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Edition 5.0 2023-02

INTERNATIONAL STANDARD

Cable networks for television signals, sound signals and interactive services – Part 11: Safety



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Cable networks for television signals, sound signals and interactive services – Part 11: Safety

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CABLE NETWORKS FOR TELEVISION SIGNALS, SOUND SIGNALS AND INTERACTIVE SERVICES –

Part 11: Safety

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IEC 60728-11 has been prepared by technical area 5: Cable networks for television signals, sound signals and interactive services, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

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

a) Replacement of references to IEC 60065 and IEC 60950-1 with references to IEC 62368-1.
b) Addition of subclauses 4.4 to 4.6.
c) Revised definition of class I equipment, class II equipment, main earthing terminal, see 3.1.6, 3.1.8 and 3.1.31.
d) Addition of definitions for harm, hazard, ordinary person, instructed person, skilled person, see 3.1.22, 3.1.23, 3.1.39, 3.1.40 and 3.1.41.

e) Additional requirement to provide details on the equipment installed, see 4.1.

f) Additional mechanical, design and construction requirements, see 4.2.2.

g) Changes to the accessible part requirements, see 4.2.3.

h) The current carrying capacity and dielectric strength of components is now obligatory, see 8.1.3.

i) The assessment of the risk of lightning strike is now obligatory, see Figure 10.

j) Extension of remote feeding voltage on subscriber feeder, see Table 1.

The text of this standard is based on the following documents:

Draft	Report on voting
100/3866/FDIS	100/3882/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The list of all the parts of the IEC 60728 series, under the general title *Cable networks for television signals, sound signals and interactive services,* 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 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.

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

Standards and other deliverables of the IEC 60728 series deal with cable networks including equipment and associated methods of measurement for headend reception, processing and distribution of television and sound signals and for processing, interfacing and transmitting all kinds of data signals for interactive services using all applicable transmission media. These signals are typically transmitted in networks by frequency-multiplexing techniques.

This includes for instance:

- regional and local broadband cable networks,
- extended satellite and terrestrial television distribution networks and systems,
- individual satellite and terrestrial television receiving systems,

and all kinds of equipment, systems and installations used in such cable networks, distribution and receiving systems.

The extent of this standardization work is from the antennas and/or special signal source inputs to the headend or other interface points to the network up to the terminal input of the customer premises equipment.

The standardization work will consider coexistence with users of the RF spectrum in wired and wireless transmission systems.

The standardization of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals, etc.) as well as of any coaxial, balanced and optical cables and accessories thereof is excluded.

CABLE NETWORKS FOR TELEVISION SIGNALS, SOUND SIGNALS AND INTERACTIVE SERVICES –

Part 11: Safety

1 Scope

This part of IEC 60728 deals with the safety requirements applicable to fixed sited systems and equipment. As far as applicable, it is also valid for mobile and temporarily installed systems, for example, caravans.

Additional requirements may be applied, for example, referring to:

- electrical installations of buildings and overhead lines,
- other telecommunication services distribution systems,
- water distribution systems,
- gas distribution systems,
- lightning systems.

This document is intended to provide requirements specifically for the safety of the system, personnel working on it, subscribers and subscriber equipment. It deals only with safety aspects and is not intended to define a standard for the protection of the equipment used in the system.

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 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015
IEC 60364-4-44:2007/AMD2:2018

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*
IEC 60364-5-54:2011/AMD1:2021

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 62305-2:2010, *Protection against lightning – Part 2: Risk management*

IEC 62305-3:2010, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62368-1:2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 62561-1:2017, *Lightning protection system components (LPSC) – Part 1: Requirements for connection components*

IEC 62561-2, *Lightning protection system components (LPSC) – Part 2: Requirements for conductors and earth electrodes*

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

ISO/IEC 30129:2015, *Information technology – Telecommunications bonding networks for buildings and other structures*
ISO/IEC 30129:2015/AMD1:2019

EN 50575:2014, *Power, control and communication cables – Cables for general applications in construction works subject to reaction to fire requirements*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions 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
air-termination system
part of an external LPS using metallic elements such as rods, mesh conductors or catenary wires intended to intercept lightning flashes

[SOURCE: IEC 62305-3:2010, 3.6]

3.1.2
amplifier
device to compensate for attenuation

3.1.3
attenuation
ratio of the input power to the output power

Note 1 to entry: The ratio is expressed in decibels.

