



**SLOVENSKI STANDARD**  
**oSIST prEN IEC 60728-101-2:2022**  
**01-november-2022**

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**Zahteve za zmogljivost za signale na izhodu sistema pri delovanju pod obremenitvijo vseh digitalnih kanalov**

Performance requirements for signals delivered at the system outlet in operation with alldigital channels load

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Exigences de performance relatives aux signaux délivrés à la prise d'abonné en fonctionnement sous une charge de porteuses exclusivement numériques

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33.160.01	Avdio, video in avdiovizualni sistemi na splošno	Audio, video and audiovisual systems in general

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TITLE:

**<p>Performance requirements for signals delivered at the system outlet in operation with all-digital channels load</p>**

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE NETWORKS FOR TELEVISION SIGNALS,  
SOUND SIGNALS AND INTERACTIVE SERVICES –****Part 101-2: Performance requirements for signals  
delivered at the system outlet in operation with all-digital channels load**

## FOREWORD

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International Standard IEC 60728-101-2 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 International Standard is to be used in conjunction with IEC 60728-101:2016.

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

FDIS	Report on voting
100/XX/FDIS	100/XX/RVD

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

- 105 The language used for the development of this International Standard is English.
- 106 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in  
107 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at  
108 [https://www.iec.ch/members\\_experts/refdocs](https://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are  
109 described in greater detail at <https://www.iec.ch/standardsdev/publications>.
- 110 A list of all parts of the IEC 60728 series, under the general title *Cable networks for television*  
111 *signals, sound signals and interactive services*, can be found on the IEC website.
- 112 The committee has decided that the contents of this document will remain unchanged until the  
113 stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the  
114 specific document. At this date, the document will be
- 115 • reconfirmed,
  - 116 • withdrawn,
  - 117 • replaced by a revised edition, or
  - 118 • amended.
- 119 A bilingual version of this publication may be issued at a later date.
- 120

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## 121 INTRODUCTION

122 Standards and deliverables of IEC 60728 series deals with cable networks including  
123 equipment and associated methods of measurement for headend reception, processing and  
124 distribution of television and sound signals and for processing, interfacing and transmitting all  
125 kinds of data signals for interactive services using all applicable transmission media. These  
126 signals are typically transmitted in networks by frequency-multiplexing techniques.

127 This includes for instance

- 128 • regional and local broadband cable networks,
- 129 • extended satellite and terrestrial television distribution systems,
- 130 • individual satellite and terrestrial television receiving systems,

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

133 The extent of this standardization work is from the antennas and/or special signal source  
134 inputs to the headend or other interface points to the network up to the terminal input of the  
135 customer premises equipment.

136 The standardization work will consider coexistence with users of the RF spectrum in wired  
137 and wireless transmission systems.

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

141 The reception of television signals inside a building requires an outdoor antenna and a  
142 distribution network to convey the signal to the TV receivers. 2022

<https://standards.iteh.ai/catalog/standards/sist/ce0c94bf-5c06-42e5-8efc->

143 This part of IEC 60728 deals with the requirements that must be fulfilled at the system outlet  
144 or terminal input, when the CATV/MATV/SMATV system is in operation.

145 These performance requirements for signals at the system outlet or terminal input in operation  
146 are derived from considerations of the characteristics of the received signals at the input of  
147 the headend (see Clause 6 of IEC 60728-101) and the summation of the impairments  
148 produced by the headend, the CATV/MATV/SMATV network and the home network, when the  
149 requirements given in IEC 60728-101 and IEC 60728-101-1 are fulfilled.

150 This document gives the guidelines for calculation of the operational characteristics at system  
151 outlet, taking into account the performance requirements of the CATV/MATV/SMATV network,  
152 of the home networks and of the received signals, given in the International Standards  
153 IEC 60728-101 and 60728-101-1 prepared by TA 5: Cable networks for television signals,  
154 sound signals and interactive services, of IEC technical committee 100: Audio, video and  
155 multimedia systems and equipment.

156 This document considers digital signals only and is based on IEC 60728-101 dealing with  
157 system performance of forward paths loaded with digital channels only. For performance  
158 requirements for analogue signals delivered at the system outlet in operation refer to IEC  
159 60728-1-2 ED2.

