# ISO/IEC 11801-4

Edition 1.0 2017-11

# INTERNATIONAL STANDARD

## Information technology – Generic cabling for customer premises
## Part 4: Single-tenant homes



ISO/IEC 11801-4:2017-11(en)



**THIS PUBLICATION IS COPYRIGHT PROTECTED**
**Copyright © 2017 ISO/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 ISO/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 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 It also gives information on projects, replaced and withdrawn publications.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 16 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.

# ISO/IEC 11801-4

Edition 1.0 2017-11

# INTERNATIONAL STANDARD

## Information technology – Generic cabling for customer premises
## Part 4: Single-tenant homes

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.200

ISBN 978-2-8322-5035-8

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

# CONTENTS

FOREWORD ..... 5
INTRODUCTION ..... 7
1 Scope ..... 9
2 Normative references ..... 9
3 Terms, definitions and abbreviated terms ..... 9
3.1 Terms and definitions ..... 9
3.2 Abbreviated terms ..... 10
4 Conformance ..... 11
5 Structure of the generic cabling system ..... 11
5.1 General ..... 11
5.2 Functional elements ..... 12
5.3 Cabling subsystems for ICT and BCT ..... 12
5.3.1 General ..... 12
5.3.2 Primary home cabling subsystem ..... 14
5.3.3 Secondary home cabling subsystem ..... 14
5.4 Cabling structure ..... 14
5.5 Interfaces ..... 15
5.5.1 Equipment interfaces and test interfaces ..... 15
5.5.2 Channel and permanent link ..... 16
5.5.3 Network access cabling ..... 17
5.5.4 External network interface ..... 18
5.6 Accommodation of functional elements ..... 18
5.6.1 General ..... 18
5.6.2 Coverage areas ..... 19
5.6.3 Dimensioning and configuring ..... 20
5.6.4 Connecting hardware ..... 21
5.6.5 Application outlets ..... 21
5.6.6 Equipment cords ..... 21
6 Channel performance requirements ..... 22
6.1 General ..... 22
6.2 Environmental performance ..... 22
6.3 Transmission performance ..... 22
6.3.1 Channel construction ..... 22
6.3.2 Balanced cabling ..... 22
6.3.3 Coaxial cabling ..... 23
6.3.4 Optical fibre cabling ..... 23
7 Link performance requirements ..... 23
7.1 General ..... 23
7.2 Balanced cabling ..... 23
7.3 Coaxial cabling ..... 23
7.4 Optical fibre cabling ..... 23
8 Reference implementations ..... 23
8.1 General ..... 23
8.2 Channel construction ..... 24
8.3 Balanced cabling ..... 24
8.3.1 General ..... 24

8.3.2 ICT channels ..... 25
8.3.3 BCT channels ..... 25
8.4 Coaxial cabling ..... 26
8.5 Optical fibre cabling ..... 26
8.5.1 General ..... 26
8.5.2 Component selection ..... 26
8.5.3 Dimensions ..... 26
9 Cable requirements ..... 26
9.1 General ..... 26
9.2 Balanced cables ..... 27
9.2.1 ICT cabling ..... 27
9.2.2 BCT cabling ..... 27
9.3 Coaxial cables ..... 27
9.4 Optical fibre cables ..... 27
10 Connecting hardware requirements ..... 27
10.1 General requirements ..... 27
10.2 Connecting hardware for balanced cabling ..... 27
10.2.1 General requirements ..... 27
10.2.2 Electrical, mechanical and environmental performance ..... 27
10.3 Connecting hardware for coaxial cabling ..... 28
10.3.1 General requirements ..... 28
10.3.2 Electrical, mechanical and environmental performance ..... 28
10.4 Connecting hardware for optical fibre cabling ..... 28
10.4.1 General requirements ..... 28
10.4.2 Optical, mechanical and environmental performance ..... 28
11 Cords ..... 28
11.1 Jumpers ..... 28
11.2 Balanced cords ..... 28
11.3 Coaxial cords ..... 28
11.4 Optical fibre cords ..... 28
Annex A (informative) Reference implementation of TV and radio applications – use of baluns ..... 29
A.1 Types and locations of baluns ..... 29
A.1.1 General ..... 29
A.1.2 Baluns at the ENI and baluns at the equipment interface toward the PHD ..... 29
A.1.3 Baluns near or in the BO ..... 30
A.1.4 Baluns in the cord between BO and the terminal equipment ..... 31
A.2 Home network interface ..... 31
Bibliography ..... 33