3.1.4
cable networks
television signals, sound signals and interactive services, regional and local broadband cable networks, extended satellite and terrestrial television distribution networks or systems and individual satellite and terrestrial television receiving systems

Note 1 to entry: These networks and systems can be used in downstream and upstream directions.

3.1.5
CATV network
regional and local broadband cable networks designed to provide sound and television signals as well as signals for interactive services to a regional or local area

Note 1 to entry: Originally defined as Community Antenna Television network.

3.1.6
class I equipment
equipment in which protection against electric shock does not rely on basic insulation only, but that includes a supplementary safeguard in such a way that means are provided for the connection of accessible conductive parts to the protective earthing conductor in the fixed wiring of the installation

Note 1 to entry: For equipment intended for use with a flexible cord or cable, this provision includes a protective conductor as part of the flexible cord or cable.

Note 2 to entry: Class I equipment can be provided with class II construction.

Note 3 to entry: This entry is based on IEC 62368-1:2018, 3.3.15.1.

3.1.7
class II construction
part of an equipment for which protection against electric shock relies upon double insulation or reinforced insulation

Note 1 to entry: This entry is based on IEC 62368-1:2018, 3.3.15.2.

3.1.8
class II equipment
equipment in which protection against electric shock does not rely on basic insulation only, but in which a supplementary safeguard is provided, there being no provision for protective earthing or reliance upon installation conditions

Note 1 to entry: This entry is based on IEC 62368-1:2018, 3.3.15.3.

3.1.9
earthing arrangement
all electrical means involved in the earthing of a system, installation or equipment

Note 1 to entry: Electric connection and devices used for earthing are examples of electrical means.

[SOURCE: IEC 60050-195:2021, 195-02-20, modified – The preferred term "grounding arrangement (US)" has been deleted.]

3.1.10
earthing conductor
conductor forming a conductive path between a conductive part and an earth electrode

EXAMPLE A conductor connected between a main earthing terminal or busbar and an earth electrode.

[SOURCE: IEC 60050-195:2021, 195-02-03, modified – The preferred term "grounding conductor (US)" has been deleted.]

3.1.11
earth electrode
conductive part that is in electric contact with local earth, directly or through an intermediate conductive medium

[SOURCE: IEC 60050-195:2021, 195-02-01, modified – The preferred term "grounding electrode (US)" has been deleted.]

3.1.12
earthing terminal
terminal provided on equipment and intended for the electric connection with the earthing arrangement

[SOURCE: IEC 60050-195:2021, 195-02-31, modified – The preferred term "grounding terminal (US)" has been deleted.]

3.1.13
electric shock
physiological effect resulting from an electric current passing through a human or livestock

[SOURCE: IEC 60050-195:2021, 195-01-04, modified – The specific use <protection against electric shock> has been deleted.]

3.1.14
equipotential bonding
set of electric connections intended to achieve equipotentiality between conductive parts

[SOURCE: IEC 60050-195:2021, 195-01-10]

3.1.15
equipotential bonding bar
busbar which is part of an equipotential bonding system and enables the electric connection of a number of conductors for equipotential bonding purposes

[SOURCE: IEC 60050-826:2022, 826-13-35]

3.1.16
protective bonding conductor
protective conductor provided for protective-equipotential-bonding

[SOURCE: IEC 60050-195:2021, 195-02-10.]

3.1.17
exposed conductive part
conductive part of equipment that can be touched and that is not live under normal conditions, but that can become live when basic insulation fails

[SOURCE: IEC 60050-195:2021, 195-06-10]

3.1.18
extended terrestrial television distribution network or system
distribution network or system designed to provide sound and television signals received by terrestrial receiving antenna to households in one or more buildings

Note 1 to entry: This kind of network or system can possibly be combined with a satellite antenna for the additional reception of TV and/or radio signals via satellite networks.

