

Cable networks for television signals, sound signals and interactive services - Part 6: Optical equipment

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60728-6:2011 sisaldab Euroopa standardi EN 60728-6:2011 ingliskeelset teksti.

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English version

**Cable networks for television signals, sound signals and interactive services -
Part 6: Optical equipment
(IEC 60728-6:2011)**

Réseaux de distribution par câbles pour
signaux de télévision, signaux de
radiodiffusion sonore et services
interactifs -
Partie 6: Matériels optiques
(CEI 60728-6:2011)

Kabelnetze für Fernsehsignale,
Tonsignale und interaktive Dienste -
Teil 6: Optische Geräte
(IEC 60728-6:2011)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 100/1654/CDV, future edition 3 of IEC 60728-6, prepared by technical area 5, Cable networks for television signals, sound signals and interactive services, of IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60728-6 on 2011-05-16.

This European Standard supersedes EN 60728-6:2003.

EN 60728-6:2011 includes the following significant technical changes with respect to EN 60728-6:2003.

- The normative references were updated.
- The methods of measurement for optical power and return loss were substituted by references to other standards.
- The method of measurement for polarization dependent loss was deleted.
- A method of measurement for carrier-to-crosstalk ratio (CCR) was added.
- The methods of measurement for CSO and CTB of optical amplifiers were substituted by a method of measurement for microscopic gain tilt of optical amplifiers. This parameter can be used for calculating the second order distortion of optical amplifiers according to the method described in the new Annex B.
- New classes for optical transmitters and receivers have been defined.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-02-16
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-05-16

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60728-6:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068 series	NOTE	Harmonized in EN 60068 series (not modified).
IEC 60068-2-48	NOTE	Harmonized as EN 60068-2-48.
IEC 60169-2	NOTE	Harmonized as EN 60169-2.
IEC 60728-5	NOTE	Harmonized as EN 60728-5.

IEC 60793-2-50	NOTE	Harmonized as EN 60793-2-50.
IEC 60825-2	NOTE	Harmonized as EN 60825-2.
IEC 61280-2-2	NOTE	Harmonized as EN 61280-2-2.
IEC 61280-4-2	NOTE	Harmonized as EN 61280-4-2.
IEC 61281-1:1999	NOTE	Harmonized as EN 61281-1:1999 (not modified).
IEC 61290-1-1	NOTE	Harmonized as EN 61290-1-1.
IEC 61290-1-2	NOTE	Harmonized as EN 61290-1-2.
IEC 61290-3-1	NOTE	Harmonized as EN 61290-3-1.
IEC 61290-6-1	NOTE	Harmonized as EN 61290-6-1.
IEC 61291-4	NOTE	Harmonized as EN 61291-4.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1 + corr. October	1988 1988	Environmental testing - Part 1: General and guidance	EN 60068-1 ¹⁾	1994
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	-
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test H: Change of temperature	EN 60068-2-14	-
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 60068-2-30	-	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	-
IEC 60068-2-31	-	Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens	EN 60068-2-31	-
IEC 60068-2-40	-	Environmental testing - Part 2-40: Tests. Test Z/AM: Combined cold/low air pressure tests	EN 60068-2-40	-
IEC 60169-24	-	Radio-frequency connectors - Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 ohm cable distribution systems (Type F)	EN 60169-24	-
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	EN 60728-1	-

¹⁾ EN 60068-1 includes A1 to IEC 60068-1 + corr. October.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60728-2	-	Cabled distribution systems for television and sound signals - Part 2: Electromagnetic compatibility for equipment	-	-
IEC 60728-3	2010	Cable networks for television signals, sound signals and interactive services - Part 3: Active wideband equipment for cable networks	EN 60728-3	2011
IEC 60728-11	-	Cable networks for television signals, sound signals and interactive services - Part 11: Safety	EN 60728-11	-
IEC 60728-13 + corr. August	2010 2010	Cable networks for television signals, sound signals and interactive services - Part 13: Optical systems for broadcast signal transmissions	EN 60728-13	2010
IEC 60793-2-50	2008	Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	EN 60793-2-50	2008
IEC 60825-1	-	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	-
IEC 61280-1-1	-	Fibre optic communication subsystem basic test procedures - Part 1-1: Test procedures for general communication subsystems - Transmitter output optical power measurement for single-mode optical fibre cable	EN 61280-1-1	-
IEC 61280-1-3	-	Fibre optic communication subsystem test procedures - Part 1-3: General communication subsystems - Central wavelength and spectral width measurement	EN 61280-1-3	-
IEC/TR 61282-4	-	Fibre optic communication system design guides - Part 4: Accommodation and utilization of non-linear effects	-	-
IEC 61290-1	Series	Optical amplifiers - Test methods - Part 1: Optical power and gain parameters	EN 61290-1	Series
IEC 61290-1-3	-	Optical amplifiers - Test methods - Part 1-3: Power and gain parameters - Optical power meter method	EN 61290-1-3	-
IEC 61290-3-2	2003	Optical amplifiers - Part 3-2: Test methods for noise figure parameters - Electrical spectrum analyzer method	EN 61290-3-2 ²⁾	2003
IEC 61290-5	Series	Optical amplifiers - Test methods - Part 5: Reflectance	EN 61290-5	Series
IEC 61290-6	Series	Optical fibre amplifiers - Basic specification - Part 6: Test methods for pump leakage parameters	EN 61290-6	Series

