

# **SLOVENSKI STANDARD**

## **SIST EN 50122-1:2011**

**01-september-2011**

**Nadomešča:**

**SIST EN 50122-1:1998**

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**Železniške naprave - Stabilne naprave električne vleke - Električna varnost, ozemljitev in povezovanje - 1. del: Zaščitni ukrepi proti električnemu udaru**

Railway applications - Fixed installations - Electrical safety, earthing and bonding - Part 1: Protective provisions against electric shock

Bahnanwendungen - Ortsfeste Anlagen - Elektrische Sicherheit, Erdung und Rückstromführung - Teil 1: Schutzmaßnahmen gegen elektrischen Schlag

Applications ferroviaires - Installations fixes - Sécurité électrique, dispositions pour les courants de retour et mise à la terre - Partie 1: Mesures de protection contre les chocs électriques

**Ta slovenski standard je istoveten z: EN 50122-1:2011**

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**ICS:**

13.260	Varstvo pred električnim udarom. Delo pod napetostjo	Protection against electric shock. Live working
29.280	Električna vlečna oprema	Electric traction equipment

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**en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 50122-1**

January 2011

ICS 29.280

Supersedes EN 50122-1:1997

English version

**Railway applications -  
Fixed installations -  
Electrical safety, earthing and the return circuit -  
Part 1: Protective provisions against electric shock**

Applications ferroviaires -  
Installations fixes -  
Sécurité électrique, mise à la terre et  
circuit de retour -  
Partie 1: Mesures de protection contre les  
chocs électriques

Bahnanwendungen -  
Ortsfeste Anlagen -  
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Rückleitung -  
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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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

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

## Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations), of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways. It was submitted to the formal vote and was approved by CENELEC as EN 50122-1 on 2010-11-16.

This document supersedes EN 50122-1:1997.

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

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
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- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2013-11-16

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives 96/48/EC (HSR), 2001/16/EC (CONRAIL) and 2008/57/EC (RAIL). See Annex ZZ.

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## 1 Scope

This European Standard specifies requirements for the protective provisions relating to electrical safety in fixed installations associated with a.c. and/or d.c. traction systems and to any installations that can be endangered by the traction power supply system.

It also applies to all aspects of fixed installations that are necessary to ensure electrical safety during maintenance work within electric traction systems.

This European Standard applies to all new lines and to all major revisions to existing lines for the following electric traction systems:

- a) railways;
- b) guided mass transport systems such as
  - 1) tramways,
  - 2) elevated and underground railways,
  - 3) mountain railways,
  - 4) trolleybus systems, and
  - 5) magnetically levitated systems, which use a contact line system,
- c) material transportation systems.

This European Standard does not apply to:

- d) mine traction systems in underground mines;
- e) cranes, transportable platforms and similar transportation equipment on rails, temporary structures (e.g. exhibition structures) in so far as these are not supplied directly or via transformers from the contact line system and are not endangered by the traction power supply system;
- f) suspended cable cars;
- g) funicular railways.

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This European Standard does not specify working rules for maintenance.

## 2 Normative references

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

EN 50119:2009, *Railway applications – Fixed installations – Electric traction overhead contact lines*

EN 50122-2, *Railway applications – Fixed installations – Part 2: Protective provisions against the effects of stray currents caused by d.c. traction systems*

EN 50124-1:2001 + A1:2003 + A2:2005, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

EN 50153:2002, *Railway applications – Rolling stock – Protective provisions relating to electrical hazards*

EN 50163, *Railway applications – Supply voltages of traction systems*

EN 60529:1991 + A1:2000, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989 + A1:1999)*

EN 60898-1:2003 + A11:2005, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation (IEC 60898-1:2002, mod.)*

EN 61140:2002 + A1:2006, *Protection against electric shock – Common aspects for installation and equipment (IEC 61140:2001 + A1:2004, mod.)*

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

HD 637 S1:1999, *Power installations exceeding 1 kV a.c.*

IEC 60050-101, *International Electrotechnical Vocabulary – Chapter 101: Mathematics*

IEC 60050-111, *International Electrotechnical Vocabulary – Chapter 111: Physics and chemistry*

IEC 60050-191, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60050-195, *International Electrotechnical Vocabulary – Chapter 195: Earthing and protection against electric shock*

IEC 60050-442, *International Electrotechnical Vocabulary – Chapter 442: Electrical accessories*

IEC 60050-811, *International Electrotechnical Vocabulary – Chapter 811: Electric traction*

IEC 60050-821, *International Electrotechnical Vocabulary – Chapter 821: Signalling and security apparatus for railways*

