .....	27
5.4.1 Pre-installation .....	27
5.4.2 Installation.....	28
5.4.3 Post-installation.....	29
5.5 Quality assurance .....	29
6 Quality planning .....	30
6.1 Quality plan.....	30
6.2 Sampling .....	31
6.2.1 Balanced cabling .....	31
6.2.2 Optical fibre cabling.....	33
6.3 Treatment of marginal results .....	34
6.3.1 Balanced cabling .....	34
6.3.2 Optical fibre cabling.....	34
6.4 Treatment of non-compliant results .....	35
6.5 Change control.....	35
7 Installation planning .....	35
7.1 General.....	35
7.2 Safety .....	35
7.2.1 General .....	35
7.2.2 Mains power cabling.....	35
7.2.3 Optical fibre cabling.....	35
7.3 Environment.....	36
7.4 Points of electrical contact.....	36
7.5 External service provision .....	36
7.5.1 Requirements .....	36

7.5.2	Recommendations .....	36
7.6	Pathways and pathway systems .....	36
7.6.1	General .....	36
7.6.2	Inside buildings .....	39
7.6.3	Outside buildings .....	42
7.7	Spaces .....	46
7.7.1	Requirements .....	46
7.7.2	Recommendations .....	48
7.8	Functional elements .....	50
7.8.1	Requirements .....	50
7.8.2	Recommendations .....	51
7.9	Segregation of information technology cabling and mains power cabling .....	52
7.9.1	General .....	52
7.9.2	Requirements .....	53
7.9.3	Recommendations .....	59
7.10	Cabling – Requirements .....	59
7.10.1	General .....	59
7.10.2	Unscreened cabling .....	59
7.10.3	Screened cabling .....	60
7.10.4	Optical fibre cabling .....	60
8	Installation practices .....	60
8.1	General .....	60
8.2	Safety .....	60
8.2.1	General .....	60
8.2.2	Mains power cabling .....	60
8.2.3	Functional bonding .....	60
8.2.4	Optical fibre cabling .....	60
8.2.5	Guards and signs .....	61
8.2.6	Enclosed spaces .....	61
8.2.7	Maintenance holes .....	61
8.2.8	Closures .....	61
8.3	Environment .....	61
8.3.1	Storage .....	61
8.3.2	Installation – Requirements .....	61
8.4	Component inspection and testing – Requirements .....	61
8.5	Pathways .....	62
8.5.1	Requirements .....	62
8.5.2	Inside buildings – Requirements .....	62
8.5.3	Outside buildings .....	62
8.6	Spaces .....	63
8.6.1	Requirements .....	63
8.6.2	Entrance facilities .....	63
8.6.3	Rooms and enclosures intended to contain distributors .....	63
8.6.4	Cabinets, frames and racks .....	63
8.6.5	Closures .....	63
8.6.6	Outlets .....	63
8.7	Pathway system installation .....	63
8.7.1	General .....	63
8.7.2	Inside buildings .....	64

