
Kabelska omrežja za televizijske signale, zvokovne signale in interaktivne storitve – 2. del: Elektromagnetna združljivost opreme

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

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English version

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

Réseaux de distribution par câbles
pour signaux de télévision, signaux de
radiodiffusion sonore et
services interactifs
Partie 2: Compatibilité électromagnétique
pour les matériels

Kabelnetze für Fernsehsignale,
Tonsignale und interaktive Dienste
Teil 2: Elektromagnetische Verträglichkeit
von Geräten

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by CENELEC Technical Committee TC 209, "Cable networks for television signals, sound signals and interactive services" on the basis of EN 50083-2:2001, its amendment A1:2005 and a further amendment to EN 50083-2, resulting from two draft amendments (prA2 and prAA) that were submitted to the Unique Acceptance Procedure and approved by CENELEC on 2006-04-01 to be published as part of a new edition of EN 50083-2.

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) 2007-04-01
 - latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-04-01
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1 Scope

1.1 General

Standards of EN 50083 and EN 60728 series deal with cable networks for television signals, sound signals and interactive services including equipment, systems and installations

- for headend-reception, processing and distribution of television and 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.

All kinds of networks like

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

and all kinds of equipment, systems and installations installed in such networks, are within this scope.

The extent of this standardisation work is from the antennas, 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 and optical cables and accessories thereof is excluded.

1.2 Specific scope of this part 2

This standard

- applies to the radiation characteristics and immunity to electromagnetic disturbance of EM-active equipment (active and passive equipment) for the reception, processing and distribution of television, sound and interactive multimedia signals as dealt with in the following parts of EN 50083 or EN 60728 series:
 - EN 60728-3 "Active wideband equipment for coaxial cable networks"
 - EN 50083-4 "Passive wideband equipment for coaxial cable networks"
 - EN 50083-5 "Headend equipment"
 - EN 60728-6 "Optical equipment"
- covers the following frequency ranges:

| | |
|--|---------------------------------------|
| Disturbance voltage injected into the mains | 9 kHz to 30 MHz |
| Radiation from active equipment | 5 MHz to 25 GHz |
| Immunity of active equipment | 150 kHz to 25 GHz |
| Screening effectiveness of passive equipment | 5 MHz to 3 GHz (25 GHz) ¹⁾ |
- specifies requirements for maximum allowed radiation, minimum immunity and minimum screening effectiveness;
- describes test methods for conformance testing.

Due to the fact that cable networks, the former cabled distribution systems for television and sound signals, are more and more used for interactive services, these networks may incorporate also equipment which carry besides the cable network equipment ports also one or more telecom signal port(s). This equipment shall be named as "multimedia network equipment".

¹⁾ For "Screening effectiveness of passive equipment" no requirements apply at present for the frequency range 3 GHz to 25 GHz. Methods of measurement and limits are investigated for inclusion in a future amendment or revised edition.

The EMC behaviour of cable network equipment, telecommunication network equipment and multimedia network equipment may be described by the following port structure (Table 1):

Table 1 - Port structure of different network equipment

| Port name | Cable network equipment | Telecommunication network equipment | Multimedia network equipment |
|----------------------|-------------------------|-------------------------------------|------------------------------|
| Enclosure | X | X | X |
| Earth | X | X | X |
| AC/DC Power Supply | X | X | X |
| Control (e.g. alarm) | X | X | X |
| Antenna input port | X | | X |
| RF network port | X | | X |
| Telecom signal port | | X | X |

Table 1 shows that cable network equipment and telecommunication network equipment have four common ports and one respectively two individual port each. Multimedia network equipment carry besides the common ports an antenna input port and/or a RF network port as well as a telecom signal port.

The electromagnetic compatibility requirements for "telecommunication network equipment only" are standardised in EN 300 386 (mainly) and in EN 301 489-4, those for "cable network equipment only" are given in this EN 50083-2.

Equipment for multimedia networks of the above mentioned type has to work under the same EMC conditions as equipment which is falling under the cable network and the telecommunication network EMC-standards. Due to the fact, that this equipment has to work in close proximity, e.g. in the same operating room, the EMC environmental conditions for all three types of equipment are the same.

This means that multimedia network equipment has to fulfil the EMC requirements of one of the above mentioned standards and in addition the EMC requirements, laid down in the other EMC standard, for the additional port, by which it is connected to the other network.