160 Although the upper frequency range of terrestrial broadcast signals depends on the allocation  
161 frequency plan of each region (e.g., in Europe it is reduced to 694 MHz, being the 700 MHz  
162 and 800 MHz bands assigned to telecommunication services), the upper frequency range into  
163 the cable networks can be maintained to 862 MHz in order to maximise the number of  
164 channels distributed in the cable networks, assuming that sufficient immunity (screening  
165 efficiency) to signals radiated in the 700 MHz and 800 MHz bands is provided.

166



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

## Part 101-2: Performance requirements for signals delivered at the system outlet in operation with all-digital channels load

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### 175 1 Scope

176 This part of IEC 60728 provides the minimum performance requirements to be fulfilled in  
177 operation at the system outlet or terminal input and describes the summation criteria for the  
178 impairments present in the received signals and those produced by the CATV/MATV/SMATV  
179 cable network, including individual receiving systems.

180 NOTE 1 When a change of signal format is made at the headend, the summation of the impairments does not  
181 apply (see also Clause 6).

182 In a building divided into apartment blocks, the signals received by the antennas are  
183 distributed by the MATV/SMATV cable network up to the home network interface (HNI); the  
184 television signals are then distributed (inside the home) by home networks (HN) of various  
185 types up to the system outlet or terminal input. The cable network can support two way  
186 operation, from the system outlet (or terminal input) towards the headend.

187 The home network can use coaxial cables, balanced pair cables, fibre optic cables (glass or  
188 plastic) and also wireless links inside a room (or a small number of adjacent rooms) to replace  
189 wired cords.

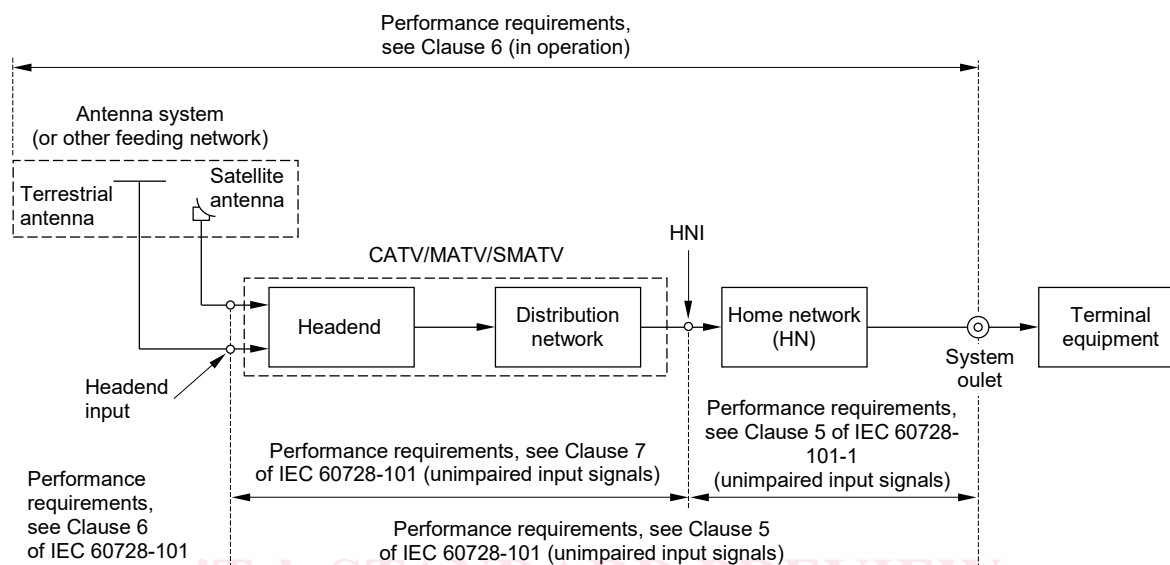
190 This part of IEC 60728 is limited to downstream TV broadcast signals received from antennas  
191 and is applicable to cable networks intended for television signals, sound signals and  
192 interactive services operating between about 5 MHz and 3 300 MHz. The frequency range is  
193 extended to 6 000 MHz for home distribution techniques that replace wired cords with a  
194 wireless two-way communication inside a room (or a small number of adjacent rooms) that  
195 uses the 5 GHz to 6 GHz frequency band.

196 Figure 1 shows the main sections of a general CATV/MATV/SMATV system, indicating the  
197 parts of the IEC 60728-101 series documents where the relevant performance requirements  
198 are indicated.

