

INTERNATIONAL STANDARD

IEC
60728-11

Second edition
2005-01

Cable networks for television signals, sound signals and interactive services –

Part 11: Safety

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE NETWORKS FOR TELEVISION SIGNALS,
SOUND SIGNALS AND INTERACTIVE SERVICES –****Part 11: Safety****FOREWORD**

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International Standard 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.

This second edition cancels and replaces the first edition published in 1997 and its amendment 1 (2000). This edition constitutes a technical revision.

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

- a) Clause 6, Equipotential bonding and earthing, has been rewritten.
- b) Clause 8, Remote power feeding in cable networks, has been rewritten.
- c) New informative Annex A: Use of shield wires to protect installations with coaxial cables
- d) New informative Annex B: Special conditions using IT power line networks

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

FDIS	Report on voting
100/847A/FDIS	100/896/RVD

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

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

IEC 60728 consists of the following parts, under the general title *Cable networks for television signals, sound signals and interactive services*:

- Part 1: Methods of measurement and system performance
- Part 2: Electromagnetic compatibility for equipment
- Part 3: Active coaxial wideband distribution equipment
- Part 4: Passive coaxial wideband distribution equipment
- Part 5: Headend equipment
- Part 6: Optical equipment
- Part 7: Hybrid fibre coax outside plant status monitoring
- Part 9: Interfaces of cabled distribution systems for digitally modulated signals
- Part 10: System performance of return path
- Part 11: Safety (this publication)
- Part 12: Electromagnetic compatibility of systems

The following differences exist in some countries.

Clause 6:

- The following parts of the standard cannot be used in areas with an IT power distribution system:
 - Examples of installations inside buildings described in 6.2g) and shown in Figures 3 and 4 cannot be used in areas with an IT-network (Norway).
 - Examples of installations inside buildings described in 6.2i) and shown in Figure 6 should be equipped with a galvanic isolator separating local earth from the cable network distribution lines (Norway).
 - Examples of installations inside buildings described in 6.2.11 and shown in Figure 7 should be equipped with a galvanic isolator separating local earth from the cable network distribution lines (Norway).
 - Subclauses 6.3.4, 6.3.4.1, 6.3.4.2 and 6.3.5 have no relevance for cable networks in areas with an IT power distribution system (Norway).
- Common earthing is not permitted due to electrical earthing conditions (France).

Subclause 6.2:

- Galvanic isolation should withstand a voltage of 1 kV r.m.s. during 1 min (France).
- The equipotential bonding method is not used in Japan (Japan).
- Earthing to gas networks as shown in Figures 3 and 4 is not admitted (Japan, Poland).

Subclause 8.1:

- Remote power feeding voltage shall not exceed 90 V AC r.m.s and the line-powering current shall not exceed 15 A (Japan).

Clause 9:

- The French regulation (arrêté interministériel, 2 April 1991) specifies, among many other parameters, the minimum distance between electric supply wires (isolated and non-isolated, low-voltage and high-voltage) and any other installation (for example, buildings, antennas, telecommunication lines, etc.). The main clauses of this regulation, which concern the cable networks, are Clauses 12, 25, 26, 33, 33bis, 38, 49, 51, 52 and 63. Clause 9 of this standard specifies distances of 10 mm (indoors) and 20 mm (outdoors), and this is not sufficient to cover overhead cables. As an example, the minimum distance between an overhead telecommunication line and an overhead low-voltage (up to 1 kV) electricity supply line should be 1 m (Clause 33). This distance may be reduced under specific conditions (Clauses 51, 52 and 63). This regulation specifies also the minimum distance from high-voltage lines. This distance varies from 1 m to 4 m depending on the voltage, on the isolation of the cable and on the location (built-up area or not) (Clauses 33 and 63) (France).
- For antennas in proximity of voltages up to 7 000 V, the following applies in Japan:
 1. Low voltage: ≤ 600 V a.c. or ≤ 750 V d.c.;
Cable: ≥ 30 cm distance;
Isolated wire: ≥ 60 cm distance.
 2. High voltage: > 600 V a.c. or > 750 V d.c.;
Cable: ≥ 40 cm distance;
Isolated wire: ≥ 80 cm distance.

Clause 10:

- The resistance to the equipotential point is not applied, because the bonding method is not used in Japan. Japanese regulations specify applying the safety terminal. The safety terminal withstands a continuous a.c. test voltage of 1 000 V for a period of not less than 1 min and maintains an insulation resistance of not less than 1,0 M Ω . Installation of a safety terminal at the junction point between the indoor cabling and the feeder cable of the distribution system is shown in Figure 14 (Japan).

Clause 11:

- A lightning protection system is applied in Japan for protection against atmospheric over-voltages and for the elimination of potential differences. In Japan, installation of a lightning protection system is necessary in the case where the topmost height of the construction exceeds 20 m, except in those cases where the construction is inside the safety zone of another lightning protection system (see Figure 15) (Japan).

