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Edition 5.0 2017-11
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Cable networks for television signals, sound signals and interactive services
Part 3: Active wideband equipment for cable networks

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

Part 3: Active wideband equipment for cable networks

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60728-3 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 fifth edition cancels and replaces the fourth edition published in 2010. This edition constitutes a technical revision.

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

a) extension of upper frequency range limit for cable network equipment in the forward path from 1 000 MHz to 1 218 MHz (optional up to 1 794 MHz);
b) extension of upper frequency range limit for cable network equipment in the return path from 85 MHz to 204 MHz;
c) integration and update of IEC 60728-3-1 content;
d) integration and update of the Technical Specification CLC/TS 50083-3-3 content;
e) deletion of specifications and test methods for obsolete analogue parameters;
f) additional normative references;
g) additional terms and definitions and abbreviations.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
100/2975/FDIS	100/2990/RVD

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

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

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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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 publication 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 ~~signals~~ and sound signals and ~~their associated data 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:

- ~~CATV[1] networks;~~
- ~~MATV networks and SMATV networks;~~
- ~~individual receiving networks;~~
- regional and local broadband cable networks,
- extended satellite and terrestrial television distribution systems,
- individual satellite and terrestrial television receiving systems,

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

~~For active equipment with balanced RF signal ports this standard applies to those ports which carry RF broadband signals for services as described in the scope of this standard.~~

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.

~~[1] This word encompasses the HFC (Hybrid Fibre Cable) networks used nowadays to provide telecommunications services, voice, data, audio and video both broadcast and narrowcast.~~

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

Part 3: Active wideband equipment for cable networks

1 Scope

This part of IEC 60728 ~~lays down~~ specifies the measuring methods, performance requirements and data publication requirements for active wideband equipment of cable networks for television signals, sound signals and interactive services.

This document

- applies to all ~~broadband~~ amplifiers used in cable networks;
- covers the frequency range 5 MHz to 3 000 MHz;

NOTE The upper limit of 3 000 MHz is an example, but not a strict value. ~~The frequency range, or ranges, over which the equipment is specified, should be published.~~

- applies to one-way and two-way equipment;
- ~~lays down~~ specifies the basic methods of measurement of the operational characteristics of the active equipment in order to assess the performance of this equipment;
- identifies the performance specifications to be published by the manufacturers;
- states the minimum performance requirements of certain parameters.

~~Amplifiers are divided into the following two quality levels:~~

~~Grade 1: amplifiers typically intended to be cascaded;~~

~~Grade 2: amplifiers for use typically within an apartment block, or within a single residence, to feed a few outlets.~~

~~Practical experience has shown that these types meet most of the technical requirements necessary for supplying a minimum signal quality to the subscribers. This classification is not a requirement but is provided to users and manufacturers for information about minimum quality criteria of the material required to install networks of different sizes. The system operator has to select appropriate material to meet the minimum signal quality at the subscriber's outlet, and to optimise cost/performance, taking into account the size of the network and local circumstances.~~

~~All requirements and published data are understood as guaranteed values within the specified frequency range and in well-matched conditions.~~

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 60065, *Audio, video and similar electronic apparatus – Safety requirements*~~

IEC 60068-1~~:1998~~, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Tests A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Tests B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

~~IEC 60068-2-29, *Basic environmental testing procedures – Part 2-29: Tests – Test Eb and guidance: Bump*~~

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test dB: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

~~IEC 60068-2-32, *Basic environmental testing procedures – Part 2-32: Tests – Test Ed: Free fall*~~

IEC 60068-2-40, *Basic environmental testing procedures – Part 2-40: Tests – Test Z/AM: Combined cold/low air pressure tests*

~~IEC 60068-2-48, *Basic environmental testing procedures – Part 2-48: Tests – Guidance on the application of the tests of IEC publication 60068 to simulate the effects of storage*~~

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

~~IEC 60728-1, *Cable networks for television signals, sound signals and interactive services – Part 1: System performance of forward paths*~~

IEC 60728-2, *Cable networks for television signals, sound signals and interactive services – Part 2: Electromagnetic compatibility for equipment*

IEC 60728-4, *Cable networks for television signals, sound signals and interactive services – Part 4: Passive wideband equipment for coaxial cable networks*

IEC 60728-5, *Cable networks for television signals, sound signals and interactive services – Part 5: Headend equipment*

IEC 60728-11, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*

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

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61319-1, *Interconnections of satellite receiving equipment – Part 1: Europe*

IEC 61319-2, *Interconnections of satellite receiving equipment – Part 2: Japan*

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

~~ITU-T Recommendation G.117, *Transmission systems and media – Digital systems and networks – International telephone connections and circuits – General recommendations on the transmission quality for an entire international telephone connection – Transmission aspects of unbalance about earth*~~

~~ITU-T Recommendation O.9, *Specifications of measuring equipment – General – Measuring arrangements to assess the degree of unbalance about earth*~~

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the following terms, definitions, symbols and abbreviated terms 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 Terms and definitions

3.1.1
amplitude frequency response
gain or loss of an equipment or system plotted against frequency

3.1.2
attenuation
ratio of the input power to the output power of an equipment or system, usually expressed in decibels

~~**3.1.3**~~
~~**balun**~~
~~device to match symmetrical impedance 100 Ω (balanced) to un-symmetrical impedance 75 Ω (unbalanced) and vice-versa~~

3.1.3
carrier-to-noise ratio
difference in decibels between the vision or sound carrier level at a given point in an equipment or system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use)

~~**3.1.5**~~
~~**chrominance-luminance delay inequality**~~
~~difference in transmission delay of chrominance and luminance signals, which results in the spilling of colour to left or right of the area of corresponding luminance~~

~~[IEC 60050-723:1997, 723-06-61]~~

3.1.4
composite intermodulation noise
CIN
sum of noise and intermodulation products from digital modulated signals

3.1.5
CINR
composite intermodulation noise ratio
ratio of the signal level and the CIN level

~~**3.1.8**~~
~~**crossmodulation**~~
~~undesired modulation of the carrier of a desired signal by the modulation of another signal as a result of equipment or system non-linearities~~

3.1.6
crosstalk attenuation
~~unwanted signals beside the wanted signal on a lead caused by electromagnetic coupling between leads;~~ ratio of the wanted signal power to the unwanted signal power, which is caused by electromagnetic coupling between two leads, while equal signal powers are applied to the leads

Note 1 to entry: Crosstalk attenuation is usually expressed in decibels.

3.1.7
decibel ratio
ten times the logarithm of the ratio of two quantities of power P_1 and P_2, i.e.

$$10\lg\frac{P_1}{P_2} \text{ in dB}$$

3.1.8
equaliser
device designed to compensate over a certain frequency range for the amplitude/frequency distortion or phase/frequency distortion introduced by feeders or equipment

Note 1 to entry: This device is for the compensation of linear distortions only.

3.1.9
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. By extension, the term is also applied to paths containing one or more radio links.

3.1.10
gain
ratio of the output power to the input power, usually expressed in decibels

3.1.11
ideal thermal noise
noise generated in a resistive component due to the thermal agitation of electrons

Note 1 to entry: The thermal power generated is given by

$$P = 4 \cdot B \cdot k \cdot T$$

where

P is the noise power, in watts;

B is the bandwidth, in hertz;

k is the Boltzmann's constant = 1,38 × 10^{-23} J/K;

T is the absolute temperature, in kelvins.