Figure 1 – Relationships between the generic cabling documents produced by ISO/IEC JTC 1/SC 25 ..... 7
Figure 2 – Structure of the generic cabling system ..... 12
Figure 3 – Interconnect and cross-connect models ..... 13
Figure 4 – Interconnect and cross-connects at the PHD ..... 13
Figure 5 – Hierarchical structure of a generic cabling system in support of ICT and BCT applications ..... 14

Figure 6 – Equipment and test interfaces in support of ICT and BCT applications ..... 16
Figure 7 – Channels and permanent links within the home ..... 17
Figure 8 – Examples of interconnection of home and network access cabling ..... 18
Figure 9 – Overview of a generic cabling for home ..... 19
Figure 10 – Interconnection of home cabling subsystems ..... 20
Figure 11 – Reference implementations for ICT and BCT channels (PHD/SHD to TO/BO) ..... 24
Figure A.1 – Balun at the ENI ..... 29
Figure A.2 – Baluns in the PHD ..... 30
Figure A.3 – Balun built into the system outlet ..... 30
Figure A.4 – Balun in the cord between BO and the TE ..... 31
Figure A.5 – Types of HNI ..... 32

Table 1 – Maximum channel lengths for reference implementations of ICT/BCT channels ..... 21
Table 2 – Link length equations ..... 25
Table A.1 – Insertion loss and total sectional slope ..... 32

# INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES

## Part 4: Single-tenant homes

## FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the 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 through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

2) 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 National Committees and ISO member bodies.

3) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC National Committees 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.

4) In order to promote international uniformity, IEC National Committees 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 or ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.

5) ISO and IEC do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. ISO or IEC are 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 ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC National Committees 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.

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 ISO/IEC publication 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 11801-4 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This first edition cancels and replaces ISO/IEC 15018:2004 and Amendment 1:2009. This edition constitutes a technical revision.

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

a) standard re-structured to contain only those requirements that are specific for generic cabling systems installed in homes;

b) the channel performance Class CCCB and related reference implementations have been deleted and are now addressed as distributed building services in ISO/IEC 11801-6;

c) implementation options now include optical fibre in addition to balanced and coaxial media.

ISO/IEC 11801-4 is to be read in conjunction with ISO/IEC 11801-1.

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

A list of all parts in the ISO/IEC 11801 series, published under the general title *Information technology – Generic cabling for customer premises*, can be found on the IEC website.

# INTRODUCTION

The importance of cabling infrastructure is similar to that of other fundamental utilities such as water and energy supply and interruptions to the services provided over that infrastructure can have a serious impact. A lack of design foresight, the use of inappropriate components, incorrect installation, poor administration or inadequate support can threaten quality of service and have commercial consequence for all types of users.

This document specifies generic cabling within a home.

The home can contain one or more buildings (e.g. farm) or be within a building which contains more than one home (e.g. one home in a multi-tenant building).

The campus or backbone cabling connecting individual homes within multi-tenant premises is specified according to the relevant standard (for instance ISO/IEC 11801-1 or IEC 60728).

Generic cabling for distributed building services in homes is specified in ISO/IEC 11801-6, which addresses all of the above premises and spaces within them.

Figure 1 shows the schematic and contextual relationships between the standards relating to information technology cabling produced by ISO/IEC JTC 1/SC 25, namely the ISO/IEC 11801 series of standards for generic cabling design, standards for the installation, operation and administration of generic cabling and for testing of installed generic cabling.

