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Informacijska tehnologija – Osnovni kabelski sistemi – 10. del: Enoparični kabli

Information technology - Generic cabling systems - Part 10: Single pair cabling

Informationstechnik - Anwendungsneutrale Kommunikationskabelanlagen - Teil 10: Einpaarige Verkabelung

Technologies de l'information - Systèmes de câblage générique - Partie 10: Câblage mono-paire

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33.040.50	Vodi, zveze in tokokrogi	Lines, connections and circuits
35.110	Omreževanje	Networking

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Information technology - Generic cabling systems - Part 10: Single pair cabling

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générique - Partie 10: Câblage mono-paire

Informationstechnik - Anwendungsneutrale
Kommunikationskabelanlagen - Teil 10: Einpaarige
Verkabelung

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2025-02-14.

It has been drawn up by CLC/TC 215.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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100 **European foreword**

101 This document (prEN 50173-10:2024) has been prepared by CLC/TC 215 “Electrotechnical aspects of
102 telecommunication equipment”.

103 This document is currently submitted to the CENELEC Enquiry.

104 The following dates are proposed:

- latest date by which the existence of this (doa) dav + 6 months
document has to be announced at national
level
- latest date by which this document has to be (dop) dav + 12 months
implemented at national level by publication of
an identical national standard or by
endorsement
- latest date by which the national standards (dow) dav + 36 months
conflicting with this document have to be (to be confirmed or
withdrawn modified when voting)

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105 **Introduction**

106 This document contains general requirements for generic 1-pair balanced cabling and supports the generic
107 cabling approach of EN 50173-1.

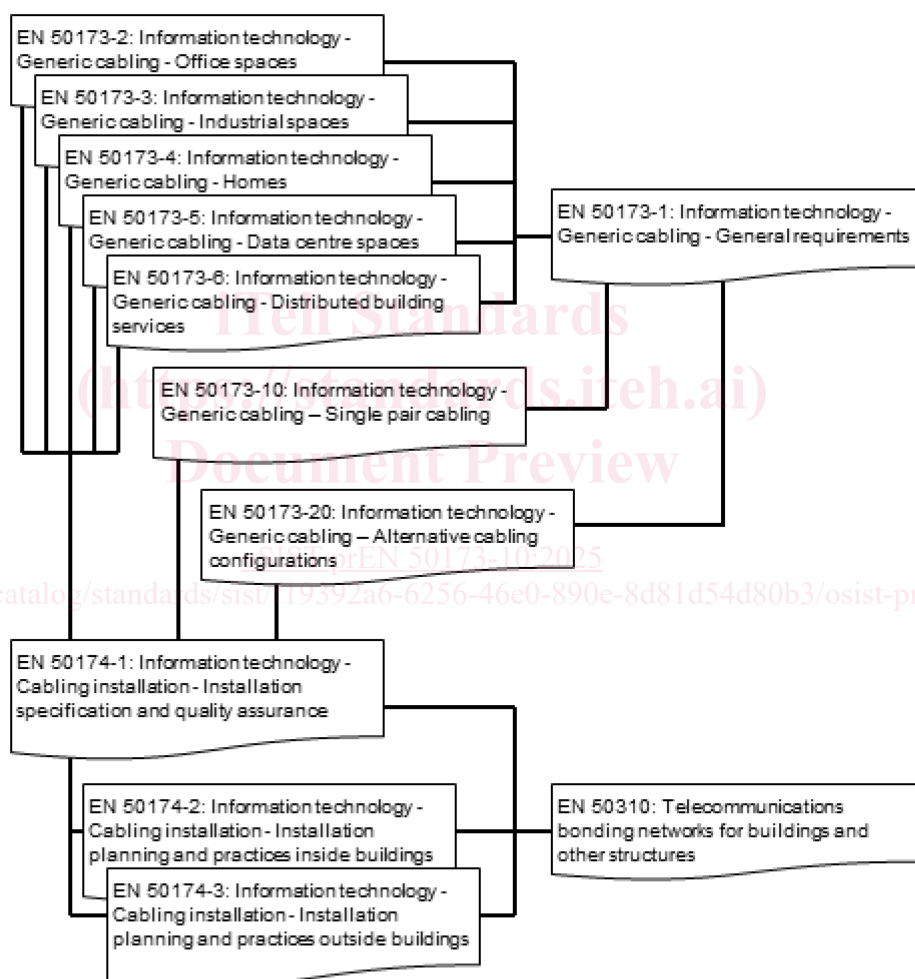
108 It contains a compilation of balanced single pair channel requirements for 100 m reach and beyond together
109 with the supporting cable and connecting hardware requirements based on:

110 — IEC 61156 series (ffs)

111 — EN IEC 63171 series

112 For the mentioned balanced single pair channels remote power supply services are specified.

113 Balanced single pair channels and links specified in this document are not a replacement for the generic 4-pair
114 channels in EN 50173-1. They are an additional media type intended for use in industrial automation networks
115 (e.g. for sensors, actuators and controllers) and “intelligent buildings”.