IEC 60050-826, *International Electrotechnical Vocabulary – Chapter 826: Electrical installations*

IEC/TS 60479-1:2005, *Effects of current on human beings and livestock – Part 1: General aspects*

ISO 3864-1:2002, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

ISO 7010:2003 + A1:2006, *Graphical symbols – Safety colours and safety signs – Safety signs used in workplaces and public areas*

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### 3 Terms and definitions

SIST EN 50122-1:2011

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

dd9e4b155e69/sist-en-50122-1-2011

#### 3.1 Electrical safety and hazards

##### 3.1.1

##### **electrical safety**

freedom from unacceptable risk of harm caused by electrical systems

##### 3.1.2

##### **electric shock**

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

[IEC 60050-826-12-01]

##### 3.1.3

##### **(effective) touch voltage ( $U_{te}$ )**

voltage between conductive parts when touched simultaneously by a person or an animal

NOTE 1 The value of the effective touch voltage can be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts

[IEC 60050-195-05-11]

NOTE 2 The conductive path through the body is conventionally from hand to both feet (horizontal distance of 1 m) or from hand to hand.

**3.1.4****prospective touch voltage ( $U_{tp}$ )**

voltage between simultaneously accessible conductive parts when those conductive parts are not being touched by a person or an animal

[IEC 60050-195-05-09]

**3.1.5****body voltage ( $U_b$ )**

product of the current through the body and the body impedance

**3.1.6****standing surface**

any point on a surface where persons may stand or walk about without great effort

**3.1.7****protective boarding**

non-conducting barrier to protect persons from coming into direct contact with the live conductor rail

**3.1.8****(electrically) protective obstacle**

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

[IEC 60050-195-06-16]

**3.1.9****(electrically) protective barrier**

part providing protection against direct contact from any usual direction of access

[IEC 60050-195-06-15]

**3.1.10****anti-trespassing guard**

equipment provided to deter entry to a restricted area, structure or building by an unauthorized person

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**3.1.11****conductive part**

part which can carry electric current

[IEC 60050-195-01-06]

**3.1.12****exposed conductive part**

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

NOTE 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.

[IEC 60050-442-01-21]

**3.1.13****live part**

conductor or conductive part intended to be energised in normal use. By convention this does not include the running rails and parts connected to them

**3.1.14****direct contact**

electric contact of persons or animals with live parts

[IEC 60050-826-12-03]

**3.1.15****indirect contact**

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

[IEC 60050-826-12-04]

**3.1.16****neutral conductor**

conductor electrically connected to the neutral point and capable of contributing to the distribution of electric energy

[IEC 60050-826-14-07]

**3.1.17****protective conductor (PE)**

conductor, required by some measures for protection against electric shock, for electrically connecting any of the following parts:

- exposed conductive parts;
- extraneous conductive parts;
- main earthing terminal;
- earth electrode;
- earthed point of the source or artificial neutral

**3.1.18****PEN conductor**

conductor combining the functions of both a protective earthing conductor and a neutral conductor

[IEC 60050-826-13-25]

**3.1.19****solid-wall design**

any kind of construction made of concrete, steel or other material without any holes or gaps

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**3.1.20****voltage-limiting device (VLD)**

protective device whose function is to prevent existence of an impermissible high touch voltage

**3.2 Earthing and equipotential bonding****3.2.1****earth**

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

[IEC 60050-826-04-01]

**3.2.2****earthing**

connection of conductive parts to an appropriate earth electrode

**3.2.3****earth electrode**

conductor or a group of conductors in intimate contact with and providing an electrical connection to earth

[IEC 60050-461-06-18]

**3.2.4****structure earth**

construction made of metallic parts or construction including interconnected metallic structural parts, which can be used as an earth electrode

NOTE Examples are reinforced railway structures such as bridges, viaducts, tunnels, mast foundations and reinforced track bed.