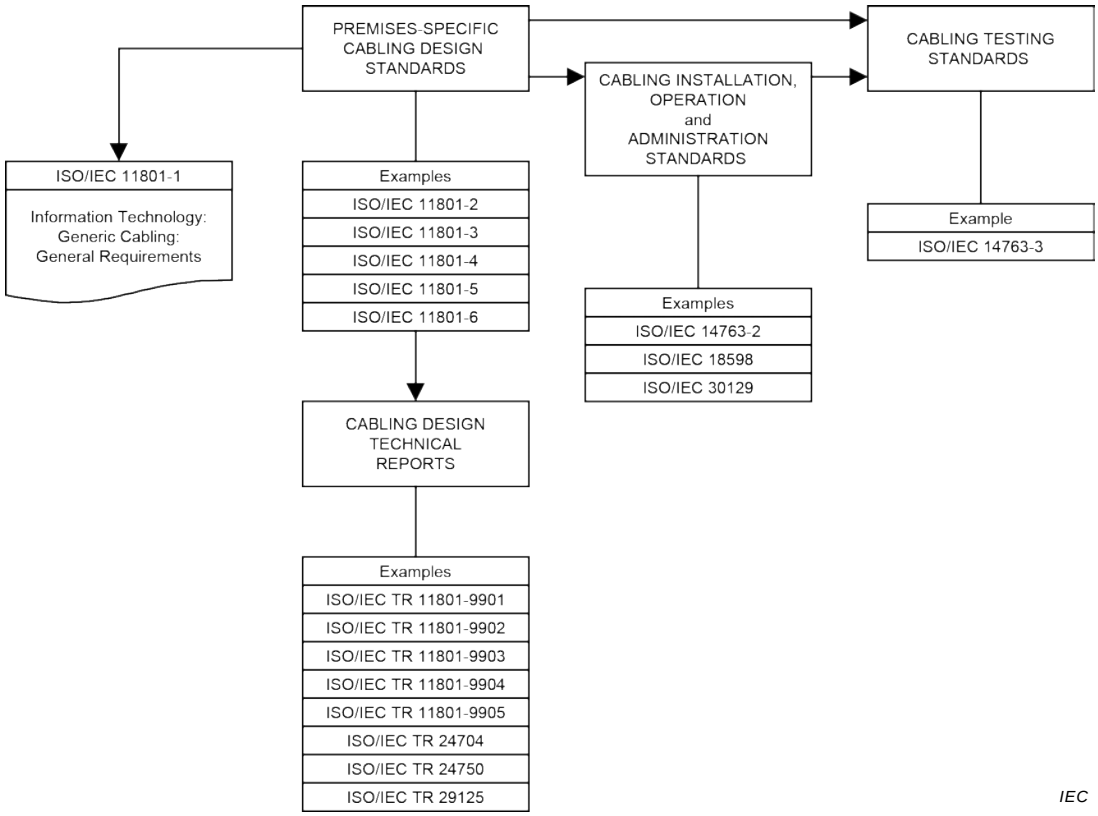



**Figure 1 – Relationships between the generic cabling documents produced by ISO/IEC JTC 1/SC 25**

The generic cabling specified by this document provides users with

a) an application independent system capable of supporting a wide range of applications in a range of installation and operating environments,

b) a flexible scheme such that modifications are both easy and economical,

c) a multi-vendor supply chain within an open market for cabling components.

In addition, this document provides

d) relevant industry professionals with guidance allowing the accommodation of cabling before specific requirements are known, i.e. in the initial planning either for construction or refurbishment and for further deployment as the requirements of areas are defined,

e) industry and standardization bodies with a cabling system which supports current products and provides a basis for future product development and applications standardization,

f) users, designers and manufacturers of application-specific cabling systems with advice on interfacing to this generic cabling,

g) suppliers of cabling components and installers of cabling with relevant requirements,

h) service providers with a distribution system for their services.

Applications addressed in this document include those developed by the technical committees of IEC (including the subcommittees of ISO/IEC JTC 1) and study groups of ITU-T as used to support the following services:

- information and communications technologies (ICT),
- broadcast and communications technologies (BCT).

This document also applies where cabling is designed to support only one of the services listed above.

Physical layer requirements for the applications listed in Annex E of ISO/IEC 11801-1:2017 have been analysed to determine their compatibility with the cabling performance specified in this document and, together with statistics concerning premises geography from different countries and the models described in Clause 6, have been used to develop the requirements for cabling components and to stipulate their arrangement into cabling systems.

As a result, this document

1) specifies a structure for generic cabling supporting a wide variety of applications including, but not restricted to, the applications in ISO/IEC 11801-1:2017, Annex E,

2) adopts balanced cabling channel and link Classes D, E, $E_A$, F, $F_A$ and BCT-B specified in ISO/IEC 11801-1,

3) adopts coaxial cabling channel and link Classes BCT-C specified in ISO/IEC 11801-1,

4) adopts optical fibre cabling channel and link requirements specified in ISO/IEC 11801-1,

5) adopts component requirements, specified in ISO/IEC 11801-1, and specifies cabling implementations that ensure performance of permanent links and of channels that meet or exceed the requirements of a specified group (e.g. Class) of applications.

Life expectancy of generic cabling systems can vary depending on environmental conditions, supported applications, aging of materials used in cables, and other factors such as access to pathways (campus pathways are more difficult to access than building pathways). With appropriate choice of components, generic cabling systems meeting the requirements of this document are expected to have a life expectancy of at least ten years.

This document has taken into account requirements specified in application standards listed in ISO/IEC 11801-1:2017, Annex E. It refers to International Standards for components and test methods whenever appropriate International Standards are available.

# INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES

## Part 4: Single-tenant homes

## 1 Scope

This part of ISO/IEC 11801 specifies generic cabling for single-tenant homes. A home can contain one or more buildings or can be within a building that contains more than one home. It covers balanced cabling, optical fibre cabling and coaxial cabling.

This document specifies a generic cabling for two groups of applications:

1) information and communications technologies (ICT),
2) broadcast and communications technologies (BCT).

