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**Železniške naprave - Vozna sredstva - Zaščitni ukrepi proti nevarnostim električne napetosti**

Railway applications - Rolling stock - Protective provisions relating to electrical hazards

Bahnanwendungen - Fahrzeuge - Schutzmaßnahmen in Bezug auf elektrische Gefahren

Applications ferroviaires - Matériel roulant - Mesures de protection vis-à-vis des dangers d'origine électrique

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## Railway applications - Rolling stock - Protective provisions relating to electrical hazards

Applications ferroviaires - Matériel roulant - Mesures de  
protection vis-à-vis des dangers d'origine électrique

Bahnanwendungen - Fahrzeuge - Schutzmaßnahmen in  
Bezug auf elektrische Gefahren

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## Foreword

This document (EN 50153:2014) has been prepared by CLC/SC 9XB "Electromechanical material on board rolling stock" from CLC/TC 9X "Electrical and electronic applications for railways".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-03-10
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-03-10

This document supersedes EN 50153:2002.

EN 50153:2013 includes the following significant technical changes with respect to EN 50153:2002:

- the document now takes into account EN 50122-1:2011 and UIC leaflet 533:2011;
- other normative references and some definitions have been updated;
- Annex D has been added, Annex C has been changed.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

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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.

## Introduction

It is generally accepted that safety depends on human factors, based on the normal behaviour of the operators involved, as well as upon technical factors.

For these reasons, this European Standard, in several instances, leaves a choice to the contracting parties between two alternatives. These alternatives consist of either the provision of operating rules, regulations and procedures, or in the application of technical measures such as mechanical or electrical interlocking devices.

A list of the cases for which the contracting parties (e.g. user and manufacturer) should reach agreement before signing the contract is included in Annex B.

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## 1 Scope

This European Standard defines requirements to be applied in the design and manufacture of electrical installations and equipment to be used on rolling stock to protect persons from electric shocks.

This European Standard is applicable to rolling stock of rail transport systems, road transport systems, if they are powered by an external supply (e.g. trolley buses), magnetically levitated transport systems and to the electrical equipment installed in these systems.

This European Standard does not apply to:

- mine railways in mines,
- crane installations, moving platforms and similar transport systems on rails,
- funicular railways,
- temporary constructions.

## 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 50122-1:2011<sup>1)</sup>, *Railway applications — Fixed installations — Electrical safety, earthing and the return circuit — Part 1: Protective provisions against electric shock*

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

EN 50388, *Railway applications — Power supply and rolling stock — Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability*

HD 60364-4-41:2007, *Low-voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock (IEC 60364-4-41:2005, modified)*

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

EN 61140, *Protection against electric shock — Common aspects for installation and equipment (IEC 61140)*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1)*

IEC/TS 60479-1, *Effects of current on human beings and livestock — Part 1: General aspects*

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1) This document is currently impacted by the amendment EN 50122-1:2011/A1:2011.



### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

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

NOTE For more information relating to definitions of parts of the fixed installations, see EN 50122-1 from which these definitions are derived.

##### 3.1.1 Definitions concerning persons

###### 3.1.1.1

###### **(electrically) instructed person**

person adequately advised or supervised by electrically skilled persons to enable them to perceive risks and to avoid hazards electricity can create

###### 3.1.1.2

###### **ordinary person**

person who is neither a skilled person nor an (electrically) instructed person

###### 3.1.1.3

###### **skilled person**

person who can judge the work assigned to him and recognize possible dangers on the basis of their professional training, knowledge and experience and of their knowledge of the relevant requirements

##### 3.1.2 Other definitions

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###### 3.1.2.1

###### **closed electrical operating area**

room or location which serves exclusively for the operation of electrical equipment and is kept secure by a means appropriate to the voltage and location

Note 1 to entry: Access to such areas is permitted only to skilled persons and (electrically) instructed persons.

Note 2 to entry: The definition of closed electrical operating area can be suitable for underfloor or upperroof cabinets. Generally speaking, it is any location (inside or outside the car body) which is kept secured because of the voltage that can assumed to be present on the equipment inside it. Access to such areas is not allowed for ordinary persons.