8.7.3	Outside buildings .....	64
8.8	Closure installation .....	64
8.9	Cable installation .....	65
8.9.1	Cable installation within pathway systems .....	65
8.9.2	General .....	65
8.9.3	Inside buildings .....	66
8.9.4	Cable installation in maintenance holes .....	66
8.9.5	Cable installation within closures – Requirements .....	67
8.10	Joining and terminating of cables .....	67
8.10.1	Requirements .....	67
8.10.2	Balanced cabling .....	68
8.10.3	Screened balanced cabling .....	68
8.10.4	Optical fibre cabling .....	68
8.11	Cords and jumpers .....	68
8.12	Surge protective devices .....	68
8.13	Acceptance .....	68
8.13.1	Inspection .....	68
8.13.2	Testing .....	69
9	Documentation and administration .....	69
9.1	Symbols and preparation of documents .....	69
9.2	Administration .....	69
9.2.1	General .....	69
9.2.2	Administration system .....	70
9.2.3	Identifiers – Requirements .....	72
9.2.4	Component labelling .....	72
9.2.5	Records .....	75
9.2.6	Cable administration system .....	79
9.2.7	Reports .....	82
10	Testing .....	82
10.1	General .....	82
10.1.1	Links and permanent links .....	82
10.1.2	Channels .....	83
10.1.3	Cabling interface adaptors .....	84
10.1.4	Calibration .....	84
10.1.5	Equipment protection .....	84
10.1.6	Measurement conditions .....	84
10.2	Test procedures for balanced cabling .....	85
10.2.1	General .....	85
10.2.2	Measurement of length-related parameters .....	85
10.2.3	Treatment of marginal test results .....	85
10.2.4	Treatment of unacceptable test results .....	85
10.2.5	Test result format .....	85
10.2.6	Test result documentation .....	86
10.3	Test procedures for optical fibre cabling .....	86
10.3.1	General .....	86
10.3.2	Treatment of unacceptable test results .....	86
10.3.3	Test result documentation .....	87
11	Inspection .....	87
11.1	General .....	87

11.2	Inspection Level 1 .....	87
11.3	Inspection Level 2 .....	88
11.4	Inspection Level 3 .....	88
11.5	Inspection documentation – Requirements .....	88
12	Operation .....	89
12.1	Standard operating procedure .....	89
12.1.1	Requirements .....	89
12.1.2	Recommendations .....	89
12.2	Cords and jumpers .....	89
12.3	Optical fibre adaptors .....	89
13	Maintenance.....	89
13.1	Approaches to maintenance .....	89
13.1.1	General .....	89
13.1.2	Requirements .....	90
13.2	Maintenance procedures .....	90
13.2.1	Requirements .....	90
13.2.2	Recommendations .....	90
14	Repair .....	91
	Annex A (normative) Optical fibre polarity maintenance: connecting hardware for multiple optical fibres .....	92
	Annex B (normative) Common infrastructures within multi-tenant premises .....	101
	Annex C (normative) Cabling in accordance with ISO/IEC 11801 .....	109
	Annex D (normative) Cabling in accordance with ISO/IEC 15018 .....	116
	Annex E (normative) Cabling in accordance with ISO/IEC 24764 .....	122
	Annex F (normative) Cabling in accordance with ISO/IEC 24702 .....	135
	Annex G (normative) Cabling in accordance with ISO/IEC TR 24704 .....	138
	Bibliography.....	139
	Figure 1 – Schematic relationship between ISO/IEC 14763-2 and other relevant standards.....	12
	Figure 2 – Quality assurance schematic.....	23
	Figure 3 – Example of conformant and non-conformant bend radius management .....	40
	Figure 4 – Example of use of curved corners in pathway systems .....	42
	Figure 5 – Example of cabling installations outside buildings .....	43
	Figure 6 – Dimensions of rooms intended to contain distributors.....	50
	Figure 7 – Process of determining cable separation.....	54
	Figure 8 – Flowchart for cable separation calculation.....	57
	Figure 9 – Separation of mains power and information technology cables without dividers.....	58
	Figure 10 – Separation of mains power and information technology cables with dividers.....	58
	Figure 11 – Examples of cord and jumper labelling .....	74
	Figure 12 – Cable administration database and possible linkages.....	80
	Figure 13 – Basic cabling administration .....	80
	Figure 14 – Examples of cabling permanent links .....	83
	Figure 15 – Reference planes for link and channels (point-to-point).....	83
	Figure 16 – Example of a cabling channel.....	84