116

117 **Figure 1 — Schematic relationship between the EN 50173 series and other relevant standards**

118 1 Scope

119 This document specifies 1-pair cabling and can be used in conjunction with all the space-specific standards of
120 the EN 50173 series but especially EN 50173-3 and EN 50173-6.

121 NOTE 1-pair cabling for EN 50173-2, EN 50173-4 and EN 50173-5 is for further study.

122 It delivers 1-pair cabling specifications to extend generic cabling systems according to the EN 50173 series.

123 This document specifies the:

124 — structure and minimum configuration for extension of generic cabling by 1-pair cabling;

125 — interfaces at the service outlet (SO/TO);

126 — performance requirements for cabling links and channels;

127 — implementation requirements and options;

128 — performance requirements for cabling components;

129 — conformance requirements and verification procedures.

130 This document takes into account the requirements specified in application standards listed in Annex C.

131 2 Normative references

132 The following documents are referred to in the text in such a way that some or all of their content constitutes
133 requirements of this document. For dated references, only the edition cited applies. For undated references,
134 the latest edition of the referenced document (including any amendments) applies.

135 EN 50173-1:2018, *Information technology - Generic cabling systems - Part 1: General requirements*

136 EN 50173-3, *Information technology - Generic cabling systems - Part 3: Industrial spaces*

137 EN 50173-6, *Information technology - Generic cabling systems - Part 6: Distributed building services*

138 EN 50174-1, *Information technology - Cabling installation - Part 1: Installation specification and quality*
139 *assurance*

140 EN 50174-2, *Information technology - Cabling installation - Part 2: Installation planning and practices inside*
141 *buildings*

142 EN 50288 (all parts), *Multi-element metallic cables used in analogue and digital communication and control*

143 EN 60512-4-1, *Connectors for electronic equipment - Tests and measurements - Part 4-1: Voltage stress tests*
144 *- Test 4a: Voltage proof (IEC 60512-4-1)*

145 EN 60512-4-2, *Connectors for electronic equipment - Tests and measurements - Part 4-2: Voltage stress tests*
146 *- Test 4b: Partial discharge (IEC 60512-4-2)*

147 EN 60512-6-2, *Connectors for electronic equipment - Tests and measurements - Part 6-2: Dynamic stress tests*
148 *- Test 6b: Bump (IEC 60512-6-2)*

149 EN 60512-6-3, *Connectors for electronic equipment - Tests and measurements - Part 6-3: Dynamic stress tests*
150 *- Test 6c: Shock (IEC 60512-6-3)*

151 EN 60512-6-4, *Connectors for electronic equipment - Tests and measurements - Part 6-4: Dynamic stress tests*
152 *- Test 6d: Vibration (sinusoidal) (IEC 60512-6-4)*

