



SLOVENSKI STANDARD
oSIST prEN 50155:2024
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Železniške naprave - Vozna sredstva - Elektronska oprema

Railway applications - Rolling stock - Electronic equipment

Bahnanwendungen - Elektronische Einrichtungen auf Schienenfahrzeugen

Applications ferroviaires - Équipements électroniques utilisés sur le matériel roulant

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Railway applications - Rolling stock - Electronic equipment

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Schienenfahrzeugen

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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.

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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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198 European foreword

199 This document (prEN 50155:2024) has been prepared by CLC/SC 9XB, “Electrical, electronic and
200 electromechanical material on-board rolling stock, including associated software”.

201 The following dates are proposed:

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- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months (to be confirmed or modified when voting)

202 This document will supersede EN 50155:2021 and all of its amendments and corrigenda (if any).

203 prEN 50155:2024 includes the following significant technical changes with respect to EN 50155:2021:

204 a) Revision of Clause 1 Scope;

205 1) Scope regarding “Software requirements for on-board railway equipment” is covered by EN 50716.

206 b) Updating of Clause 2 Normative references;

207 c) Revision of Clause 3 Terms, definitions and abbreviations”, new definitions and reorganization of
208 subclauses;

209 1) Definition modified for “operating temperature”;

210 2) Definition added for “ancillary component”;

211 d) Improvement of Clause 4 General requirements, in terms of better wording, requirement expansion and
212 reorganization of subclauses;

213 1) Precision about concept of expected performance level for all operational conditions.

214 2) Wording improvements of 4.3.2 to 4.3.3 “Performance criterion A and B;

215 3) Wording improvements of 4.4.2 about “Operating temperature classes” and concept of temperature
216 (45 °C) to consider during service life with its effects on unit material ageing.

217 e) Improvement of Clause 5 Electrical service conditions, with reorganization of subclauses;

218 1) Subclause “5.1.1 General” is added before “5.1.2 DC supply system” and “5.1.3 AC supply system”;

219 2) Nominal voltage (Un) of the electronic equipment “should” be selected amongst the following values:
220 24 V, 28 V, 36 V, 48 V, 72 V, 96 V, 110 V;

221 3) Wording improvement of 5.2.2 “Equipment shall operate satisfactorily within the voltage range and
222 duration defined in Table 4, measured at its power input terminals”;