²⁾ EN 61290-3-2 is superseded by EN 61290-3-2:2008, which is based on IEC 61290-3-2:2008.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61290-11	Series	Optical amplifier - Test methods - Part 11: Polarization mode dispersion parameter	EN 61290-11	Series
IEC 61291-1	-	Optical amplifiers - Part 1: Generic specification	EN 61291-1	-
IEC 61291-5-2	-	Optical amplifiers - Part 5-2: Qualification specifications - Reliability qualification for optical fibre amplifiers	EN 61291-5-2	-
IEC 61300-3-6	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-6: Examinations and measurements - Return loss	EN 61300-3-6	-
IEC 61754-4	-	Fibre optic connector interfaces - Part 4: Type SC connector family	EN 61754-4	-
IEC/TR 61931	1998	Fibre optic - Terminology	-	-
IEC 80416	Series	Basic principles for graphical symbols for use on equipment	EN 80416	Series
IEC 60417	database	Graphical symbols for use on equipment	-	-
IEC 60617	database	Graphical symbols for diagrams	-	-

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INTRODUCTION

Standards 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, sound signals and their associated data signals and for processing, interfacing and transmitting all kinds of signals for interactive services using all applicable transmission media.

- This covers all kinds of networks that convey modulated RF carriers such as CATV-networks;
- MATV-networks and SMATV-networks;
- individual receiving networks;

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

NOTE CATV encompasses the Hybrid Fibre Coaxial (HFC) networks used nowadays to provide telecommunications services, voice, data and audio and video both broadcast and narrowcast.

The extent of this standardisation 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.

The standardisation 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.

The reception of television signals inside a building requires an outdoor antenna and a distribution network to convey the signal to the TV receivers.

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

Part 6: Optical equipment

1 Scope

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

This standard

- applies to all optical transmitters, receivers, amplifiers, directional couplers, isolators, multiplexing devices, connectors and splices 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.

- identifies guaranteed performance requirements for certain parameters;
- lays down data publication requirements with guaranteed performance;
- describes methods of measurement for compliance testing.

All requirements and published data relate to minimum performance levels within the specified frequency range and in well-matched conditions as might be applicable to cable networks for television signals, sound signals and interactive services.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*

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

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

IEC 60068-2-6:2007, *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 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12+ 12 h cycle)*

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

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

IEC 60169-24, *Radio-frequency connectors – Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 ohm cable distribution systems (Type F)*

IEC 60417, *Graphical symbols for use on equipment*

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

IEC 60617, *Graphical symbols for diagrams*

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 60728-3:2010, *Cable networks for television signals, sound signals and interactive services – Part 3: Active wideband equipment for coaxial cable networks*

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

IEC 60728-13:2010, *Cable networks for television signals, sound signals and interactive services – Part 13: Optical systems for broadcast signal transmissions*

IEC 60793-2-50:2008, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 61280-1-1, *Fibre optic communication subsystem basic test procedures – Part 1-1: Test procedures for general communication subsystems – Transmitter output optical power measurement for single-mode optical fibre cable*

IEC 61280-1-3, *Fibre optic communication subsystem basic test procedures – Part 1-3: General communication subsystems – Central wavelength and spectral width measurement*

IEC 61282-4, *Fibre optic communication system design guides – Part 4: Accommodation and utilization of non-linear effects*

IEC 61290-1 (all parts), *Optical amplifiers – Test methods – Part 1: Power and gain parameters*

IEC 61290-1-3, *Optical amplifiers – Test methods – Part 1-3: Power and gain parameters – Optical power meter method*

IEC 61290-3-2:2003, *Optical amplifiers – Part 3-2: Test methods for noise figure parameters – Electrical spectrum analyzer method*

IEC 61290-5 (all parts), *Optical amplifiers – Test methods – Part 5: Reflectance parameters*

IEC 61290-6 (all parts), *Optical fibre amplifiers – Basic specification – Part 6: Test methods for pump leakage parameters*

IEC 61290-11 (all parts), *Optical amplifiers – Test methods – Part 11: Polarization mode dispersion parameter*

IEC 61291-1, *Optical amplifiers – Part 1: Generic specification*

IEC 61291-5-2, *Optical amplifiers – Part 5-2: Qualification specifications – Reliability qualification for optical fibre amplifiers*

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

IEC 61754-4, *Fibre optic connector interfaces – Part 4: Type SC connector family*

IEC/TR 61931:1998, *Fibre optic – Terminology*

IEC 80416 (all parts), *Basic principles for graphical symbols for use on equipment*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60728-1, IEC/TR 61931 and the following apply.

3.1.1

optical transmitting unit

optical transmitter

TX

transmit fibre optic terminal device accepting at its input port an electrical signal and providing at its output port an optical carrier modulated by that input signal

[IEC/TR 61931:1998, definition 2.9.6]

NOTE For the purposes of this standard, optical transmitters may have more than one input port accepting electrical RF signals.

3.1.2

optical receiving unit

optical receiver

Rx

receive fibre optic terminal device accepting at its input port a modulated optical carrier, and providing at its output port the corresponding demodulated electrical signal (with the associated clock, if digital)

[IEC/TR 61931:1998, definition 2.9.7]

NOTE For the purposes of this standard, optical receivers may have more than one output port providing electrical RF signals.