Subclause 11.1.1:

- An equipotential bonding conductor is not used, because the bonding method is not used in Japan (Japan).

Subclause 11.2.2:

- An earth termination system is not used in Japan. Only a lightning protection system is applied (see Figure 15) (Japan).
- As the conductivity of earth in Finland is lower than what is normal in many other countries, the earthing electrodes in 11.2.2 should be as shown in Figures 16 a), 16 b) or 16 c) (Finland).

- The earthing conductors have the following requirements (Japan):
 - a) Conductors for a lightning rod: $\geq 30 \text{ mm}^2 \text{ Cu}$.
 - b) For an earthing resistance of $\leq 10 \Omega$, the diameter has to be at least 2,6 mm Cu.
 - c) For an earthing resistance of $\leq 100 \Omega$, indoors, the diameter has to be at least 1,6 mm Cu or the cross-sectional area has to be at least $2 \text{ mm}^2 \text{ Cu}$
 - d) For an earthing resistance of $\leq 100 \Omega$, outdoors, the diameter has to be at least 2,6 mm Cu or the cross-sectional area has to be at least $5,5 \text{ mm}^2 \text{ Cu}$.

Subclause 12.2:

- The bending moment of a mast up to 6 m is not applied in Japan. In Japan, the mast shall not be destroyed by the following wind pressures (Japan):
 1. For an antenna height $h < 16 \text{ m}$, the wind pressure is $60 \sqrt{h}$, in kg per m^2 .
 2. For an antenna height $h \geq 16 \text{ m}$, the wind pressure is $120 \sqrt[4]{h}$, in kg per m^2 .

Subclause 12.3:

- The required wind pressure value is 700 N/m^2 for buildings up to 30 m (Finland).

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Standards of the IEC 60728 series deal with cable networks including equipment and associated methods of measurement for head-end reception, processing and distribution of television signals, sound signals, interactive multimedia signals, interfaces and their associated data signals, using all applicable transmission media.

This includes

- CATV networks;
- MATV networks and SMATV networks;
- individual receiving networks;

and all kinds of equipment, systems and installations installed in such networks.

The extent of this standardization work is from the antennas, special signal source inputs to the head-end or other interface points to the network up to the terminal input.

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

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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 standard is intended to provide 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 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 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

IEC 60825-1:2001, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*

IEC 60825-2:2000, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61024-1:1990, *Protection of structures against lightning – Part 1: General principles*

ISO 3864:2002, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

EN 50117 (all parts), *Coaxial cables used in cabled distribution networks*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Some terms have been taken from IEC 60050-195 and IEC 60050-826.

3.1.1

amplifier

device to compensate for attenuation

3.1.2

attenuation

decibel ratio of the input power to the output power

3.1.3

cable networks (for television signals, sound signals and interactive services)

general overall term used to define CATV-networks, MATV-networks, SMATV-networks and individual receiving networks; these networks can be used in downstream and upstream directions

3.1.4

CATV network or community antenna television network

network designed to provide sound and television signals as well as signals for interactive services to communities

3.1.5

earthing arrangement

all the electric connections and devices involved in the earthing of a system, an installation and equipment

[IEV 195-02-20]

3.1.6

earthing conductor

protective conductor connecting the main earthing terminal or bar to the earth electrode

[IEV 826-04-07]

3.1.7

earth electrode

conductive part or a group of conductive parts in intimate contact with and providing an electrical connection with earth

[IEV 826-04-02]

3.1.8

earthing terminal

connection point by means of which the earthing or grounding of a conducting part of an equipment is accomplished

3.1.9

electric shock

pathophysiological effect resulting from an electric current passing through a human or animal body

[IEV 826-03-04]

3.1.10

equipotential bonding

electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential

[IEV 826-04-09]

3.1.11

equipotential bonding bar

bar to which, for example, extraneous conductive parts (see IEV 826-03-03), metal sheet of electrical power and telecommunication cables and other cables can be bonded

3.1.12

equipotential bonding conductor

protective conductor for ensuring equipotential bonding

[IEV 826-04-10]

3.1.13

feeder

transmission path forming part of a cable network. Such a path may consist of a metallic cable, optical fibre, waveguide or any combination of them. By extension, the term is also applied to paths containing one or more radio links

3.1.14

galvanic isolator

device providing electrical isolation below a certain frequency range.

3.1.15

hazardous voltage

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

[IEC 60065:2001, definition 2.6.10]

3.1.16

head-end

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

3.1.17

individual receiving network

network designed to provide sound and television signals as well as signals for interactive services to an individual household

3.1.18

lightning protection system (LPS)

complete system used to protect a space against the effects of lightning consisting of both external and internal lightning protection systems

NOTE In particular cases, an LPS may consist of an external LPS or an internal LPS only (see IEC 61024-1).

3.1.19

main earthing terminal; main earthing bar

terminal or bar provided for the connection of protective conductors, including equipotential bonding conductors and conductors for functional earthing, if any, to the means of earthing

[IEV 826-04-08]