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- 223 4) Wording improvement of 5.2.3 “Electronic equipment shall also operate at the values of the DC supply
224 voltage, which are measured at the terminals of the equipment, within the entire range of temporary
225 supply voltage variation defined in Table 4.”;
- 226 5) Wording improvement of 5.2.6 “EXAMPLE 3 Considering the maximum and minimum temporary
227 supply voltage for equipment designed to operate at nominal voltages from 24 V up to 110 V, the
228 minimum temporary voltage is $0,6 \times 24 \text{ V}$ and the maximum temporary voltage is $1,4 \times 110 \text{ V}$ ”;
- 229 6) Wording improvement of 5.2.8 “Starting the combustion engine by a starter motor powered by the
230 battery voltage supply system can cause voltage drops and fluctuations on the battery voltage supply
231 system”;
- 232 7) 5.3.1 “Supply by a specific source” is renamed 5.3.1 “Supply by a specific DC or AC source”;
- 233 8) 5.3.2 “Supply by an AC auxiliary power converter”, sentence “In some special cases more restrictive
234 requirements for the voltage characteristics can be specified between the involved parties.” Is added;
- 235 9) 5.3.4 “Design and test requirements for AC supply” is added; with reference to informative Annex I;
- 236 f) Improvement of Clause 6 Reliability, maintainability and expected useful life;
- 237 1) 6.3.3.1, sentence “Maintenance or diagnostic procedures at this level shall not require the removal or
238 replacement of any part of the defective LRU” is added;
- 239 2) 6.5, sentence “The supplier shall provide information about purpose-built test equipment and/or special
240 tools are required to carry out the user's maintenance procedures.”, is added;
- 241 3) 6.5, sentence “Purpose-built test equipment does not necessarily have to comply with this standard”
242 is changed by “Purpose-built test equipment does not necessarily need to be in accordance with the
243 requirements of this document.”
- 244 g) Wording improvements and precision added to Clause 7 Design;
- 245 1) 7.2.4: Rewording of the sentence about reference potential of galvanically isolated power supplies
246 outputs.;
- 247 2) 7.2.6: The following sentence is added: “The equipment shall restart in normal operating mode when
248 the supply voltage is within the continuous voltage”
- 249 h) Clause 9 Components,
- 250 1) 9.1: The acronyms UPIC is used to identify the “user programmable integrated circuits”;
- 251 2) 9.2: Improvement of the text related to requirements that can be required at tender stage by the user
252 about reliability, the life duration of components and the documentation of the electronic equipment.;
- 253 i) Wording improvements and precisions added for Clause 10 Construction
- 254 1) 10.2.5: Added recommendation: “It is recommended to avoid integrated circuit socket and/or edge
255 connectors as far as possible”;
- 256 2) 10.6.5: Applicable standard about defined flammability of rigid PCB: “The base material of the rigid
257 PCB shall be epoxy and woven glass fabric laminated sheet of defined flammability in accordance with
258 EN 45545-2:2020+A1:2023.”;
- 259 3) 10.8.2: Precision about identification of subracks and PBA: “Means shall be provided on the subracks
260 and PBAs to indicate any revision/change in design or manufacturing.”;

261 4) 10.11: Precision about “Materials and finishes”: “Potting to provide additional protection should only
 262 be used if it is necessary for technical reasons” and “Coating and potting materials may not need to be
 263 dimensionally stable as long as their thermal coefficient is considered to avoid high stress on
 264 components or assemblies”.

265 j) Revision of Clause 12 Documentation;

266 1) 12.1: Added requirement about identification of “documents or drawings submitted to the user”: “shall
 267 be identified by an appropriate and unambiguous reference, a date, a version or revision index, a
 268 record of changes and an explanatory title of the presented item and of the type of document or
 269 drawing.”;

270 2) 12.3: Precision about the datasheet content: “This document shall contain all information which the
 271 user needs to evaluate whether the electronic equipment fulfils the requirements covered by the scope
 272 of this document.”

273 3) 12.7: The design documentation structure is reorganised on the main topics: Hardware, User
 274 Programmable Integrated Circuits (UPIC) and Software.

275 4) Subclauses that were previously in the topic “Repair documentation”: (e.g.: “12.7.10.2 Circuit
 276 diagrams”, “12.7.10.3 Component list (Bill of material)” and 12.7.10.4 Component layout”) are moved
 277 to the “Hardware” main documentation topic.;

278 5) 12.7.3: The new standard reference about “Requirements for software development” is used: “All
 279 identified information items (documentation) shall be in accordance with EN 50716:2023.”

280 EN 50716 specifies the documentation required for the software development process but does not specify
 281 the documentation to provide to the user. In the EN 50155 scope, the following requirement is kept: “the
 282 supplier shall determine and list which information items are deliverable documents, consultable documents
 283 and non-deliverable documents and which information items are to be archived.”, but the following sentence
 284 is deleted: “At least the highly recommended documents (HR) in EN 50657:2017, Table A.1 column basic
 285 integrity shall be provided for non-safety related on-board equipment.”

286 6) 12.9.1: Precisions about Repair documentation – General: “The equipment detailed repair
 287 documentation is delivered only under specific request of the user and is subject to a contractual
 288 agreement between supplier and user regarding the contents, the confidentiality and the rights of use
 289 of this documentation.”