- 199 • The requirements for the signals received at the headend are given in Clause 6 of  
200 IEC 60728-101.
- 201 • The requirements for the CATV/MATV/SMATV cable network, assuming an unimpaired  
202 input signal at the input of the headend, up to the system outlet are given in  
203 IEC 60728-101, Clause 5.
- 204 • The requirements for the CATV/MATV/SMATV cable network up to the home network  
205 interface (HNI) are given in IEC 60728-101, Clause 7, assuming an unimpaired input  
206 signal at the input of the headend.
- 207 • The specific requirements from HNI to the system outlet or terminal input are given in  
208 IEC 60728-101-1, Clause 5, assuming an unimpaired input signal at the HNI.
- 209 • The requirements at the system outlet in operation are given in Clause 6 of this document.

210 The expression “in operation” means that the received signals, with their impairments, are  
211 applied to the headend input of the CATV/MATV/SMATV cable network. The requirements at  
212 the system outlet “in operation” are derived, therefore, by summing the impairments of the  
213 various cascaded parts of the system and of the input signal.

214 When a change of signal format from digital to digital (e.g. from QPSK to QAM) (e.g. as in ETSI  
 215 EN 300473) or from digital to analogue (e.g. from DVB-S/S2 to AM-VSB or DVB-T/T2 to AM-  
 216 VSB) is made at the headend, the summation of the impairments that produce a relaxation of  
 217 requirements at system outlet does not apply. Such a case will be the equivalence of  
 218 unimpaired signals applied at the headend input. Therefore, the requirements at system outlet  
 219 given in IEC 60728-1 apply.



220

221 Diagram of the main sections of a CATV/MATV/SMATV cable network and the relevant parts  
 222 of the IEC 60728-101 series where the requirements are indicated.

### 223 **Figure 1 – CATV/MATV/SMATV cable network – Performance requirements**

224 This document also provides references for the basic methods of measurement of the  
 225 operational characteristics of the downstream cable network in order to assess its  
 226 performance.

227 All requirements refer to the performance limits to be achieved in operation at any system  
 228 outlet when terminated in a resistance equal to the nominal load impedance of the system,  
 229 unless otherwise specified. Where system outlets are not used, the above applies to the  
 230 terminal input.

231 NOTE 2 If the home network is subdivided into a number of parts, using different transmission media (e.g. coaxial  
 232 cabling, balanced cabling, optical cabling, wireless links) the accumulation of degradations should not exceed the  
 233 figures given below.

234 NOTE 3 Performance requirements of return paths as well as special methods of measurement for the use of the  
 235 return paths in cable networks are described in IEC 60728-10.

## 236 **2 Normative references**

237 The following referenced documents are indispensable for the application of this document.  
 238 For dated references, only the edition cited applies. For undated references, the latest edition  
 239 of the referenced document (including any amendments) applies.