Figure A.1 – Duplex connecting hardware plug .....	93
Figure A.2 – Duplex connecting adapter .....	93
Figure A.3 – Duplex patch cord .....	93
Figure A.4 – Views of crossover patch cords .....	94
Figure A.5 – Optical fibre sequences and adapter orientation in patch panel for the symmetrical position method .....	95
Figure A.6 – Optical fibre sequences and adapter orientation in patch panel for the reverse-pair position method .....	95
Figure A.7 – Array connector cable or patch cord (key-up to key-up) .....	97
Figure A.8 – Array adapter with aligned keyways .....	97
Figure A.9 – Transition assembly .....	98
Figure A.10 – Connectivity method for duplex signals .....	99
Figure A.11 – Connectivity method for parallel optics channels .....	100
Figure B.1 – Example of common pathways and spaces in a multi-tenant building .....	102
Figure B.2 – Example of a campus entrance facility .....	104
Figure B.3 – Example 1: Common equipment room .....	106
Figure B.4 – Example 1: Common telecommunications room .....	107
Figure B.5 – Example 2: Common telecommunications room .....	107
Figure C.1 – Connection of functional elements providing redundancy .....	110
Figure E.1 – Connection of functional elements providing redundancy .....	123
Figure E.2 – Example of layered cable trays with smaller width upper trays .....	126
Figure E.3 – Example of uncovered (accessible) row of floor tiles to provide access to lower tray .....	127
Figure E.4 – Dimensions of rooms intended to contain distributors .....	129
Figure E.5 – Example of "hot" aisles, "cold" aisles and cable pathway locations .....	131
Table 1 – Installed balanced cabling test parameters .....	31
Table 2 – Minimum sample sizes for alien (exogenous) crosstalk testing .....	33
Table 3 – Installed optical fibre cabling test parameters .....	33
Table 4 – Examples of pathway systems .....	37
Table 5 – Stacking height for non-continuous and interval support pathway systems .....	41
Table 6 – Design and planning of pathways outside buildings .....	43
Table 7 – Separation recommendations between metallic information technology cabling and specific EMI sources .....	53
Table 8 – Classification of information technology cables .....	55
Table 9 – Minimum separation S .....	55
Table 10 – Power cabling factor P .....	56
Table 11 – Level of installation complexity .....	70
Table 12 – Level of operational complexity .....	70
Table 13 – Minimum requirements of administration systems .....	71
Table 14 – Minimum requirements of operational administration systems .....	72
Table 15 – Labelling requirements .....	73
Table 16 – Labelling recommendations (additional) .....	74
Table 17 – Infrastructure records for spaces, cabinets, racks, frames and closures .....	76

Table 18 – Infrastructure records for cables and termination points .....	77
Table 19 – Infrastructure records .....	78
Table 20 – Infrastructure records for pathways and premises.....	79
Table 21 – Recommendations of installation administration systems.....	81
Table 22 – Recommendations of operational administration systems.....	81
Table A.1 – Optical fibre colour code scheme of IEC 60794-2 .....	92
Table B.1 – Summary of common spaces used to service a multi-tenant building.....	102
Table D.1 – Minimum requirements for dimensions of primary distribution spaces .....	118
Table D.2 – Requirements for dimensions of secondary distribution spaces.....	119
Table D.3 – Minimum dimensions of spaces allocated to junction boxes .....	120
Table D.4 – Recommendations for dimensions of primary distribution spaces .....	120
Table D.5 – Recommendations for dimensions of secondary distribution spaces.....	121
Table E.1 – Environmental requirements for data centres .....	124
Table F.1 – Risk elements for consideration in determining an appropriate maintenance approach.....	137

# INFORMATION TECHNOLOGY – IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING –

## Part 2: Planning and installation

### FOREWORD

- 1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.
- 2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.
- 3) The formal decisions or agreements of IEC and ISO 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 and ISO member bodies.
- 4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
- 6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.
- 7) All users should ensure that they have the latest edition of this publication.
- 8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies 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 of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.
- 9) 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.
- 10) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 14763-2 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This first edition supersedes Clauses 11 and 12 of ISO/IEC 11801, published in 2002, replaces ISO/IEC 14763-1, published in 1999, its Amendment 1 (2004), ISO/IEC TR 14763-2, published in 2000, ISO/IEC 18010, published in 2002, and its Amendment 1 (2005) and constitutes a technical revision.