290 “NOTE The list, the description, reference of special tools and the list of declared non-repairable
 291 items, are not subjected to contractual agreement, confidentiality and right of use. (See: 12.9.2 and
 292 12.9.3)”;

293 k) Improvements of Clause 13 Testing;

294 1) 13.1 General: Added precisions about the test specification: “A test specification defines the test
 295 procedures and the acceptance criteria of the individual tests and the test sequence, if relevant. The
 296 test specification shall be written by the supplier”.

297 “NOTE Additional information are provided by Annex B for the verification of equipment by the system
 298 integrator at system level.”

299 2) 13.2.2: Added precision about type tests and “production serial tests”: “Equipment used for type tests
 300 shall previously been subjected to routine test. If the production routine tests are not ready at this step,
 301 they may be replaced by equivalent tests.”

302 3) 13.4 title: “Test specification” is renamed “Description of the tests”;

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- 303 4) 13.4.2: Added precision about the performance test: "The performance test is carried out according to
304 the test specification, which contains the performance test procedure, written by the supplier either for
305 type test or for routine test."
- 306 5) Test descriptions for 13.4.5.1, 13.4.5.2, 13.4.5.2 and 13.4.6 are improved.
- 307 6) 13.4.7.1: The following sentence is added for insulation test: "During the test all input / output of the
308 same equipotential area should be connected together in order to avoid damages due to unwanted
309 voltages within the equipotential area."
- 310 7) 13.4.7.2: Additional details are provided for Insulation resistance test acceptance requirements when
311 high impedance bleeder resistors are inserted between adjacent equipotential areas or between an
312 equipotential area and functional earth.;
- 313 8) 13.4.8: Cyclic damp heat test: Additional details are provided for final test acceptance requirements:
- 314 l) Improvement of informative Annex A - List of default requirements of EN 50155 and related subclauses;
315 Content is updated;
- 316 m) Improvement of informative Annex B - System testing approach (In particular B.10)
- 317 n) Improvement of informative Annex C - Severity level of service conditions in different vehicle locations.
318 (Figure C.2)
- 319 o) Improvement of informative Annex D - Example for an equipment tests compliance summary sheet.
- 320 p) Informative Annex E User programmable integrated circuit life cycle example.
- 321 q) Improvement of informative Annex F – Design suggestions for electronic hardware used on rolling stock
- 322 1) F.1: Added precision: "The values given in Tables F.2 to F.19 are examples of typical use and can vary
323 from one design to another."
- 324 2) F.2.2 Added precision: "Between battery referenced ports and earth, the use of voltage suppressors is
325 not recommended to ensure high dielectric isolation between battery referenced ports and earth."
- 326 3) F.2.6 Prototype testing:
- 327 "At prototype stage, all functions should be verified according to the specification. It is also recommended
328 that the integrity of signals between parts of the circuit be investigated. Furthermore, it is strongly
329 recommended to carry out the tests following the type test specification."
- 330 "These tests are intended as investigation tests, but they cannot be used to produce a type test report. One
331 of the reasons is that, normally, the prototype equipment is not manufactured according to the same
332 manufacturing process as a series equipment."
- 333 4) F.2.7 Interfacing: About analogue and digital interfaces:
- 334 "They should be designed as differential inputs and/or outputs to ensure adequate common-mode noise
335 rejection."
- 336 r) Improvement of informative Annex G - Electronic equipment not designed for use on rolling stock;
- 337 1) New text about "Applicability conditions for use of electronic equipment not designed for rolling stock";
- 338 2) New text about "electronic equipment properties list" that should be comparable to the requirements in
339 this document.