**3.2.5****rail to earth resistance**

electrical resistance between the running rails and the earth or structure earth

**3.2.6****equipotential bonding**

provision of electric connections between conductive parts, intended to achieve equipotentiality

[IEC 60050-826-13-19]

**3.2.7****main equipotential busbar (MEB)**

busbar where the equipotential conductors terminate

**3.2.8****cross bond**

electrical connection intended to connect in parallel the conductors of the return circuit

**3.2.9****rail-to-rail cross bond**

electrical bond that interconnects the running rails of the same track

**3.2.10****track-to-track cross bond**

electrical bond that interconnects tracks

**3.2.11****rail joint bond**

conductor ensuring the electrical continuity of rails at a joint

[IEC 60050-811-35-07]

**3.2.12****open connection**

connection of conductive parts to the return circuit by a voltage-limiting device which makes a conductive connection either temporarily or permanently if the limited value of the voltage is exceeded

**3.2.13****common building**

building or structure which contains or supports an a.c. railway and a d.c. railway; furthermore where some conductive parts of the structure are within the contact line zone or the current collector zone of the a.c. railway and some conductive parts of the structure are within the contact line zone or the current collector zone of the d.c. railway

NOTE Even the unintended connection of conductive parts of different structures can form a common building, e.g. via reinforcement, wiring, pipes, etc.

**3.3 Return circuit****3.3.1****return circuit**

all conductors which form the intended path for the traction return current

EXAMPLE The conductors may be:

- running rails,
- return conductor rails,
- return conductors,
- return cables.

**3.3.2****track return system**

system in which the running rails of the track form a part of the return circuit for the traction current

[IEC 60050-811-35-02]

**3.3.3****return conductor**

conductor paralleling the track return system and connected to the running rails at periodic intervals

**3.3.4****return conductor rail – return current rail**

conductor rail used instead of the running rail for the return currents

[IEC 60050-811-34-10]

**3.3.5****return cable**

conductor connecting the running rails or other parts of the return circuit to the substation

NOTE Similar to IEC 60050-811-35-04.

**3.3.6****traction return current**

sum of the currents returning to the supply source, the substation or regenerative braking vehicles

**3.3.7****rail potential ( $U_{RE}$ )**

voltage occurring between running rails and earth

**3.3.8****closed formation**

area where the top of the running rails is at the same level as the surrounding surface

**3.3.9****open formation**

area where the running rails are laid above the surrounding surface

**3.3.10****conductance per length  $G'_{RE}$** 

reciprocal value of the rail to earth resistance per length (S/km)

**3.3.11****insulating rail joint**

mechanical rail joint which longitudinally separates the rail electrically

**3.3.12****track circuit**

electrical circuit of which the rails of a track section form a part, with usually a source of current connected at one end and a detection device at the other end for detecting whether this track section is clear or occupied by a vehicle

NOTE In a continuous signalling system, the track circuit may be used to transmit information between the ground and the train.

[IEC 60050-821-03-01]

**3.3.13****top of rail level (TOR)**

common rail level tangent

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## 3.4 Electric traction system

### 3.4.1

#### **electric traction system**

railway electrical distribution network used to provide energy for rolling stock

NOTE The system may comprise:

- contact line systems;
- return circuit of electric traction systems;
- running rails of non electric traction systems, which are in the vicinity of, and conductively connected to the running rails of an electric traction system;
- electrical installations, which are supplied from contact lines either directly or via a transformer;
- electrical installations in substations, which are utilized solely for distribution of power directly to the contact line;
- electrical installations of switching stations.

### 3.4.2

#### **(traction) substation**

installation to supply a contact line system and at which the voltage of a primary supply system, and in certain cases the frequency, is transformed to the voltage and the frequency of the contact line

### 3.4.3

#### **(traction) switching station**

installation from which electrical energy can be distributed to different feeding sections or from which different feeding sections can be switched on and off or can be interconnected

### 3.4.4

#### **feeding section**

electrical section of the route fed by individual track feeder circuit-breakers within the area supplied by the substation

[EN 50119:2009, 3.3.2]

[SIST EN 50122-1:2011](https://standards.iteh.ai/catalog/standards/sist/947fb110-c275-4202-96e4-dd9e4b155e69/sist-en-50122-1-2011)

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### 3.4.5

#### **fault condition**

non intended condition caused by short-circuit. The time duration is terminated by the correct function of the protection devices and circuit breakers

NOTE For the relevant fault duration the correct operation of protection devices and circuit breakers is taken into account.

### 3.4.6

#### **short-circuit**

accidental or intentional conductive path between two or more conductive parts forcing the electric potential differences between these conductive parts to be equal to or close to zero

[IEC 60050-195-04-11]

### 3.4.7

#### **high voltage**

nominal voltage exceeding AC 1 000 V or DC 1 500 V

### 3.4.8

#### **low voltage**

nominal voltage up to and including AC 1 000 V or DC 1 500 V

### 3.4.9

#### **zone of mutual interaction**

zone for which a mutual interference between a.c. railway and d.c. railway shall be considered

### 3.4.10

#### **expected prospective short-circuit current**

short-circuit current in d.c. traction systems that it is expected to be reached if the fault is not switched off