This document specifies directly or via reference to ISO/IEC 11801-1

a) the structure and minimum configuration for generic cabling within homes,
b) the interfaces at the telecommunications outlet (TO) and broadcast outlet (BO),
c) the performance requirements for cabling links and channels,
d) the implementation requirements and options,
e) the performance requirements for cabling components,
f) the conformance requirements and verification procedures.

Safety and electromagnetic compatibility (EMC) requirements are outside the scope of this document, and are covered by other standards and by regulations. However, information given by this document can be of assistance.

## 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 60728 (all parts), *Cable networks for television signals, sound signals and interactive services*

IEC 61754-20 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 20: Type LC connector family*

ISO/IEC 11801-1:2017, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 14763-2, *Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*

ISO/IEC 30129, *Information technology – Telecommunications bonding networks for buildings and other structures*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11801-1, ISO/IEC 14763-2 and the following apply.

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

**3.1.1**
**application outlet**
telecommunications outlet or broadcast outlet

**3.1.2**
**balun**
device to provide impedance transformation between balanced and unbalanced components

**3.1.3**
**broadcast outlet**
fixed connecting device which provides an interface to the terminal equipment

**3.1.4**
**coverage area**
area within a home covered by any application

**3.1.5**
**home**
physical structure used as a dwelling place

EXAMPLE A house or an apartment.

Note 1 to entry: This can be an individual building, part of a larger building or more than one building.

**3.1.6**
**home network interface**
interface for access to the network for distribution of television signals, sound signals and interactive services inside a single-tenant home

**3.1.7**
**primary home cable**
cable that connects a primary home distributor to a telecommunications outlet or broadcast outlet or to a secondary home distributor where present

**3.1.8**
**primary home distributor**
distributor from which the primary home cable starts

**3.1.9**
**secondary home cable**
cable that connects a secondary home distributor to a telecommunications outlet or broadcast outlet

**3.1.10**
**secondary home distributor**
distributor used to provide additional infrastructure flexibility and/or allocate transmission equipment between the primary home distributor and coverage areas (e.g. for homes with multiple floors)

### 3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO/IEC 11801-1 and the following apply.

BO broadcast outlet

ENI external network interface

HNI home network interface

PHD primary home distributor

SHD secondary home distributor

TV television

UHF ultra-high frequency

VHF very high frequency

## 4 Conformance

For a cabling installation to conform to this document the following applies.

a) The configuration and structure shall conform to the requirements outlined in Clause 5.

b) Channels shall meet the requirements specified in Clause 6 when subjected to environment conditions, local to the channels (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6. This shall be achieved by one of the following:

   1) a channel design and implementation ensuring that the prescribed channel performance of Clause 6 is met;

   2) attachment of appropriate components to a permanent link design meeting the prescribed performance class of Clause 7. Channel performance shall be ensured where a channel is created by adding more than one cord to either end of a link meeting the requirements of Clause 7;

   3) for $E_1$ environments, using the reference implementations of Clause 8 and compatible cabling components conforming to the requirements of Clauses 9, 10 and 11 based upon a statistical approach of performance modelling.

      NOTE 1 This approach is not applicable to Class BCT-B cabling.

c) The interfaces to the cabling at the TO and BO shall conform to the requirements of Clause 10 with respect to mating interfaces and performance when subjected to environment conditions, local to the connecting hardware (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6.

d) Connecting hardware at other places in the cabling structure shall meet the performance requirements specified in Clause 10 when subjected to environment conditions, local to the connecting hardware (see NOTE 2 below), as defined by the applicable environmental Class(es) of Clause 6.

e) The requirements of ISO/IEC 14763-2 and ISO/IEC 30129 shall be met.

This document does not specify which tests and sampling levels should be adopted. Test methods to assess conformance with the channel and link requirements of Clause 6 and Clause 7, respectively, are specified in ISO/IEC 11801-1. The test parameters to be measured, the sampling levels and the treatment of measured results to be applied for particular installation shall be defined in the installation specification and quality plan for that installation prepared in accordance with ISO/IEC 14763-2.

In the absence of the channel, the conformance of the link shall be used to verify conformance with this document.

Specifications marked "ffs" are preliminary specifications, and are not required for conformance to this document.

NOTE 2 The applicable environmental classification of ISO/IEC 11801-1:2017, 6.2.1, local to the cabling or cabling component(s), is that of the environment immediately adjacent to the cabling or cabling component(s).

## 5 Structure of the generic cabling system

### 5.1 General

Clause 5 identifies the functional elements of a generic cabling system to support ICT and/or BCT applications, describes how they are connected together to form subsystems and identifies the interfaces at which application-specific components are connected to the generic cabling infrastructure.