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INTERNATIONAL STANDARD



**Railway applications – Rolling stock –
Protective provisions against electrical hazards**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RAILWAY APPLICATIONS – ROLLING STOCK –

Protective provisions against electrical hazards

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61991 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This second edition cancels and replaces the first edition, published in 2000. This edition constitutes a technical revision. It is based on EN 50153:2014.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Replacement of several reference standards.
- b) Several terms and abbreviated terms are introduced;
- c) Table 2 – Voltage bands for France is moved to Annex B as Table B.1, Table 3 – Voltage bands for Italy is deleted;
- d) Annex B and Annex C are introduced.
- e) Annex B includes special national conditions.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2467/FDIS	9/2487/RVD

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

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

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

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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 document leaves a choice to the contracting parties between two alternatives in several instances. These alternatives consist of either the provision of operating rules, regulations and procedures, or 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) shall reach agreement before signing the contract is included in Annex A.

RAILWAY APPLICATIONS – ROLLING STOCK –

Protective provisions against electrical hazards

1 Scope

This document ~~offers a set of rules that are~~ defines requirements applied in the design and manufacture of electrical installations and equipment to be used on rolling stock to protect persons from electric shocks.

~~The methods used to satisfy the rules may differ, in accordance with the procedures and practices of the operating organization.~~

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

This document does not apply to:

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

~~Testing of vehicles against the requirements of IEC 61991 is not included. For this, refer to IEC 61433.~~

The requirements for the fixed installations about the protection against the vehicles' potential are not covered in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

~~IEC 60077-1, Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules¹⁾~~

~~IEC 60364 (all parts), Electrical installations of buildings~~

~~IEC 60364-4-41:1992, Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock~~

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

¹⁾ ~~To be published.~~

~~IEC 60439 (all parts), Low-voltage switchgear and controlgear assemblies~~

IEC TS 60479-1:1994, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

~~IEC 60536 (all parts), Classification of electrical and electronic equipment with regard to protection against electric shock~~

~~IEC 60850, Railway applications – Supply voltages of traction systems^{†)}~~

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61310-1:1995, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, auditory acoustic and tactile signals*

~~IEC 62128, Railway applications – Protective provisions against electrical hazards – Electric equipment for fixed installations^{†)}~~

IEC 62128-1:2013, *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 1: Protective provisions against electric shock*

IEC 62313, *Railway applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock*

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

IEC 62995:2018, *Railway applications – Rolling Stock – Rules for installation of cabling*

^{†)} ~~To be published.~~

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Railway applications – Rolling stock –
Protective provisions against electrical hazards**

**Applications ferroviaires – Matériel roulant –
Dispositions de protection contre les dangers électriques**

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Protective provisions against electrical hazards

1 Scope

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This document 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.

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

IEC 62995:2018, *Railway applications – Rolling Stock – Rules for installation of cabling*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

APPLICATIONS FERROVIAIRES – MATÉRIEL ROULANT –

Dispositions de protection contre les dangers électriques

AVANT-PROPOS

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La Norme internationale IEC 61991 a été établie par le comité d'études 9 de l'IEC: Matériels et systèmes électriques ferroviaires.

Cette deuxième édition annule et remplace la première édition, publiée en 2000. Cette édition constitue une révision technique. Elle est basée sur l'EN 50153:2014.

Cette édition inclut les changements techniques significatifs suivants par rapport à l'édition précédente:

- a) Remplacement de plusieurs références de normes.
- b) Ajout de plusieurs termes et termes abrégés.
- c) Le Tableau 2 – Classes de tension pour la France est déplacé dans l'Annex B comme Tableau B.1, le Tableau 3 – Classes de tension pour l'Italie est supprimé.

- d) L'Annexe B et l'Annexe C sont introduites.
- e) L'Annexe B inclut des conditions nationales particulières.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
9/2467/FDIS	9/2487/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

INTRODUCTION

Il est généralement admis que la sécurité dépend de facteurs humains, reposant sur le comportement normal des opérateurs impliqués, ainsi que de facteurs techniques.

C'est pour cette raison que, dans certains cas, le présent document laisse aux parties contractantes le choix entre deux possibilités. Ces possibilités correspondent, d'une part à la mise en place de modes opératoires, réglementations ou procédures, et d'autre part à la prise de mesures techniques comme des dispositifs de verrouillage mécaniques ou électriques.

Une liste des cas pour lesquels les parties contractantes (c'est-à-dire l'utilisateur et le fabricant) doivent conclure un accord préalable au contrat est donnée en Annexe A.

APPLICATIONS FERROVIAIRES – MATÉRIEL ROULANT –

Dispositions de protection contre les dangers électriques

1 Domaine d'application

Le présent document définit les exigences appliquées, dans la conception et la fabrication des installations et équipements électriques à utiliser sur le matériel roulant, pour la protection des personnes contre les chocs électriques.

Le présent document est applicable aux matériels roulants des systèmes de transport sur rails, aux systèmes de transport routier, s'ils sont alimentés par une source extérieure (trolleybus), aux systèmes de transport à sustentation magnétique et aux équipements électriques installés dans ces systèmes.

Le présent document ne s'applique pas aux:

- chemins de fer miniers,
- installations de grues, plates-formes mobiles et systèmes de transport similaires sur rails,
- funiculaires,
- constructions provisoires.

Les exigences pour les installations fixes sur la protection contre le potentiel des véhicules ne sont pas couvertes dans le présent document.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60364-4-41:2005, *Installations électriques à basse tension – Partie 4-41: Protection pour assurer la sécurité – Protection contre les chocs électriques*

IEC TS 60479-1, *Effets du courant sur l'homme et les animaux domestiques – Partie 1: Aspects généraux*

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 61140:2016, *Protection contre les chocs électriques – Aspects communs aux installations et aux matériels*

IEC 61310-1, *Sécurité des machines – Indication, marquage et manœuvre – Partie 1: Exigences pour les signaux visuels, acoustiques et tactiles*

IEC 62128-1:2013, *Applications ferroviaires – Installations fixes – Sécurité électrique, mise à la terre et circuit de retour – Partie 1: Mesures de protection contre les chocs électriques*

IEC 62313, *Applications ferroviaires – Alimentation électrique et matériel roulant – Critères techniques pour la coordination entre le système d'alimentation (sous-station) et le matériel roulant*

IEC 62497-1, *Applications ferroviaires – Coordination de l'isolement – Partie 1: Exigences fondamentales – Distances d'isolement dans l'air et lignes de fuite pour tout matériel électrique et électronique*

IEC 62995:2018, *Applications ferroviaires – Matériel roulant – Règles d'installation du câblage*