SLOVENSKI STANDARD
oSIST prEN 50155:2016

01-maj-2016

Železniške naprave - Elektronska oprema na voznih sredstvih

Railway applications - Electronic equipment used on rolling stock

Bahnanwendungen - Elektronische Einrichtungen auf Schienenfahrzeugen

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Applications ferroviaires - Équipements électroniques utilisés sur le matériel roulant

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Railway applications - Electronic equipment used on rolling stock

Applications ferroviaires - Équipements électroniques utilisés sur le matériel roulant

Bahnanwendungen - Elektronische Einrichtungen auf Schienenfahrzeugen

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2016-05-13.

It has been drawn up by CLC/SC 9XB.

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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European foreword

This document [prEN 50155:2016] has been prepared by CLC/TC 9X “Electrical and electronic applications for railways”.

This document is currently submitted to the Enquiry.

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• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

This document will supersede EN 50155:2007.

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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Introduction

This standard is applied in the design, manufacturing, testing of any electronic equipment installed on board rolling stock.

It also describes the electrical and environmental operating conditions.

The changes in the identification of temperature classes listed in Table 1 reflect the no relationship with temperature classes listed in EN 50125-1.

The aim of this standard is not to be a detailed guideline for the design of the electronic equipment; the design is made under the responsibility of the supplier. The supplier should take into account the requirements resulting from the specific on board installation (see Annex C).

The delivered product shall comply with the design requirements, the documentation requirements and the testing requirements of this standard.

The roles of user and/or supplier are shown in the picture below.

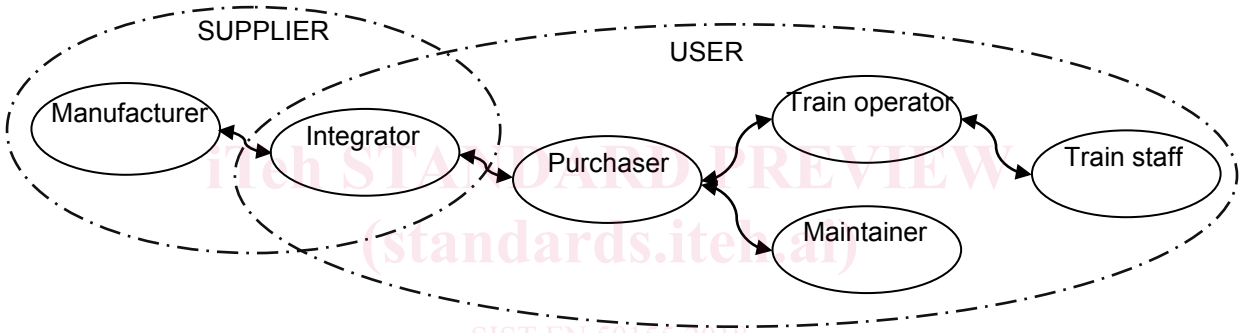

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Figure 1 — Roles and relationship of user and/or supplier

NOTE Due to the parallel CLC enquiry processes of this standard and the newly developed rolling stock software standard, the responsible CENELEC standing committee CLC/SC 9XB decided to identify those software requirements within prEN 50155 which will potentially be removed from this standard and replaced by a reference to the new software standard “software on-board of rolling stock, excluding railway control and protection applications” (prEN 50657) where necessary.

List of Software-related parts within this standard:

- Subclause 7.3: Detailed practices,
- Subclause 7.4: Features of software controlled equipment,
- Clause 9: Components (this covers programmable components in one paragraph and now refers to Clause 12),
- Clause 12: Documentation,
- Annex E: Life cycle model examples,
- Annex G: Non-railway designed electronic equipment.

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1 Scope

This draft European Standard applies to all electronic equipment for control, regulation, protection, diagnostic, supply, etc. installed on rail vehicles.

For the purpose of this draft European Standard, electronic equipment is defined as equipment mainly composed of semiconductor devices and recognized associated components. These components will mainly be mounted on printed boards.

Sensors (current, voltage, speed, etc.) and firing unit printed board assemblies for power electronic devices are covered by this standard. Complete firing units and electronic power circuits are covered by EN 61287-1.

This draft European Standard covers the conditions of operation, design requirements, documentation, and testing of electronic equipment, as well as basic hardware and software requirements considered necessary for compliant and reliable equipment.

Specific requirements related to practices necessary to ensure defined levels of functional safety will be determined in accordance with relevant railway safety standards.

Subject to the paragraph above, software is within the scope of this standard until a suitable standard for software on board rolling stock is available.

NOTE A standard for software on board rolling stock (except for software for train control and protection) is under development.

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 45545 (all parts), *Railway applications — Fire protection on railway vehicles*

EN 45545-2:2013; *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behavior of materials and components*

EN 50121-3-1, *Railway applications — Electromagnetic compatibility — Part 3-1: Rolling stock — Train and complete vehicle*

EN 50121-3-2:2006, *Railway applications — Electromagnetic compatibility — Part 3-2: Rolling stock — Apparatus*

EN 50124-1, *Railway applications - Insulation coordination — Part 1: Basic requirements — Clearances and creepage distances for all electrical and electronic equipment*

EN 50125-1:2014, *Railway applications — Environmental conditions for equipment — Part 1: Rolling stock and on-board equipment*

EN 50153, *Railway applications — Rolling stock — Protective provisions relating to electrical hazards*

EN 50163, *Railway applications — Supply voltages of traction systems (IEC 60850)*