Note 2 to entry: This kind of network or system can also carry other signals for special transmission systems (e.g. MoCA or Wi-Fi) in the return path direction.

3.1.19
extraneous conductive part
conductive part not forming part of the electrical installation and that is likely to introduce an electric potential, generally the electric potential of a local earth

[SOURCE: IEC 60050-195:2021, 195-06-11]

3.1.20
feeder
transmission path forming part of a cable network

Note 1 to entry: Such a path may consist of a metallic cable, optical fibre, waveguide or any combination of them.

Note 2 to entry: By extension, the term is also applied to paths containing one or more radio links.

3.1.21
galvanic isolator
device providing electrical isolation below a certain frequency range

3.1.22
harm
physical injury or damage to persons, property, and domestic animals

Note 1 to entry: Physical injury or damage to persons also includes health aspects.

Note 2 to entry: This entry is based on ISO/IEC Guide 51:2014, 3.1.

3.1.23
hazard
potential source of harm

Note 1 to entry: The term hazard can be qualified in order to define its origin (e.g. electrical hazard, mechanical hazard) or the nature of the potential harm (e.g. electric shock hazard, cutting hazard, toxic hazard, fire hazard).

Note 2 to entry: This entry is based on ISO/IEC Guide 51:2014, 3.2.

3.1.24
hazardous voltage
electrical condition of an object from which a hazardous touch current (electric shock) could be drawn

[SOURCE: IEC 60065:2014, 2.6.10, modified – The term "hazardous live" has been replaced by "hazardous voltage".]

3.1.25
headend
equipment connected between receiving antennas or other signal sources and the remainder of the cable network, to process the signals to be distributed

3.1.26
home distributor
HD
physical distribution point within a home where cables terminate

Note 1 to entry: This note applies to the French language only.

3.1.27
individual terrestrial television receiving system
system designed to provide sound and television signals received via terrestrial broadcast networks to an individual household

Note 1 to entry: This kind of system can also carry other signals for special transmission systems (e.g. MoCA or Wi-Fi) in the return path direction.

3.1.28
let-go threshold current
value of the maximum electric current through the human body at which that human being can release himself or herself

[SOURCE: IEC 60050-195:2021, 195-03-09.]

3.1.29
lightning protection system
LPS
complete system used to reduce physical damage due to lightning flashes to a structure

Note 1 to entry: It consists of both external and internal lightning protection systems.

[SOURCE: IEC 62305-3:2010, 3.1]

3.1.30
local broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a local area (e.g. one town or one village)

3.1.31
main earthing terminal
main earthing bar
terminal or busbar that is part of the earthing arrangement of an installation and enabling the electric connection of a number of conductors used for earthing or bonding purposes

[SOURCE: IEC 60050-195:2021, 195-02-33, modified – The preferred terms "main grounding terminal (US)" and "main grounding busbar (US)" have been deleted and, in the term, "busbar" has been abbreviated to "bar".]

3.1.32
MATV network
extended terrestrial television distribution networks or systems designed to provide sound and television signals received by terrestrial receiving antenna to households in one or more buildings

Note 1 to entry: Originally defined as master antenna television network.

Note 2 to entry: This kind of network or system can possibly be combined with a satellite antenna for the additional reception of TV and/or radio signals via satellite networks.

Note 3 to entry: This kind of network or system can also carry other signals for special transmission systems (e.g. MoCA or Wi-Fi) in the return path direction.

