# SLOVENSKI STANDARD
# SIST EN 50083-10:2000

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**Cable networks for television signals, sound signals and interactive services - Part 10: System preformance for return**

Cable networks for television signals, sound signals and interactive services -- Part 10: System performance for return paths

Kabelnetze für Fernsehsignale, Tonsignale und interaktive Dienste -- Teil 10: Rückkanal-Systemanforderungen



Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs -- Partie 10: Caractéristiques des systèmes de voie de retour



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# Cable networks for television signals, sound signals and interactive services Part 10: System performance for return paths

Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs
Partie 10: Caractéristiques des systèmes de voie de retour

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Teil 10: Rückkanal-Systemanforderungen



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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**



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## Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 209, Cable networks for television signals, sound signals and interactive services.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50083-10 on 1999-02-01.

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) 1999-09-01

- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1999-09-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex B is normative and annexes A and C are informative.

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# 1 Scope

## 1.1 General

Standards of EN 50083 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 these standardization work is from the antennas, special signal source inputs to the headend or other interface points to the network up to the system outlet or the terminal input, where no system outlet exists.



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



## 1.2 Specific scope of this part 10

This standard is dealing with the transparent return path of cable networks operated in the frequency range between 5 MHz and 65 MHz or parts thereof. Higher frequencies may be used in fibre based networks.

> NOTE: In addition it is possible to use the frequency range from 0 to 5 MHz for return path transmissions, e.g. for NMS or other control, monitoring and signalling purposes. Applications below 5 MHz are not covered by this standard.

An active return path carries typically only return signals. A passive return path can be used for both return and forward signals.

This standard lays down the basic methods of measurement for signals typically used in the return path of cable networks in order to assess the performance of those signals and their performance limits.

All requirements refer to the performance limits which shall be obtained between the reference points (figure 1) of the return path system.

One reference point is the network termination close to the subscriber. It is the last point where all forward and return signals are present and carried on the same cable. If no network termination point exists, the reference point is the system outlet.

The other reference point is the input of the return signal receiver (or transceiver). At this point the transparent signal path ends and behind this point the signal is treated in a non-transparent way. The return signal receiver can be situated at the headend but can also be at the node of the coaxial cell or at any other point of the network.

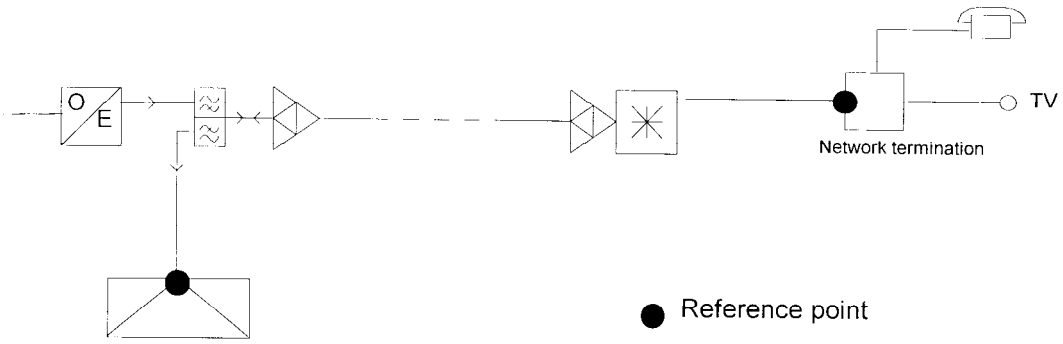



**Figure 1: Reference points of an active return path system (example).**



In addition to the system performance requirements for the transparent return path, system performance recommendations were laid down in this standard e.g. for the overall frequency allocation, for the use of specific modulation techniques for different interactive multimedia services or for different sub-bands within the return path frequency range etc.



Specific equipment installed in cable networks for the operation of such return paths is standardised in the relevant equipment standards, parts 3 to 6 of the EN 50083 series.

Transmission systems are not within the scope of this standard.EMBED

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

| | | |
|---|---|---|
| EN 50083 | | Cable networks for television signals, sound signals and interactive services |
| EN 50083-1<br>+ A1 | 1993<br>1997 | Part 1: Safety requirements |
| EN 50083-2<br>+ A1 | 1995<br>1997 | Part 2: Electromagnetic compatibility for equipment |
| EN 50083-3 | 1998 | 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 | 199X | Part 5: Headend equipment |
| EN 50083-6 | 1997 | Part 6: Optical equipment |
| EN 50083-7 | 199X | Part 7: System performance |
| EN 50083-8 | 1999 | Part 8: Electromagnetic compatibility for networks |
| ETS 300 800 | 1998 | Digital Video Broadcasting (DVB); Interaction channel for Cable TV distribution systems (CATV) |

## 3 Terms, definitions, symbols and abbreviations

### 3.1 Terms and definitions

#### 3.1.1 broadcast signal

A signal comprising of video and/or audio and/or data content which is distributed to several receivers simultaneously.



#### 3.1.2 downstream direction

Direction of signal flow in a cable network from the headend or any other central point (node) of a cable network to the subscribers´ area.



#### 3.1.3 forward path (downstream)

Part of a cable network by which signals are distributed in the downstream direction from the headend or any other central point (node) of a cable network to the subscribers´ area.

#### 3.1.4 frequency error

A quality of supply evaluated on the basis of the actual frequency of an electrical system compared to the nominal value. Frequency error consists of initial error, short term and long term frequency stability.

#### 3.1.5 headend

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.

NOTE: The headend may, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

#### 3.1.6 hybrid fibre coaxial network (HFC)

Cable network which is comprised of optical equipment and cables and coaxial equipment and cables in different parts.