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- 153 EN 60512-11-4, *Connectors for electronic equipment - Tests and measurements - Part 11-4: Climatic tests -*
154 *Test 11d: Rapid change of temperature (IEC 60512-11-4)*
- 155 EN 60512-11-7, *Connectors for electronic equipment - Tests and measurements - Part 11- 7: Climatic tests -*
156 *Test 11g: Flowing mixed gas corrosion test (IEC 60512-11-7)*
- 157 EN 60512-11-9, *Connectors for electronic equipment - Tests and measurements - Part 11-9: Climatic tests -*
158 *Test 11i: Dry heat (IEC 60512-11-9)*
- 159 EN 60512-11-10, *Connectors for electronic equipment - Tests and measurements - Part 11-10: Climatic tests*
160 *- Test 11j: Cold (IEC 60512-11-10)*
- 161 EN 60512-11-12, *Connectors for electronic equipment - Tests and measurements - Part 11-12: Climatic tests*
162 *- Test 11m: Damp heat, cyclic (IEC 60512-11-12)*
- 163 EN 60512-16-4, *Connectors for electronic equipment - Tests and measurements - Part 16-4: Mechanical tests*
164 *on contacts and terminations - Test 16d: Tensile strength (crimped connections) (IEC 60512-16-4)*
- 165 EN 60512-17-2, *Connectors for electronic equipment - Tests and measurements - Part 17-2: Cable clamping*
166 *tests - Test 17b: Cable clamp resistance to cable rotation (IEC 60512-17-12)*
- 167 EN 60512-17-4, *Connectors for electronic equipment - Tests and measurements - Part 17-4: Cable clamping*
168 *tests - Test 17d: Cable clamp resistance to cable torsion (IEC 60512-17-4)*
- 169 EN 60512-19-3, *Electromechanical components for electronic equipment - Basic testing procedures and*
170 *measuring methods - Part 19: Chemical resistance tests - Section 3: Test 19c - Fluid resistance (IEC 60512-*
171 *19-3)*
- 172 EN IEC 60512-23-3, *Electromechanical components for electronic equipment - Basic testing procedures and*
173 *measuring methods - Part 23-3: Test 23c: Shielding effectiveness of connectors and accessories (IEC 60512-*
174 *23-3)*
- 175 EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*
- 176 EN 61935-2, *Specification for the testing of balanced and coaxial information technology cabling - Part 2: Cords*
177 *as specified in ISO/IEC 11801 and related standards (IEC 61935-2)*
- 178 prEN IEC 61935-4, *Specification for the testing of balanced and coaxial information technology cabling- Part 4:*
179 *Installed balanced single pair cabling as specified in ISO/IEC 11801-1 and related standards (IEC 61935-4)*
- 180 EN 62012-1, *Multicore and symmetrical pair/quad cables for digital communications to be used in harsh*
181 *environments - Part 1: Generic specification (IEC 62012-1)*
- 182 prEN IEC 63171:2024, *Connectors for electrical and electronic equipment - Shielded or unshielded free and*
183 *fixed connectors for balanced single-pair data transmission with current-carrying capacity - General*
184 *requirements and tests (IEC 63171:2024)*
- 185 EN IEC 63171-1, *Connectors for electrical and electronic equipment - Part 1: Detail specification for two-way,*
186 *shielded or unshielded, free and fixed connectors - Mechanical mating information, pin assignment and*
187 *additional requirements for Type 1 copper LC style (IEC 63171-1)*
- 188 IEC 63171-6, *Connectors for electrical and electronic equipment - Part 6: Detail specification for 2-way and 4-*
189 *way (data/power), shielded, free and fixed connectors for power and data transmission with frequencies up to*
190 *600 MHz*
- 191 IEC 61156-11, *Multicore and symmetrical pair/quad cables for digital communications – Part 11: Symmetrical*
192 *single pair cables with transmission characteristics up to 1,25 GHz – Horizontal floor wiring – Sectional*
193 *specification*

- 194 IEC 61156-12, *Multicore and symmetrical pair/quad cables for digital communications - Part 12: Symmetrical*
195 *single pair cables with transmission characteristics up to 600 MHz - Work area wiring - Sectional specification*
- 196 IEC 61156-13, *Multicore and symmetrical pair/quad cables for digital communications – Part 13: Symmetrical*
197 *single pair cables with transmission characteristics up to 20 MHz - Horizontal floor wiring - Sectional*
198 *specification*
- 199 IEC 61156-14, *Multicore and symmetrical pair/quad cables for digital communications – Part 14: (work area*
200 *cables related to Part 13: Cables for 10 Mb/s over one pair – Sectional specification)*¹
- 201 IEC 61935-1, *Specification for the testing of balanced and coaxial information technology cabling - Part 1:*
202 *Installed balanced cabling as specified in ISO/IEC 11801-1 and related standards*
- 203 IEC 61935-2-X (all parts), *Testing of balanced communication cabling in accordance with ISO/IEC 11801*

204 **3 Terms, definitions and abbreviations**

205 **3.1 Terms and definitions**

206 For the purposes of this document, the terms and definitions given in EN 50173-1 and EN 50174-1 apply.

207 ISO and IEC maintain terminological databases for use in standardization at the following addresses:

208 — IEC Electropedia: available at <https://www.electropedia.org/>

209 — ISO Online browsing platform: available at <https://www.iso.org/obp>

210 **3.2 Abbreviations**

211 For the purposes of this document, the abbreviations given in EN 50173-1, EN 50173-6 and the following apply:

AO Automation Outlet

DC direct current

DCLR direct current loop resistance

ED Edge Distributor

IL insertion loss

PoDL Power over data line

RL return loss

SPE Single Pair Ethernet

212 **3.3 Symbols**

213 For the purposes of this document, the symbols given in EN 50173-1 apply.

214 **4 Structure of 1-pair cabling**

215 **4.1 General**

216 This clause identifies the structure and hierarchy of 1-pair cabling, describes how they are connected to form
217 horizontal cabling sub systems using 1-pair cabling at their ends and identifies the interfaces at which
218 application-specific components are connected to the generic cabling.