###### 3.1.2.2

###### **contact line**

conductor system for supplying electrical energy to rolling stock systems through current-collecting equipment

###### 3.1.2.3

###### **contact wire**

electric conductor of an overhead contact line with which the current collectors make contact

###### 3.1.2.4

###### **cut-off**

supply of electrical energy to live parts is switched off

**3.1.2.5****direct contact**

contact of persons or livestock with live parts

**3.1.2.6****double insulation**

insulation comprising both basic insulation and supplementary insulation

**3.1.2.7****earth**

conductive mass of the earth, whose electrical potential at any point is conventionally taken as equal to zero

**3.1.2.8****electrical operating area**

room or location which serves primarily for the operation of electrical equipment and is normally entered only by skilled persons or (electrically) instructed persons

Note 1 to entry: Generally speaking, an electrical operating area is any location (mainly inside the car body) where electrical equipments operate. The above is the main function of this area but not the only one. In fact, normally the area is not kept secured and protection against direct contact is achieved by other means (e.g. (electrically) protective obstacles).

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**3.1.2.9****electric shock**

pathophysiological effect resulting from an electric current passing through a human or animal body

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**3.1.2.10****equipotential bond**

electrical connection putting various exposed conductive parts at a substantially equal potential

Note 1 to entry: This can be abbreviated to 'bond' or 'bonding'.

**3.1.2.11****exposed conductive part**

conductive part of electrical equipment, which can be touched and which is not normally live, but can become live when basic insulation fails

Note 1 to entry: A conductive part of electrical equipment which can only become live through contact with an exposed conductive part which has become live is not considered to be an exposed conductive part itself.

**3.1.2.12****indirect contact**

electric contact of persons or livestock with exposed conductive parts which have become live under fault conditions

**3.1.2.13****interlocking device**

device which makes the operation of a switching device dependent upon the position or operation of one or more other pieces of equipment

**3.1.2.14****interlock system**

system incorporating interlocking devices on access points to electrical equipment to prevent energisation of accessible live parts

**3.1.2.15****insulation/insulated**

supply of electrical energy to live parts is switched off and inadvertent reconnection prevented

**3.1.2.16****live part**

conductor or conductive part intended to be energized in normal use

Note 1 to entry: By convention this does not include the running rails and parts connected to them.

**3.1.2.17****locking system**

system which comprises interlocking devices and physically prevents access to live parts unless the supply of electrical energy to the live parts has been isolated and made safe

**3.1.2.18****mechanical locking**

use of a lock or bolted /screwed fixings to prevent access panels or doors being opened and require the use of a key or tool to remove (standards.iteh.ai)

**3.1.2.19****multi-stage insulation**

insulation which is employed in, e.g., roof or underframe-mounted traction resistors which are air-insulated

**3.1.2.20****nominal voltage**

voltage by which an installation or part of an installation is designated

Note 1 to entry: The voltages are expressed by the value between poles, ripple-free for DC and by the r.m.s. value between phases for AC.

Note 2 to entry: The actual voltage may differ from the nominal voltage by a quantity within permitted tolerances. For further information about traction systems supply voltages, see EN 50163.

**3.1.2.21****PELV system**

electric system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, except earth faults in other electric circuits

**3.1.2.22****(electrically) protective obstacle**

part preventing unintentional direct contact, but not preventing direct contact by deliberate action

**3.1.2.23****power circuit**

circuit carrying the current of the machines and equipment, such as convertors and traction motors, which transmit the traction output

**3.1.2.24****protection system**

means of ensuring safety against electrical hazards by means of system design as opposed to reliance on procedures

**3.1.2.25****protective conductor**

conductor provided for purposes of safety, for example protection against electric shock

**3.1.2.26****protective-equipotential-bonding**

equipotential bonding for the purposes of safety

**3.1.2.27****SELV system**

electric system in which the voltage cannot exceed the value of extra-low voltage:

– under normal conditions and

– under single fault conditions, including earth faults in other electric circuits

**3.1.2.28****unit**

<articulated> minimum operational formation of articulated cars

<non-articulated> minimum operational formation comprising one or more vehicles coupled together

**3.2 Abbreviations**

For the purposes of this document, the following abbreviations apply.

AC Alternating Current

DC Direct Current

SELV Safety Extra Low Voltage

PELV Protective Extra Low Voltage

r.m.s. root-mean-square value (effective value)

**4 Classification of voltage bands****4.1 General principles**

In this European Standard, the applicable protective measures are based on the highest value of the nominal supply voltage which the equipment or the electrical circuits are subjected to.

The voltages are classified into bands according to the nominal value as shown in Table 1. Different rules apply to each of these bands.