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

In addition to the supersession of parts of earlier standards and the incorporation of other standards, this standard provides much greater detail in all aspects of planning and installation with respect to ISO/IEC TR 14763-2 and provides clearly differentiated and directed requirements and recommendations.



The list of all currently available parts of the ISO/IEC 14763 series, under the general title *Information technology – Implementation and operation of customer premises cabling*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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

**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.**

## INTRODUCTION

The importance of services delivered by information technology cabling infrastructure is similar to that of utilities such as heating, lighting and electricity supplies. As with those utilities, interruptions to service can have a serious impact. Poor quality of service due to lack of planning, use of inappropriate components, incorrect installation, poor administration or inadequate support can threaten an organisation's effectiveness.

There are four phases in the successful implementation of information technology cabling

- a) design,
- b) specification – the detailed requirement for the cabling, including the planning of its accommodation and associated building services addressing safety and specific environments (e.g. electromagnetic) together with the quality assurance requirements to be applied,
- c) installation – in accordance with the requirements of the specification,
- d) operation – the management of connectivity and the maintenance of transmission performance during the life of the cabling.

This International Standard supports the specification, implementation and operation of generic information technology cabling designed in accordance with the standards and associated documents developed by ISO/IEC JTC 1/SC 25 and addresses the following topics

- specification depending on the application, environment, building infrastructure and facilities, etc.,
- quality assurance,
- installation planning (including pathways and spaces) depending on the application, environment, building infrastructure and facilities, etc,
- installation practice (including pathways and spaces),
- documentation and administration,
- testing,
- inspection,
- operation,
- maintenance and maintainability (based on any impact from planning and installation),
- repair and repairability (based on any impact from planning and installation).

It does not cover those aspects of installation associated with the transmission of signals in free space between transmitters, receivers or their associated antenna systems (e.g. wireless, radio, microwave or satellite).

The following normative Annexes support specific aspects of planning and installation

- Annex A: Optical fibre polarity,
- Annex B: Common infrastructures within multi-tenant premises.

The requirements and recommendations of the main body of this standard are premises-independent. The following normative Annexes include requirements for generic cabling in accordance with specific standards

- Annex C: Cabling in accordance with ISO/IEC 11801,
- Annex D: Cabling in accordance with ISO/IEC 15018,
- Annex E: Cabling in accordance with ISO/IEC 24764,
- Annex F: Cabling in accordance with ISO/IEC 24702,

- Annex G: Cabling in accordance with ISO/IEC TR 24704.

This standard sets out the responsibilities of information technology cabling installers and premises owners, and is intended to be referenced in relevant contracts. The owners may delegate selected responsibilities to designers, specifiers, operators and maintainers of installed information technology cabling.