#### 3.1.7 impulse noise

This noise is caused by electromagnetic interference into cable networks. Impulse noise is characterised by pulses with a duration of typically < 10 μs.

### 3.1.8 ingress noise

This noise is caused by electromagnetic interference into cable networks. Its power decreases with increasing frequency. It is permanently present but slowly varies in its intensity as a function of time.

### 3.1.9 interaction path

Part of a cable network by which interactive signals are transmitted in the downstream direction (from the headend or node to the subscriber) and in the upstream direction (from the subscriber to the headend or node).

### 3.1.10 location specific noise

Noise which occurs at a specific area of a cable network or which occurs in a cable network located in a specific environment.

### 3.1.11 multiple interference

Interfering signal which consists of ≥2 signals which originate from ≥2 sources.

NOTE: On return path the multiple interference consists of ingress noise and intermodulation distortion products.



### 3.1.12 multimedia signal

A signal comprising of two or more different media contents e.g. video, audio, text, data, etc.

### 3.1.13 network management system (NMS)



A software based system for controlling and supervising cable networks.

### 3.1.14 network segment

Part of a cable network comprising a set of functions and/or a specific extent of the complete cable network.

### 3.1.15 network termination

Electrical termination of a cable network at any outlet on subscribers' side and headend or node side.

### 3.1.16 node

Central point of a network segment at which signals could be fed into the forward path or could be gathered from a number of subscribers out of the return path.

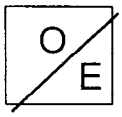
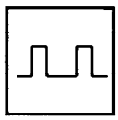
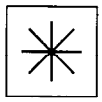
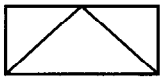
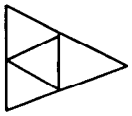
### 3.1.17 return path (upstream)

Part of a cable network by which signals are transmitted in the upstream direction from any subscriber, connected to the network, to the headend or any other central point (node) of a cable network.

### 3.1.18 upstream direction

Direction of signal flow in a cable network from a subscriber to the headend or any other central point (node) of a cable network.

### 3.2 Symbols

| Symbols | Terms | Symbols | Terms |
|---|---|---|---|
|   | Optical receiver |   | Spectrum analyser |
|  | Test waveform generator |  | Passive distribution network |
|   | Signal generator |  | Oscilloscope |
|  | Variable attenuator |  | Low pass |
|   | System under Test |  | Modulator |
|  | Demodulator |   | QAM Demodulator |
|   | QPSK Demodulator |   | Bit Error Rate Detector |
|  | Amplifier with return path amplifier | | |



### 3.3 Abbreviations

| | |
|---|---|
| BER | Bit Error Rate |
| BW | Bandwidth, equivalent noise bandwidth |
| CATV | Community Antenna Television |
| CB | Citizen Band |
| CDMA | Code Division Multiple Access |
| C/MI | Carrier-to-Multiple Interference ratio |
| C/N | Carrier-to-Noise ratio |
| COFDM | Coded Orthogonal Frequency Division Multiplexing |
| CSO | Composite Second Order |
| CTB | Composite Triple Beat |

| | |
|---|---|
| DC | Direct Current |
| DVB | Digital Video Broadcasting |
| EMC | Electromagnetic Compatibility |
| FM | Frequency Modulation |
| FSK | Frequency Shift Keying |
| HFC | Hybrid Fibre Coaxial |
| IF | Intermediate Frequency |
| IM | Intermodulation |
| I/Q | In-phase/Quadrature signals |
| ISM | Industrial, Scientific, Medical |
| LPF | Low-Pass Filter |
| MATV | Master Antenna Television (Network) |
| MMDS | Multichannel Multipoint Distribution System |
| MPEG | Motion Picture Experts Group |
| MUX | Multiplex(er) |
| MVDS | Multichannel Video Distribution System |
| NMS | Network Management System |
| OFDM | Orthogonal Frequency Division Multiplexing |
| PAL | Phase Alternating Line |
| PRBS | Pseudo Random Binary Sequence |
| QAM | Quadrature Amplitude Modulation |
| QPSK | Quaternary Phase Shift Keying |
| RF | Radio Frequency |
| RMS | Root Mean Square |
| RBW | Resolution Bandwidth |
| S | Signal level, before corrections |
| SHF | Super High Frequency |
| SI | Service Information |
| SL | Signal level (corrected) |
| SMATV | Satellite Master Antenna Television (Network) |
| S/N | Signal-to-Noise ratio |
| SUT | System Under Test |
| TS | Transport Stream |
| TV | Television |
| UHF | Ultra-High Frequency |
| VBW | Video Bandwidth |
| VHF | Very-High Frequency |

# 4 Methods of measurement

## 4.1 Setup of the network

Even if the main target of this part four of this standard is to describe the measurement methods for the performance of the return path it is very important to do this on a properly aligned network plant. The following setup and operational procedures is a guideline for that.

The return path differs in several ways from the forward path, even though they share mostly the same physical network. table 1 gives some hints.

**Table 1: Characterisation criteria for downstream and upstream operations**

| Criteria | Downstream | Upstream |
|---|---|---|
| signals present | Continuously | intermittently or continuously |
| power levels | well-defined | varying |
| channel allocation | well-defined | may vary over time |
| signal bandwidth | well-defined | application dependent |
| Modulation scheme | Fixed | application dependent |
| amplifier input | Single | several inputs |



As can be seen from the table the variable factors require that the procedures used to operate the return path plant differ from those used in downstream direction.

One major difference is that the amplifiers in downstream direction are aligned by adjusting their output signals to predetermined levels and in the return direction the network plant is adjusted so that the input signals from different sources are equalised at the amplifier input. Different type of signals may be at different levels.