¹ In preparation.

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219 1-pair transmission channels and links, created by connecting application-specific cabling components to the
 220 generic cabling, are used to support specific applications. Applications listed in Annex C are supported by
 221 connecting active equipment at the distributors.

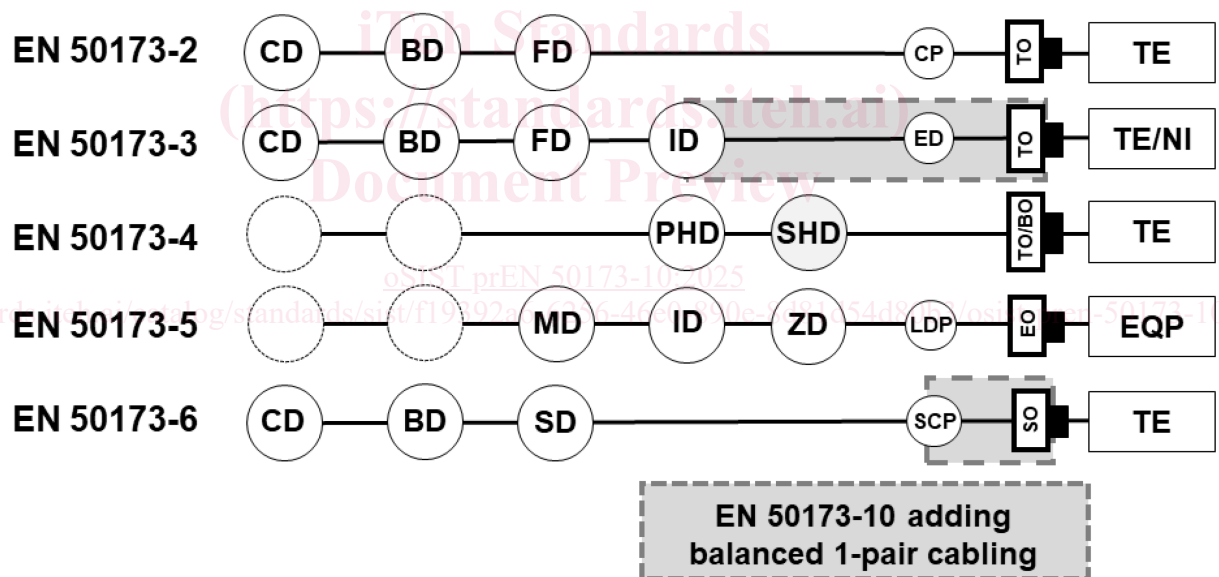
222 4.2 Functional elements

223 The 1-pair cabling system described in this document is an extension of the generic cabling system according
 224 to EN 50173 series using the functional elements described in EN 50173-1 up to EN 50173-6. The following
 225 functional elements are relevant for 1-pair cabling systems:

- 226 a) Intermediate Distributor (ID), which can become an IID (see EN 50173-3);
- 227 b) Edge Distributor (ED), which offers a possible medium change from 4-pair or 2-pair cable to 1-pair cable;
- 228 c) Telecommunication Outlet (TO), which become an AO (see EN 50173-3);
- 229 d) Service Concentration Point (SCP);
- 230 e) Service Outlet (SO).

231 4.3 Structure and hierarchy

232 1-pair cabling systems consist of 1-pair cables, 1-pair connectors, and 1-pair connection cords. The 1-pair
 233 cabling systems are connected to distributors or other functional elements to create together with the generic
 234 cabling system an end-to-end cabling solution according to the scope of EN 50173 series. The general structure
 235 is shown in Figure 2.



236

237 **Figure 2 — General structure of 1-pair cabling in EN 50173-10**

238 4.4 Channels

239 This document specifies 1-pair cabling channels to support data and power transmission for Single Pair
 240 Ethernet and other services to extend generic cabling according EN 50173 series or other appropriate
 241 infrastructures and implementations.

- 242 a) T1-20: 1-pair cabling up to 20 MHz; designed for 10 Mbit/s transmission up to 100 m and current carrying
 243 capacity of minimum 0,75 A per conductor.
- 244 b) T1-20A: 1-pair cabling up to 20 MHz; designed for 10 Mbit/s transmission up to 230 m and current carrying
 245 capacity of minimum 0,25 A per conductor.