By this procedure it is ensured that multimedia network equipment fulfils the EMC conditions of one of the above mentioned networks and will neither disturb the respective other system nor will be disturbed by the respective other system via the connecting port.

Coaxial cables for cable networks do not fall under the scope of this standard. Reference is made to the European Standard series EN 50117 "Coaxial cables used in cabled distribution networks".

This standard also covers active indoor antennas for which the requirements and the applicable methods of measurement are limited to the radiation and the electrostatic discharge phenomena.

Standardisation in the field of "Electromagnetic compatibility" for any broadcast terminals (e.g. tuners, receivers, decoders, etc.) is covered by the European Standards EN 55013 and EN 55020 and for multimedia terminals by EN 55022 and EN 55024.

Requirements for the electromagnetic compatibility of receiver leads are laid down in EN 60966-2-4, EN 60966-2-5 and EN 60966-2-6.

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.

| | | |
|------------------------------|----------------------|--|
| EN 50083/ EN 60728 | series | Cable networks for television signals, sound signals and interactive services |
| EN 60728-3 | 2006 | Part 3: Active wideband equipment for coaxial cable networks |
| EN 50083-4 | 1998 | Part 4: Passive wideband equipment for coaxial cable networks |
| EN 50083-5 | 2001 | Part 5: Headend equipment |
| EN 60728-6 | 2003 | Part 6: Optical equipment |
| EN 50083-8 | 2002 | Part 8: Electromagnetic compatibility for networks |
| EN 60728-10 | 2006 | Part 10: System performance for return paths |
| EN 50117 | series | Coaxial cables used in cabled distribution networks |
| EN 55013 + A1 + A2 | 2001 2003 2006 | Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR 13:2001, mod. + A1:2003 + A2:2006) |
| EN 55016-1-1 + A1 | 2004 2005 | Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus (CISPR 16-1-1:2003) |
| EN 55020 + A1 + A2 | 2002 2003 2005 | Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement (CISPR 20:2002 + A1:2002 + A2:2004) |
| EN 55022 + A1 + A2 | 1998 2000 2003 | Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:1997 + A1:2000 + A2:2002, mod.) |
| EN 55024 + A1 + A2 | 1998 2001 2003 | Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:1997 + A1:2001 + A2:2002, mod.) |
| EN 60966-2-4 | 2003 | Radio frequency and coaxial cable assemblies; Part 2-4: Detail specification for cable assemblies for radio and TV receivers (Frequency range 0 to 3000 MHz, IEC 61169-2 connectors) (IEC 60966-2-4:2003) |
| EN 60966-2-5 | 2003 | Radio frequency and coaxial cable assemblies; Part 2-5: Detail specification for cable assemblies for radio and TV receivers (Frequency range 0 to 1000 MHz, IEC 61169-2 connectors) (IEC 60966-2-5:2003) |
| EN 60966-2-6 | 2003 | Radio frequency and coaxial cable assemblies; Part 2-6: Detail specification for cable assemblies for radio and TV receivers (Frequency range 0 to 3000 MHz, IEC 61169-24 connectors) (IEC 60966-2-6:2003) |
| EN 61000-3-2 | 2000 | Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase) (IEC 61000-3-2:2000, mod.) |
| EN 61000-4-2 + A1 + A2 | 1995 1998 2001 | Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test (IEC 61000-4-2:1995 + A1:1998 + A2:2000) |

| | | |
|-------------------------------|----------------------|---|
| EN 61000-4-3 + A1 + IS1 | 2002 2002 2004 | Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:2002 + A1:2002) |
| EN 61000-4-4 + A1 + A2 | 1995 2001 2001 | Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test (IEC 61000-4-4:1995 + A1:2000 + A2:2001) |
| EN 61000-4-6 + A1 + IS1 | 1996 2001 2004 | Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6:1996 + A1:2000) |
| EN 61000-6-1 | 2001 | Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:1997, mod.) |
| EN 61079-1 | 1993 | Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band - Part 1: Radio- frequency measurements on outdoor units (IEC 61079-1:1992) |
| EN 300 386 V1.3.3 | 2005 | Electromagnetic compatibility and Radio spectrum Matters (ERM) – Telecommunication network equipment – ElectroMagnetic Compatibility (EMC) requirements |
| EN 301 489-4 V1.3.1 | 2002 | Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 4: Specific conditions for fixed radio links and ancillary equipment and services |
| IEC 60050-161 | 1990 | International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility |
| CISPR 16-1 | 1999 | Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus |

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3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the definitions contained in IEC 60050(161) "Electromagnetic compatibility" apply. The most important definitions of IEC 60050(161) are repeated hereafter with the IEC-numbering given in brackets. In addition some more specific definitions, used in this standard, are listed.