3.1.33
metal installation
extended metal items in the structure to be protected which may form a path for lightning current, such as pipework, staircases, elevator guide rails, ventilation, heating and air conditioning ducts, and interconnected reinforcing steel

[SOURCE: IEC 62305-3:2010, 3.18]

3.1.34
multiple-stranded conductor
stranded conductor consisting of a number of groups of wires assembled together in one or more helical layers, the wires in each group being either bunched or stranded

[SOURCE: IEC 60050-461:2008, 461-01-10]

3.1.35
natural component of LPS
conductive component installed not specifically for lightning protection which can be used in addition to the LPS or in some cases could provide the function of one or more parts of the LPS

Note 1 to entry: Examples of the use of this term include:

- natural air-termination;
- natural down-conductor;
- natural earthing electrode.

[SOURCE: IEC 62305-3:2010, 3.15]

3.1.36
network interface unit
NIU
interface between the cable network and the network inside an apartment

Note 1 to entry: The network interface unit can contain an overvoltage protective element and/or a galvanic isolation.

Note 2 to entry: This note applies to the French language only.

3.1.37
neutral conductor
conductor electrically connected to the neutral point and capable of contributing to the distribution of electric energy

[SOURCE: IEC 60050-195:2021, 195-02-06.]

3.1.38
PEN conductor
conductor combining the functions of both a protective earthing conductor and a neutral conductor

[SOURCE: IEC 60050-195:2021, 195-02-12.]

3.1.39
ordinary person
person other than an electrically instructed person and an electrically skilled person

Note 1 to entry: Ordinary persons include not only users of the equipment, but also all persons who may have access to the equipment or who may be in the vicinity of the equipment. Under normal operating conditions or abnormal operating conditions, ordinary persons should not be exposed to parts comprising energy sources capable of causing pain or injury. Under single fault condition, ordinary persons should not be exposed to parts comprising energy sources capable of causing injury.

3.1.40
electrically instructed person
person who has been electrically instructed and trained by an electrically skilled person, or who is supervised by an electrically skilled person, to identify energy sources that may cause pain and to take precautions to avoid unintentional contact with or exposure to those energy sources

Note 1 to entry: Under normal operating conditions, abnormal operating conditions or single fault conditions, electrically instructed persons should not be exposed to parts comprising energy sources capable of causing injury.

3.1.41
electrically skilled person
person who has training or experience in the technology of the equipment, particularly in knowing the various energies and energy magnitudes used in the equipment

Note 1 to entry: Electrically skilled persons are expected to use their training to and experience to recognise energy sources capable of causing pain or injury and to take action for protection from injury from those energies. Electrically skilled persons should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

3.1.42
protective conductor
PE conductor
conductor provided for purposes of electrical safety

[SOURCE: IEC 60050-195:2021, 195-12-09, modified – The term "PE conductor" has been added.]

3.1.43
receiver lead
lead, which connects the system outlet to the subscriber equipment

3.1.44
receiving antenna
device with proper electrical characteristics that intercepts desired signals in the atmosphere and transfers these to the remainder of the cable network

3.1.45
regional broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a regional area covering several towns and/or villages

3.1.46
remote power feeding voltage
voltage for supplying power to network equipment via the cable network or a separate line

3.1.47
safety distance
minimum distance between two conductive parts within the space to be protected between which no dangerous sparking can occur

3.1.48
SMATV network
extended distribution networks or systems designed to provide sound and television signals received by satellite receiving antenna to households in one or more buildings

Note 1 to entry: Originally defined as satellite master antenna television network.

Note 2 to entry: This kind of network or system can possibly be combined with terrestrial antennas for the additional reception of TV and/or radio signals via terrestrial networks.

Note 3 to entry: This kind of network or system can also carry control signals for satellite switched systems or other signals for special transmission systems (e.g. MoCA or Wi-Fi) in the return path direction.

3.1.49
splitter
spur unit
device in which the signal power at the (input) port is divided equally or unequally between two or more (output) ports

Note 1 to entry: Some forms of this device may be used in the reverse direction for combining signal energy.

3.1.50
spur feeder
feeder to which splitters, subscriber taps or looped system outlets are connected

3.1.51
subscriber equipment
equipment at the subscriber premises such as receivers, tuners, decoders, video recorders, multimedia terminals

3.1.52
subscriber feeder
feeder connecting a subscriber tap to a system outlet or, where the latter is not used, direct to the subscriber equipment.