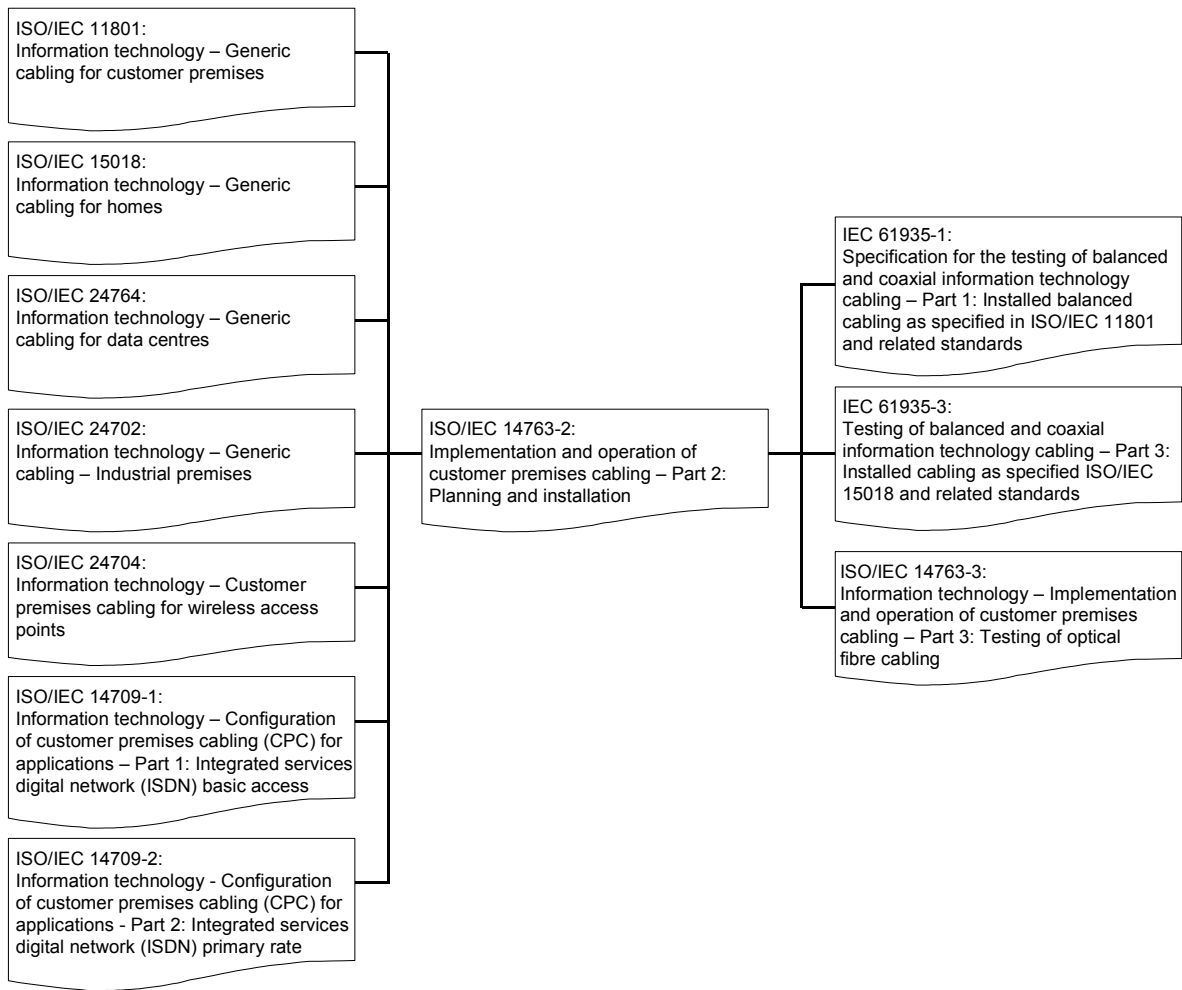
This standard is also relevant to

- architects, building designers and builders,
- main contractors,
- designers, suppliers, installers, inspectors (auditors), building managers, maintainers and owners of information technology cabling,
- public network providers and local service providers,
- end users.

This International Standard is one of a number of documents prepared in support of international standards and technical reports for cabling design produced by ISO/IEC JTC 1/SC 25. Figure 1 shows the inter-relationship between these standards and technical reports.

Users of this standard should be familiar with the applicable cabling design standard.

NOTE Telecommunications infrastructure affects raw material consumption. The infrastructure design and installation methods also influence product life and sustainability of electronic equipment life cycling. These aspects of telecommunications infrastructure impact our environment. Since building life cycles are typically planned for decades, technological electronic equipment upgrades are necessary. The telecommunications infrastructure design and installation process magnifies the need for sustainable infrastructures with respect to building life, electronic equipment life cycling and considerations of effects on environmental waste. Telecommunications designers are encouraged to research local building practices for a sustainable environment and conservation of fossil fuels as part of the design process.