3.1.1 radiation (electromagnetic) [IEV 161-01-10]

1. the phenomenon by which energy in the form of electromagnetic waves emanates from a source into space
2. energy transferred through space in the form of electromagnetic waves

NOTE By extension, the term "electromagnetic radiation" sometimes also covers induction phenomena.

3.1.2 immunity (to a disturbance) [IEV 161-01-20]

ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

3.1.3 internal immunity [IEV 161-03-06]

ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances appearing at its normal input terminals or antenna

3.1.4**external immunity** [IEV 161-03-07]

ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances entering other than via its normal input terminals or antenna

3.1.5**mains immunity** [IEV 161-03-03]

immunity to mains-borne disturbance

3.1.6**immunity level** [IEV 161-03-14]

maximum level of a given electromagnetic disturbance incident on a particular device, equipment or system for which it remains capable of operating at a required degree of performance

3.1.7**immunity limit** [IEV 161-03-15]

specified minimum immunity level

3.1.8**immunity margin** [IEV 161-03-16]

the ratio of the immunity limit to the electromagnetic compatibility level

3.1.9**electromagnetic disturbance** [IEV 161-01-05]

any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter

NOTE An electromagnetic disturbance may be an electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

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3.1.10**screening effectiveness**

ability of an equipment or system to attenuate the influence of electromagnetic fields from outside the equipment or system or to suppress the radiation of electromagnetic fields from inside the equipment or system

3.1.11**well-matched**

matching condition when the return loss of the equipment complies with the requirements of EN 60728-3, Table 1

3.1.12**well-screened**

a test set-up can be considered "well-screened" if its radiation level, when terminated with a matched load, is at least 20 dB below the expected radiation level of the equipment under test, the test set-up and the equipment being supplied with the same input signal level

3.1.13**electromagnetic interference (EMI)** [IEV 161-01-06]

degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance

NOTE 1 In English, the terms "electromagnetic disturbance" and "electromagnetic interference" designate respectively the cause and the effect, but they are often used indiscriminately.

NOTE 2 In French, the terms "perturbation électromagnétique" and "brouillage électromagnétique" designate respectively the cause and the effect, and should not be used indiscriminately.

3.1.14

operating frequency range

the passband for the wanted signals for which the equipment has been designed

3.1.15

wanted signal

during measurements, the wanted signal shall be simulated using a sinewave test signal having the frequency within the operating frequency range and the appropriate level

3.1.16

unwanted signal

signals inside and outside of the operating frequency range that are not considered as wanted signals
When measuring immunity (to unwanted signals), the unwanted signal shall be simulated using two sine-wave test signals.

3.1.17

first satellite intermediate frequency range

output frequency range of the outdoor unit which is comprised of the frequency band between 950 MHz and at least 3 GHz or parts thereof

3.1.18

carrier-to-interference ratio

minimum level difference measured at the output of an active equipment between the wanted signal and

- intermodulation products of the wanted signal and/or unwanted signals generated due to non-linearities;
- harmonics generated by an unwanted signal;
- unwanted signals that have penetrated into the operating frequency range;
- unwanted signals that have been converted to the frequency range to be protected (operating frequency range).

3.1.19

individual receiving system

system designed to provide television and sound signals to an individual household

3.1.20

spurious signals

all unwanted signals in the frequency range of interest

3.1.21

band

nominal operating frequency range of the equipment

3.1.22

electrostatic discharge (ESD) [IEV 161-01-22]

a transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact

3.1.23

transient (adjective and noun) [IEV 161-02-01]

pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval short compared with the time-scale of interest

3.1.24

burst [IEV 161-02-07]