240 IEC 60050-705, *International Electrotechnical Vocabulary (IEV) – Chapter 705: Radio wave*  
 241 *propagation*

242 IEC 60050-712, *International Electrotechnical Vocabulary (IEV) – Chapter 712: Antennas*

- 243 IEC 60050-725, *International Electrotechnical Vocabulary (IEV) – Chapter 725: Space*  
244 *radiocommunications*
- 245 IEC 60728-101:2016, *Cable networks for television signals, sound signals and interactive*  
246 *services – Part 1: System performance of forward paths loaded with digital channels only*
- 247 IEC 60728-101-1, *Cable networks for television signals, sound signals and interactive*  
248 *services – Part 1-1: RF cabling for two-way home networks with all-digital channels load*
- 249 IEC 60728-3, *Cable networks for television signals sound signals and interactive services –*  
250 *Part 3: Active wideband equipment for coaxial cable networks*
- 251 IEC 60966-2-4, *Radio frequency and coaxial cable assemblies – Part 2-4: Detail*  
252 *specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to*  
253 *3 000 MHz, IEC 61169-2 connectors*
- 254 IEC 60966-2-5, *Radio frequency and coaxial cable assemblies – Part 2-5: Detail*  
255 *specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to*  
256 *1 000 MHz, IEC 61169-2 connectors*
- 257 IEC 60966-2-6, *Radio frequency and coaxial cable assemblies – Part 2-6: Detail*  
258 *specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to*  
259 *3 000 MHz, IEC 61169-24 connectors*
- 260 ETSI EN 300 421, *Digital Video Broadcasting (DVB); Framing structure, channel coding and*  
261 *modulation for 11/12 GHz satellite services*
- 262 ETSI EN 300 429, *Digital Video Broadcasting (DVB); Framing structure, channel coding and*  
263 *modulation for cable systems*  
<https://standards.iteh.ai/catalog/standards/sist/ce0c94bf-5c06-42e5-8efc->
- 264 ETSI EN 300 473, *Digital Video Broadcasting (DVB); Satellite Master Antenna Television*  
265 *(SMATV) distribution systems*
- 266 ETSI EN 300 744, *Digital Video Broadcasting (DVB); Framing structure, channel coding and*  
267 *modulation for digital terrestrial television*
- 268 ETSI EN 302 307, *Digital Video Broadcasting (DVB); Second generation framing structure,*  
269 *channel coding and modulation systems for Broadcasting, Interactive Services, News*  
270 *Gathering and other broadband satellite applications*
- 271 ETSI EN 302 755, *Digital Video Broadcasting (DVB) - Frame structure, channel coding and*  
272 *modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)*
- 273 ETSI EN 302 769 (2015), *Digital Video Broadcasting (DVB); Frame structure channel coding*  
274 *and modulation for a second generation digital transmission system for cable systems (DVB-*  
275 *C2)*
- 276 **3 Terms, definitions, symbols and abbreviations**
- 277 **3.1 Terms and definitions**
- 278 For the purposes of this document, the following terms and definitions apply.
- 279 ISO and IEC maintain terminology databases for use in standardization at the following  
280 addresses:

- 281 • IEC Electropedia: available at <https://www.electropedia.org/>  
282 • ISO Online browsing platform: available at <https://www.iso.org/obp>

### 283 3.1.1

#### 284 **active home network**

285 home network that uses active equipment (for example, amplifiers) in addition to passive  
286 equipment such as splitters, taps, system outlets, cables and connectors up to the coaxial RF  
287 interface (input and/or output) of the terminal equipment for distributing and combining RF  
288 signals

289 [SOURCE: IEC 60728-1:2014, 3.1.2]

### 290 3.1.2

#### 291 **antenna**

292 part of a radio transmitting or receiving system which is designed to provide the required  
293 coupling between a transmitter or a receiver and the medium in which the radio wave  
294 propagates

295 Note 1 to entry: In practice, the terminals of the antenna or the points to be considered as the interface between  
296 the antenna and the transmitter or receiver are specified.

297 Note 2 to entry: If the transmitter or receiver is connected to its antenna by a feeder line, the antenna is  
298 considered to be a transducer between the guided radio waves of the feeder line and the radiated waves in space.

299 Note 3 to entry: See also IEC 60728-1:2014, 3.1.3, IEC 60728-1-1:2014, 3.1.2 and IEC 60728-1-2:2014, 3.1.2.

300 [SOURCE: IEC 60050-712:1992, 712-01-01, modified – The deprecated term "aerial" has  
301 been deleted, in Note 1 "should be specified" has been replaced by "are specified", Note 2  
302 has been clarified and a Note 3 giving additional references has been added.]

### 303 3.1.3

#### 304 **attenuation**

305 ratio of the input power to the output power of an equipment or system

306 Note 1 to entry: The ratio is expressed in decibels.

307 [SOURCE: IEC 60728-1:2014, 3.1.5]

### 308 3.1.4

#### 309 **balun**

310 device for transforming an unbalanced voltage to a balanced voltage or vice-versa

311 Note 1 to entry: The term is derived from "balanced to unbalanced transformer".

312 [SOURCE: IEC 60728-101-1:202x, 3.1.4]

### 313 3.1.5

#### 314 **bit error ratio**

#### 315 **BER**

316 ratio between erroneous bits and the total number of transmitted bits

317 [SOURCE: IEC 60728-1:2014, 3.1.9]

### 318 3.1.6

#### 319 **CATV network**

320 regional and local broadband cable networks designed to provide sound and television signals  
321 as well as signals for interactive services to a regional or local area

322 Note 1 to entry: Originally defined as Community Antenna Television network.

323 [SOURCE: IEC 60728-1-1:2014, 3.1.9 and IEC 60728-1-2:2014, 3.1.8]