- 246 c) T1-600: 1-pair cabling up to 600 MHz; designed for 1 Gbit/s transmission up to 100 m and current carrying
247 capacity of minimum 0,75 A per conductor.
- 248 d) P1-20: 1-pair cabling up to 20 MHz; designed for 10 Mbit/s transmission up to 100 m and current carrying
249 capacity of minimum 2 A per conductor.
- 250 e) P1-20A: 1-pair cabling up to 60 MHz; designed for 10 Mbit/s transmission up to 300 m and current carrying
251 capacity of minimum 0,75 A per conductor.
- 252 f) P1-20B: 1-pair cabling up to 20 MHz; designed for 10 Mbit/s transmission up to 1 000 m and current
253 carrying capacity of minimum 0,25 A per conductor.

254 For further information, see Annex A.

255 **4.5 Equipment interfaces and test interfaces**

256 Equipment and test interfaces are specified in EN 50173-3:2018, 4.7.1.

257 **5 Channel performance**

258 **5.1 Environmental performance**

259 The environmental performance shall comply with EN 50173-1:2018, Table 3.

260 **5.2 Transmission performance**

261 **5.2.1 General**

262 The required transmission performance Class of this clause shall be met for all environmental classifications
263 specified for the channel. The transmission performance is specified at 20°C

264 **5.2.2 Balanced single-pair cabling channel performance**

265 **5.2.2.1 General**

266 This standard specifies the following Classes for single-pair balanced cabling:

- 267 a) Class T1-20: specified up to 20 MHz and 100 m; current carrying capacity of minimum 0,75 A, 4
268 connections;
- 269 b) Class T1-20A: specified up to 20 MHz and 230 m; current carrying capacity of minimum 0,25 A, 4
270 connections;
- 271 c) Class T1-600: specified up to 600 MHz and 100 m; current carrying capacity of minimum 0,75 A, 4
272 connections;
- 273 d) Class P1-20: specified up to 20 MHz and 100 m; current carrying capacity of minimum 2 A, 4 connections;
- 274 e) Class P1-20A: specified up to 20 MHz and 300 m; current carrying capacity of minimum 0,75 A, 4
275 connections;
- 276 f) Class P1-20B: specified up to 20 MHz and 1000 m; current carrying capacity of minimum 0,25 A, 10
277 connections.

278 The 100 m channels are backward compatible.

279 Annex C lists balanced cabling applications by Class.

280 NOTE For the length determination of application specific channels or links see Annex D.

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281 The parameters specified in this subclause apply to channels with screened or unscreened cable elements,
282 with or without an overall screen, unless explicitly stated otherwise.

283 The nominal impedance of channels is 100 Ω. This is achieved by suitable design, and appropriate choice of
284 cabling components (irrespective of their nominal impedance).

285 The requirements in 5.2 are given by limits computed to one decimal place, using the equation for a defined
286 frequency range. The limits for the propagation delay are computed to three decimal places. The informative
287 tables show the calculated values derived from the relevant equation at key frequencies. Many specifications
288 in 5.2 have a plateau in the specified requirement. These plateaus do not accurately depict the system
289 performance. They have been added for measurement purposes.

290 5.2.2.2 Return loss

291 The variation of the input impedance of a channel is characterised by the return loss (RL).

292 The RL parameter is applicable to all Classes. The RL shall meet the limits computed, to one decimal place,
293 using the formulae of Table 1. The limits shown in Table 2 are derived from the formulae at key frequencies
294 only.

295 Values of RL at frequencies for which the measured channel insertion loss is below 3,0 dB are for information
296 only.

297 When required, the RL shall be measured according to IEC 61935-1. Terminations of 100 Ω shall be connected
298 to the cabling elements under test at the remote end of the channel. The return loss requirements shall be met
299 at both ends of the cabling.

300

Table 1 — Formulae for RL limits for a channel

Class	Frequency MHz	Minimum RL dB
T1-20 T1-20A	$0,1 \leq f \leq 1$	$9 + 10 \times f$
	$1 < f \leq 10$	19,0
	$10 < f \leq 20$	$24 - 5 \times \lg(f)$
T1-600	$0,1 \leq f \leq 1$	$9 + 10 \times f$
	$1 < f \leq 10$	19,0
	$10 < f \leq 40$	$24 - 5 \times \lg(f)$
	$40 < f \leq 130$	16,0
	$130 < f \leq 400$	$37 - 10 \times \lg(f)$
	$400 < f \leq 600$	11,0
P1-20	$0,1 \leq f \leq 1$	$9 + 10 \times f$
P1-20A	$1 < f \leq 10$	19,0
P1-20B	$10 < f \leq 20$	$24 - 5 \times \lg(f)$