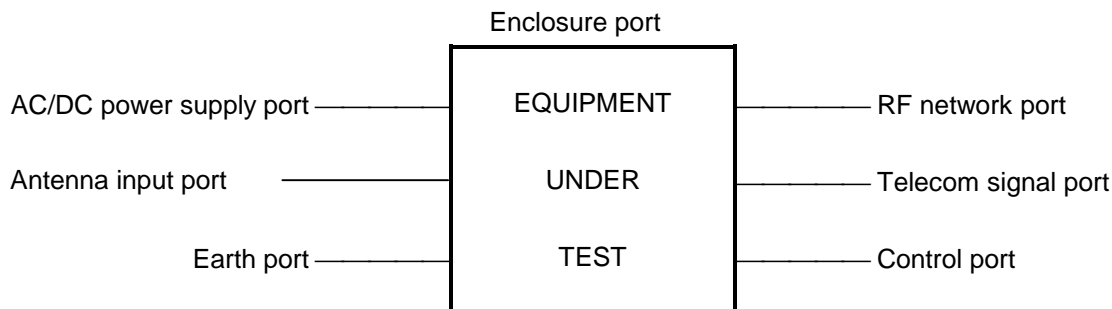
sequence of a limited number of distinct pulses or an oscillation of limited duration

3.1.25**test levels**

preferential range of test level for ESD or fast transient test

3.1.26**port**

particular interface of the specific equipment with the external electromagnetic environment:

**3.1.27****enclosure port**

physical boundary of the equipment through which electromagnetic fields may be transmitted

3.1.28**signal port**

point at which a cable for the wanted signal is connected to the equipment

3.1.29**control port**

point at which a cable for the control signal is connected to the equipment

3.1.30**AC power port**

point at which a cable for the AC power supply is connected to the equipment

3.1.31**DC power port**

point at which a cable for the DC power supply is connected to the equipment

3.1.32**in-band immunity**

immunity against disturbance at any frequency of the wanted signals carried at the interfaces and used internally within the equipment under test (e.g. input/output frequencies, IF, video band, etc.)

3.1.33**out-of-band immunity**

immunity against disturbance from signals outside the frequency band(s) of the wanted signal carried at the interfaces and used internally within the equipment under test (e.g. input/output frequencies, IF, video band, etc.)

3.1.34**RF signal port**

antenna input port or RF network port

3.1.35**antenna input port**

point at which the equipment under test is directly connected to the receiving antenna(s)

3.1.36

RF network port

point at which a coaxial cable for the wanted RF signal is connected to the equipment but excluding direct connection to the antenna

3.1.37

cable network equipment

equipment from which cable networks for television signals, sound signals and interactive services are built

NOTE Examples of typical cable network equipment could be found in Part 4 and Part 5 of the EN 50083 series and in Part 3, Part 6 and Part 10 of the EN 60728 series.

3.1.38

telecom network equipment

equipment from which telecom networks are built

NOTE Telecommunication network equipment are operated under a licence granted by a national telecommunications authority and provides telecommunications between network termination points (NTPs) (i.e. excluding terminal equipment beyond the NTPs). This covers equipment such as switching equipment (e.g.: local telephone exchanges, remote switching concentrators, international switches, telex switches, network packet switches), non-radio transmission equipment and ancillary equipment [e.g.: multiplexers, line equipment and repeaters (Synchronous Digital Hierarchy (SDH), Plesiochronous Digital Hierarchy (PDH), Asynchronous Transfer Mode (ATM)), Digital Cross Connect systems, network terminations, transmission equipment used in the access network (like XDSL)], power supply equipment (central power plant, end of suite power supplies, uninterruptible power supplies, stabilised AC power supplies and other dedicated telecommunication network power supplies, but excludes equipment which is uniquely associated with or integrated in other equipment), supervisory equipment (network management equipment, operator access maintenance equipment, traffic measurement systems, line test units, functional test units).

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3.1.39

multimedia network equipment

equipment containing broadcast and telecommunication functions

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3.1.40

outdoor signal lines

lines leaving the building and being subjected to outdoor interference

3.1.41

indoor signal lines

lines which do not leave the building and which are protected by other equipment against outdoor interference (e.g. connections from switching to transmission equipment in the same building)

3.1.42

active equipment

equipment (e.g. amplifiers, converters, etc.), performing signal processing by means of external or internal power supply in a certain frequency range

3.1.43

passive equipment

equipment (e.g. splitters, tap-offs, system outlets, etc.) not requiring a power supply in order to operate and/or not carrying out signal processing in a certain frequency range

3.1.44

electromagnetic-active equipment

all passive and active equipment carrying RF signals are considered as electromagnetic-active equipment because they are liable to cause electromagnetic disturbances or the performance of them is liable to be affected by such disturbances