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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

IEC 62128-1:2013

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 62128-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This second edition cancels and replaces the first edition issued in 2003. It constitutes a technical revision.

The main technical changes with regard to the previous edition are a consequence of the revision of the related European Standard, EN 50122-1. Main changes are the restructuring of all clauses and changes in the touch voltages limits.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/1803/FDIS	9/1837/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62128 series, published under the general title *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

RAILWAY APPLICATIONS – FIXED INSTALLATIONS – ELECTRICAL SAFETY, EARTHING AND THE RETURN CIRCUIT –

Part 1: Protective provisions against electric shock

1 Scope

This part of IEC 62128 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 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 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.

This standard does not specify working rules for maintenance.

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.

NOTE Normative references are made to IEC standards. For some references the IEC standards do not exist. In these cases, references are made to European Standards which are normative for Europe. For non-European countries these references are only informative and therefore listed in the bibliography.

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

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
Amendment 1:1999

IEC 60850, *Railway applications – Supply voltages of traction systems*

IEC 60898-1:2002, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 60913:2013, *Railway applications – Fixed installations – Electric traction overhead contact lines*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*
Amendment 1:2004

IEC 61936-1:2010, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*

IEC 61991:2000, *Railway applications – Rolling stock – Protective provisions relating to electrical hazards*

IEC 62128-2, *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 2: Provisions against the effects of stray currents caused by d.c. traction systems*

IEC 62305 (all parts), *Protection against lightning*

IEC 62497-1:2010, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

IEC 62724: –, *Railway applications – Fixed installations – Electric traction – Insulating synthetic rope assemblies for support of overhead contact lines*[1]

ISO 3864-1:2011, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 7010:2011, *Graphical symbols – Safety colours and safety signs – Registered 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

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1 To be published.

3.1.2
electric shock
pathophysiological effect resulting from an electric current passing through a human or animal body

[SOURCE: IEC 60050-604:1987, 604-04-16]

3.1.3
(effective) touch voltage
U_{te}
voltage between conductive parts when touched simultaneously by a person or an animal

Note 1 to entry: 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

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

[SOURCE: IEC 60050-195:1998, 195-05-11]

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

[SOURCE: IEC 60050-195:1998, 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

[SOURCE: IEC 60050-195:1998, 195-06-16]

3.1.9
(electrically) protective barrier
part providing protection against direct contact from any usual direction of access

[SOURCE: IEC 60050-195:1998, 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

3.1.11
conductive part
part which can carry electric current

[SOURCE: IEC 60050-195:1998, 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 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.

[SOURCE: IEC 60050-442:1998, 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

[SOURCE: IEC 60050-826:2004, 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

[SOURCE: IEC 60050-826:2004, 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

[SOURCE: IEC 60050-826:2004, 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

[SOURCE: IEC 60050-826:2004, 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

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

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

[SOURCE: IEC 60050-461:2008, 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 1 to entry: 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

[SOURCE: IEC 60050-826:2004, 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