EN 60068-2-1:2007, *Environmental testing — Part 2-1: Tests — Test A: Cold (IEC 60068-2-1:2007)*

EN 60068-2-2:2007, *Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2:2007)*

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EN 60068-2-11, *Environmental testing — Part 2: Tests — Test Ka: Salt mist (IEC 60068-2-11)*

EN 60068-2-30:2005, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005)*

EN 60297 (all parts), *Mechanical structures for electronic equipment — Dimensions of mechanical structures of the 482,6 mm (19 in) series (IEC 60297, all parts)*

EN 60352-1, *Solderless connections — Part 1: Wrapped connections — General requirements, test methods and practical guidance (IEC 60352-1)*

EN 60352-2, *Solderless connections — Part 2: Crimped connections — General requirements, test methods and practical guidance (IEC 60352-1)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61249-2-7, *Materials for printed boards and other interconnecting structures — Part 2-7: Reinforced base materials, clad and unclad — Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad (IEC 61249-2-7)*

EN 61249-2-10, *Materials for printed boards and other interconnecting structures — Part 2-10: Reinforced base materials, clad and unclad — Cyanate ester, brominated epoxide, modified or unmodified, woven E-glass reinforced laminated sheets of defined flammability (vertical burning test), copper-clad (IEC 61249-2-10)*

EN 61373:2010, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373:2010)*

EN 62326 (all parts), *Printed boards (IEC 62326, all parts)*

EN 123000, *Generic Specification: Printed boards*

EN 123200, *Sectional Specification: Single and double sided printed boards with plated-through holes*

EN 123300, *Sectional Specification: Multilayer printed boards*

EN 123400, *Sectional Specification: Flexible printed boards without through connections*

EN 123500, *Sectional Specification: Flexible printed boards with through connections*

EN ISO 9001:2015, *Quality management systems — Requirements (ISO 9001:2015)*

ISO IEC 90003, *Software engineering — Guidelines for the application of ISO 9001:2008 to computer software*

ISO IEC 12207, *Systems and software engineering — Software life cycle processes*

ISO/IEC/IEEE 15288, *Systems and software engineering — System life cycle processes*

ISO/IEC/IEEE 15289:2011, *Systems and software engineering — Content of life-cycle information items (documentation)*

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3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
printed circuit board
PCB
base material cut to size bearing at least one conductive pattern

Note 1 to entry: Printed boards are typically subdivided according to:

- their structure (e.g. single and double sided, multilayers);
- the nature of the base material (e.g. rigid, flexible).

3.1.2
printed circuit board assembly
PBA
printed circuit board with electrical and mechanical components and/or other printed boards attached to it with all manufacturing processes, soldering, coating, etc., completed

3.1.3
printed board assembly operating temperature
for PBA used in natural cooling equipment: air temperature measured near the components mounted on the PCB

for PBA used in forced cooling equipment: temperature of the cooling air flow

3.1.4
operating temperature
temperature range in which the electronic equipment can function (e.g. cubicle temperature, rack temperature, roof box temperature) in full conformity with his performance criteria, and outside which there can be temporary or permanent degradation of the equipment performances

3.1.5
plug in unit
unit which plugs into a subrack and is supported by guides

Note 1 to entry: These units can be of various types, ranging from a printed circuit board assembly mounted in a frame or box type unit, designed with a plug in connection.

3.1.6
subrack
structural unit for housing printed circuit board assemblies and/or plug in units

3.1.7
rack
free standing or fixed structure for supporting electrical or electronic equipment (e.g. subracks)

3.1.8
cubicle
enclosure for housing electrical and/or electronic equipment

3.1.9
line replaceable unit
modular component that is designed to be replaced quickly at an operating location

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3.1.10
performance test
test in which the equipment is stimulated and measured to verify the conformance to the specified functional requirements, and which will verify all functionalities

Note 1 to entry: The performance test is carried out according to the Performance test specification and Performance test procedure provided by the supplier.

3.1.11
operational check
tailored performance test which is carried out during and/or after environmental tests or stress screening sufficient to prove that the equipment is within its operational limits, and that it has survived the environmental/stress screening test

Note 1 to entry: Every environmental test or stress screening can use a different operational check.

Note 2 to entry: Operational checks are carried out according to Operational check specifications and Operational check procedures provided by the supplier.

3.1.12
system voltage supply
voltage supply used to power the electronic equipment

3.1.13
vehicle wiring
all wiring which can be connected to the system voltage supply, wherever located, and all other wiring external to the electronic equipment under consideration

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3.1.14
supply overvoltage
electrical disturbance to the control system voltage supply (e.g. caused by equipment controlling that supply, load drop)

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Note 1 to entry: A supply overvoltage will occur as an increase in the level of the control system voltage supply.

3.1.15
energetic transient pulses
non-periodic and relatively short positive or negative (or both) rapid change(s) of voltage and/or current between two steady states

3.1.16
failure
termination of the ability of an item to perform a required function

Note 1 to entry: Attention is drawn to the possibility of a consequential failure of a second item of equipment resulting from a temporary malfunction of an item of equipment connected to it.

Note 2 to entry: “Failure” is an event, as distinguished from “fault”, which is a state.

Note 3 to entry: A temporary malfunction will not be considered as a failure provided that the equipment recovers normal operation automatically following malfunction.

3.1.17
damage
change in visual appearance or alteration of electrical or mechanical integrity