- 340 3) New text about “Possible deviations or mitigations for the suitability evaluation”;
- 341 s) Improvement of informative Annex H – Paragraphs with agreements between the involved parties.
- 342 1) Added Note:
- 343 “NOTE Agreements between the involved parties (e.g. user and supplier) are not applicable to electronic
344 equipment that can be purchased as catalogue parts with qualification according to EN 50155. Since these
345 have been developed as generic products for a market, but not for a specific user”
- 346 t) Improvement of informative Annex I – Electronic equipment supplied from AC supply system;
- 347 1) Paragraph “I.1 General” is moved to 5.3.4.
- 348 2) New paragraph I.1 is renamed “Design and test provisions”
- 349 3) Table I.1 is completed by a new note:
- 350 If AC voltage is derived from an “AC Auxiliary Power converter” refer to EN 50533 for static voltage
351 tolerances and for short dips/interruptions.
- 352 If AC voltage is derived from any other AC source the technical specification of this local source, regarding
353 tolerances and short dips/interruptions, should be met. In the absence of information EN 50160 for static
354 voltage tolerances and EN IEC 61000-6-2 for short dips/interruptions should be used as a guide.
- 355 u) Improvement of informative Annex J - Typical content of datasheets
- 356 v) Improvement of informative Annex K - Insulation test and testing matrix example
- 357 w) Updated informative Annex ZZ - Relationship between this European Standard and the Essential
358 Requirements of EU Directive.
- 359 x) Updated Bibliography.
- 360 This document has been prepared under a standardization request addressed to CENELEC by the European
361 Commission. The Standing Committee of the EFTA States subsequently approves these requests for its
362 Member States.
- 363 For the relationship with EU Legislation, see informative Annex ZZ, which is an integral part of this document.

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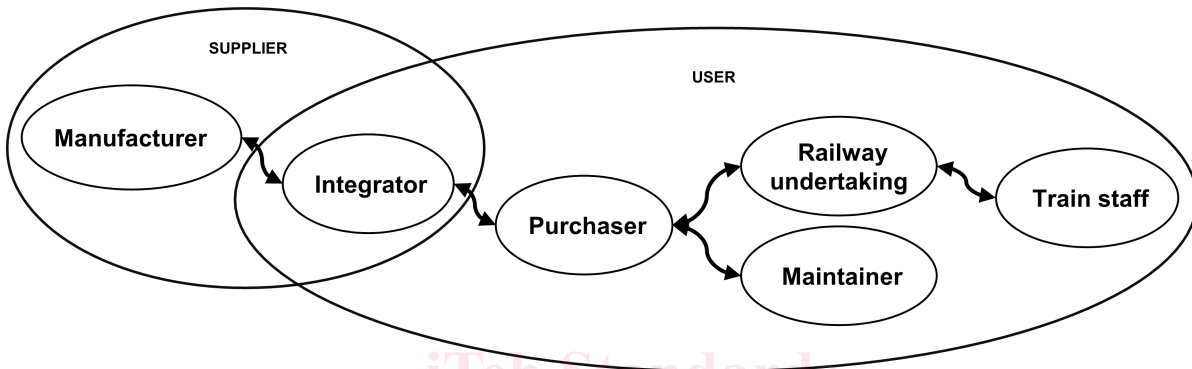
364 **Introduction**

365 This document specifies the requirements for design, manufacturing, documentation and testing of any
 366 electronic equipment installed on-board of rolling stock.

367 It also describes the electrical and environmental operating conditions.

368 The aim of this document is not to be a detailed guideline for the design of the electronic equipment. The design
 369 is the supplier's responsibility. However, some recommendations are given in informative annexes in order to
 370 draw the attention of the designer on known design aspects. The supplier should take into account the
 371 requirements resulting from the specific location of the on-board installation (see Annex C).

372 The roles of user and/or supplier are shown in Figure 1 below.



373

374 **Figure 1 — Roles and relationship of user and/or supplier**

375 This **document** primarily specifies requirements for electronic equipment that is developed and manufactured
 376 according to user specifications.

377 The requirements also apply to electronic equipment that can be purchased as catalogue parts with qualification
 378 in accordance with EN 50155. Since these have already been developed before purchase, the agreements
 379 between the involved parties (e.g. user and supplier) described in this document (see Annex H) are not
 380 applicable.