SLOVENSKI STANDARD
oSIST prEN 50122-1:2008

01-julij-2008

Nadomeġ ena:
SIST EN 50122-1:1998

Ġelezniġke naprave - Stabilne naprave elektriġne vleke ï Elektriġna varnost, ozemljitev in povezovanje - 1. del: Zaġ itni ukrepi proti elektriġnemu 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 contres les chocs électriques

Ta slovenski standard je istoveten z: **FprEN 50122-1:200X**

ICS:

13.260	Varstvo pred elektriġnim udarom. Delo pod napetostjo	Protection against electric shock. Live working
29.120.50	Varovalke in druga medtokovna zaġ ita	Fuses and other overcurrent protection devices
45.020	Železniška tehnika na splošno	Railway engineering in general

oSIST prEN 50122-1:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT prEN 50122-1

April 2008

ICS

Will supersede EN 50122-1:1997

English version

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

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

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry. Deadline for CENELEC: 2008-09-26.

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

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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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Project: 16589

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1 # Foreword

2 This draft European Standard was prepared by SC 9XC, Electric supply and earthing systems for public
3 transport equipment and ancillary apparatus (Fixed installations), of Technical Committee CENELEC TC 9X,
4 Electrical and electronic applications for railways. It is submitted to the CENELEC enquiry.

5 This document will supersede EN 50122-1:1997.

6 This draft European Standard has been prepared under a mandate given to CENELEC by the European
7 Commission and the European Free Trade Association and covers essential requirements of EC Directives
8 96/48/EC and 2001/16/EC.

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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 may 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:

- railways;
- guided mass transport systems such as:
  - tramways,
  - elevated and underground railways,
  - mountain railways,
  - trolleybus systems and
  - magnetic levitated systems;
- material transportation systems.

This European Standard does not apply to:

- mine traction systems in underground mines;
- 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;
- suspended cable cars;
- funicular railways.

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 50119:2001, *Railway applications – Fixed installations – Electric traction overhead contact lines*

EN 50122-2 [1)], *Railway applications – Fixed installations – Electrical safety, earthing and bonding – Part 2: Provisions against the effects of stray currents caused by d.c. traction systems*

EN 50122-3 [1)], *Railway applications – Fixed installations – Electrical safety, earthing and bonding – Part 3: Mutual interaction of a.c. and 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*

1) At draft stage.

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, *Protection against electric shock – Common aspects for installation and equipment* (IEC 61140:2001)

HD 384.4.41 S2:1996 + A1:2002 [2)], *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock* (IEC 60364-4-41:1992 + A2:1999, mod.)

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

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

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

IEC 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

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

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

IEC 60050-466, *International Electrotechnical Vocabulary – Chapter 466: Overhead lines*

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

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

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

ISO 3864 (all parts), *Graphical symbols – Safety colours and safety signs*

3 Terms and definitions

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

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 60050-826-03-04]

2) Superseded by 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.)

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
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 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
anti-trespassing guard
equipment provided to prevent entry to a restricted area, structure or building by an unauthorized person

3.1.10
conductive part
part which can carry electric current

[IEC 60050-195-01-06]

3.1.11
exposed conductive part
conductive part of electrical equipment, which can be touched and which is not normally live, but which may become live under fault conditions

NOTE A conductive part of electrical equipment which can only become live under fault conditions through an exposed conductive part is not considered to be an exposed conductive part.

[IEC 60050-826-03-02]

3.1.12
live part
conductor or conductive part intended to be energized in normal use, by convention. This does not include the running rails and parts connected to them

3.1.13
direct contact
electric contact of persons or animals with live parts

[IEC 60050-826-12-03]

3.1.14
indirect contact
electric contact of persons or animals with exposed conductive parts which have become live under fault conditions

[IEC 60050-826-12-04]

3.1.15
neutral conductor (symbol N)
conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy

[IEC 60050-826-01-03]

3.1.16
protective conductor (symbol 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

[IEC 60050-826-04-05]

3.1.17
PEN conductor
earthed conductor combining the functions of both protective conductor and neutral conductor

NOTE The acronym PEN results from the combination of symbols PE for the protective conductor and N for the neutral conductor.

[IEC 60050-826-04-06]

3.1.18
solid-wall design
any kind of construction made of concrete, steel or other material without any holes or gaps

3.1.19
voltage-limiting device (VLD)
protective device whose function is to prevent existence of an impermissible high touch voltage

NOTE Two variants of VLD are distinguished:

- VLD-O for operational conditions: protective device against existence of an impermissible high touch voltage coming from rail potential during operation;
- VLD-F for fault conditions: protective device against existence of an impermissible high touch voltage, coming from earth faults or short circuits between the contact line and the return circuit.

3.2 Earthing and equipotential bonding

3.2.1
earth
the 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
conductive part or a group of conductive parts in intimate contact with and providing an electrical connection with earth

[IEC 60050-826-04-02]

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

[IEC 60050-826-04-09]

3.2.7
main equipotential busbar (MEB)
busbar where the equipotential cables terminate

3.2.8
cross bond
any 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 a rail 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 under operation and fault conditions

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 via the return circuit

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 surface

3.3.9
open formation
area where the running rails are laid above the surface

3.3.10
conductance per length
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

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