**Figure 1 – Schematic relationship between ISO/IEC 14763-2 and other relevant standards**

# INFORMATION TECHNOLOGY – IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING –

## Part 2: Planning and installation

### 1 Scope

This part of ISO/IEC 14763 specifies requirements for the planning, installation and operation of cabling and cabling infrastructures (including cabling, pathways, spaces, earthing and bonding) in support of generic cabling standards and associated documents.

The following aspects are addressed

- specification of the installation,
- quality assurance,
- installation planning,
- installation practice,
- documentation,
- administration,
- testing,
- inspection,
- operation,
- maintenance,
- repair.

The requirements of Clauses 5 to 14 of this standard are premises-independent and may be amended by the requirements of premises-specific Annexes.

This part of ISO/IEC 14763 excludes

- specific requirements applicable to other cabling systems (e.g. mains power cabling); however, it takes account of the effects other cabling systems may have on the installation of information technology cabling (and vice versa) and gives general advice,
- those aspects of installation associated with the transmission of signals in free space between transmitters, receivers or their associated antenna systems (e.g. wireless, radio, microwave or satellite).

This standard is applicable to certain hazardous environments but does not exclude additional requirements which are applicable in particular circumstances (e.g. electricity supply and electrified railways).

Safety (electrical safety and protection, optical power, fire, etc.) and electromagnetic compatibility (EMC) requirements are outside the scope of this international standard and are covered by other standards and regulations. However, information given in this international standard may be of assistance in meeting these standards and regulations.

## 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 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Chapter 52: Wiring systems*

IEC 60794-2, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

IEC 61082-1, *Preparation of documents used in electrotechnology – Part 1: Rules*

IEC 61084 (all parts), *Cable trunking and ducting systems for electrical installations*

IEC 61156-5 (all parts), *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*

IEC 61156-6 (all parts), *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*

IEC 61386 (all parts), *Conduit systems for cable management*

IEC 61537, *Cable management – Cable tray systems and cable ladder systems*

IEC 61784-5 (all parts), *Industrial communication networks – Profiles*

IEC 61918:2010, *Industrial communication networks – Installation of communication networks in industrial premises*

IEC 61935-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards*

IEC 61935-3, *Testing of balanced and coaxial information technology cabling – Part 3: Installed cabling as specified in ISO/IEC 15018*

IEC 61969-1, *Mechanical structures for electronic equipment – Outdoor enclosures – Part 1: Design guidelines*

IEC 61969-2, *Mechanical structures for electronic equipment – Outdoor enclosures – Part 2: Sectional specification – Coordination dimensions for cases and cabinets*

IEC 62305-4, *Protection against lightning – Electrical and electronic systems within structures*

ISO/IEC 11801:2002, *Information technology – Generic cabling for customer premises*  
Amendment 1 (2008)  
Amendment 2 (2010)

ISO/IEC 14709-1, *Information technology – Configuration of Customer Premises Cabling (CPC) for applications – Part 1: Integrated Services Digital Network (ISDN) basic access*

ISO/IEC 14709-2, *Information technology – Configuration of Customer Premises Cabling (CPC) for applications – Part 2: Integrated services Digital Network (ISDN) primary rate*

ISO/IEC 14763-3, *Information technology – Implementation and operation of customer premises cabling – Part 3: Testing of optical fibre cabling*

ISO/IEC 15018:2004, *Information technology – Generic cabling for homes*  
Amendment 1 (2009)

ISO/IEC 20000-1, *Information technology – Service management – Part 1: Service management system requirements*

ISO/IEC 24702:2006, *Information technology – Generic cabling – Industrial premises*  
Amendment 1 (2009)

ISO/IEC TR 24704:2004, *Information technology – Customer premises cabling for wireless access points*

ISO/IEC 24764:2010, *Information technology – Generic cabling systems for data centres*

ISO/IEC TR 29106, *Information technology – Generic cabling – Introduction to the MICE environmental classification*