Note 1 to entry: The subscriber feeder can consist of either a coaxial cable, a fibre optic cable or an armoured fibre optic cable.

3.1.53
subscriber tap
device for connecting a subscriber feeder to a spur feeder

3.1.54
surge protective device
device that is intended to limit transient overvoltage and divert surge currents

Note 1 to entry: A surge protective device contains at least one non-linear component.

3.1.55
surge suppressor
device designed to limit the surge voltage between two parts within the space to be protected, such as spark gap, surge diverter or semiconductor device

3.1.56
system outlet
device for interconnecting a subscriber feeder and a receiver lead

3.1.57
touch voltage
<effective> voltage between conductive parts when touched simultaneously by a human being or livestock

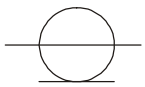
Note 1 to entry: The value of the touch voltage is influenced by the impedance of the human being or the livestock in electric contact with these conductive parts.

[SOURCE: IEC 60050-195:2021, 195-05-11.]

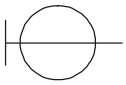
3.1.58
transfer point
interface between the cable network and the building's internal network, each of which may be separately owned and which may contain a voltage-dependent device and/or galvanic isolator

3.2 Symbols

The following graphical symbols are used in the figures of this document. These symbols are either listed in IEC 60617 or based on symbols defined in IEC 60617.


Coaxial conductor
[IEC 60617-S00011:
2001-07-01]


Amplifier
[IEC 60617-S01240:
2001-07-01]


System outlet


Galvanic isolator



Overvoltage protective device



Coaxial overvoltage protective device

3.3 Abbreviated terms

AC	alternating current
AM	amplitude modulation
ATS	air termination system
CATV	community antenna television (network)
COPD	coaxial overvoltage protective device
DC	direct current
DTH	direct to home
HD	home distributor
FTTH	fibre to the home
IP	international protection (class)
IT	isolated earth
LNB	low noise block converter
LPS	lightning protection system
LSR	lightning stroke risk
MATV	master antenna television (network)
MDU	multi dwelling unit
N	neutral (conductor)

NIU	network interface unit
NTP	network termination point
OPD	overvoltage protective device
OTP	optical transfer point
PE	protective conductor
PEN	PEN conductor
RCD	residual current device
RF	radio frequency
RMS	root mean square
SMATV	satellite master antenna television (network)
SPD	surge protective device
STB	set top box
TV	television

4 Fundamental requirements

4.1 General

The cable network shall be so designed, constructed and installed as to present no danger, either under normal condition or abnormal (any single fault) condition, to persons, animals, personnel working on, or externally inspecting, the system, or to any other person, providing particularly

- personal protection against electric shock,
- personal protection against physical injury,
- protection against fire hazard.

For further details, see IEC 60364-1:2005, IEC 60364-4-44:2007/AMD1:2015, IEC 60364-5-52:2009 and IEC 60364-5-54:2011.

The above does not apply to electrically instructed or electrically skilled persons (according to 3.1.40 or 3.1.41) working on the equipment, who can be exposed to live parts of the equipment by the removal of protective covers. Electrically instructed and electrically skilled persons shall have minimum protection against contact with live parts.

Equipment intended to be installed in a cable network shall be provided with the following information:

a) The name of the manufacturer or supplier, or the brand name or trademark, shall be clearly printed on the electrical equipment or, where that is not practicable, on its packaging. If appropriate, there shall also be marking to identify the date and place of manufacture.

b) Information provided with the equipment shall also include instructions for safe installation (assembly), maintenance, cleaning, operation and storage.

c) Where risks remain despite all the measures adopted, or in the case of potential risks which are not evident, appropriate warnings shall be provided.

d) The essential characteristics, the recognition and observance of which will ensure that equipment will be used safely and in applications for which it was intended and for which it can reasonably be foreseen, shall be marked legibly and indelibly on the equipment or, if this is not possible, in the accompanying instructions for use.