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Railway applications – Electromagnetic compatibility – Part 1: General

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 1: General

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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International Standard IEC 62236-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition published in 2008. It constitutes a technical revision and has been developed on the basis of EN 50121-1:2015.

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

a) Clarification in scope.

b) Introduction of subclause Abbreviated terms.

c) Management of EMC now based on IEC 61000 series as former reference is not adequate.

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

FDIS	Report on voting
9/2335/FDIS	9/2365/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.

A list of all parts in the IEC 62236, published under the general title *Railway applications – Electromagnetic compatibility*, can be found on the IEC website.

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- amended.

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INTRODUCTION

The railway system EMC ~~set~~ series of product-specific International Standards consists of five parts described at the end of this introduction.

The ~~set~~ series of standards provides both a framework for managing the EMC for railway~~s~~ systems and also specifies the limits for the electromagnetic (EM) emission of the railway system as a whole to the outside world and for the EM emission and immunity for equipment operating within the railway system. The latter ~~must~~ is intended to be compatible with the emission limits set for the railway system as a whole and also provides for establishing confidence in equipment being fit for purpose in the railway environment. There are different stationary emission limits set for trams/trolleybuses and for metro/mainline railway~~s~~ systems. The frequency covered by the standards is in the range from DC to 400 GHz. No measurements need to be performed at frequencies where no requirement is specified. The limits for EMC phenomena are set so that the railway system as a whole achieves electromagnetic compatibility with the outside world, and between the various parts of the railway system. Throughout the ~~set~~ series of standards, the immunity levels are chosen to ensure a reasonable level of EMC with other apparatus within the local railway environment and with emissions which enter the railway system from the outside world. Limits are also placed on EM emission by railway~~s~~ systems into the outside world.

The compatibility between railway system emissions and their external environment is based upon emission limits from the railway~~s~~ systems being set by considering the results from measurements. Given that the general compatibility between railway~~s~~ systems and their environment was satisfactory at the time these measurements were made and subsequent experience of applying the limits has confirmed their acceptability, compliance with this document has been judged to give satisfactory compatibility. The immunity and emission levels do not of themselves guarantee that the railway system will have satisfactory ~~compliance~~ EMC with its neighbours. In exceptional circumstances, for instance near a “special location” which has unusually high levels of EM interference, the railway system may require additional measures to be taken to ensure proper compatibility. Particular care should be taken when in proximity to equipment such as radio transmission equipment, military or medical installations. Attention is particularly drawn to any magnetic imaging equipment in hospitals that may be near to urban transport. In all these cases, compatibility ~~must~~ should be achieved with consultation and co-operation between the interested parties.

The immunity and emission levels do not of themselves guarantee that integration of the apparatus within the railway system will necessarily be satisfactory. The document cannot cover all the possible configurations of apparatus, but the test levels are sufficient to achieve satisfactory EMC in the majority of cases. In exceptional circumstances, for instance near a “special location” which has unusually high levels of EM interference, the system may require additional measures to be taken to ensure proper operation. The resolution of this is a matter for discussion between the equipment supplier and the project manager, infrastructure ~~controller~~ manager or equivalent.

The railway apparatus is assembled into large systems and installations, such as trains and signalling control centres. Details are given in annex A. It is not, therefore, possible to establish immunity tests and limits for these large assemblies. The immunity levels for the apparatus will normally ensure reliable operation, but it is necessary to prepare an EMC ~~management~~ plan to deal with complex situations or to deal with specific circumstances. For example, the passage of the railway line close to a high power radio transmitter which produces abnormally high field strengths. Special conditions may ~~have to~~ be applied for railway equipment which ~~has to~~ works near such a transmitter and these will be accepted as national conditions for the specification.

The series of standards IEC 62236, *Railway applications – Electromagnetic compatibility*, contains the following parts:

– *Part 1: General.* This part gives a description of the electromagnetic behaviour of a railway system; it specifies the performance criteria for the whole ~~set~~ series. A management

process to achieve EMC at the interface between the railway infrastructure and trains is referenced.

– *Part 2: Emission of the whole railway system to the outside world.* This part sets the emission limits from the railway system to the outside world at radio frequencies. It defines the applied test methods and gives information on typical field strength values at traction and radio frequency (cartography).

– *Part 3-1: Rolling stock – Train and complete vehicle.* This part specifies the emission and immunity requirements for all types of rolling stock. It covers traction rolling stock and trainsets, as well as independent hauled rolling stock. The scope of this part of the series ends at the interface of the rolling stock with its respective energy inputs and outputs.

– *Part 3-2: Rolling stock – Apparatus.* This part applies to emission and immunity aspects of EMC for electrical and electronic apparatus intended for use on railway rolling stock. It is also used as a means of dealing with the impracticality of immunity testing a complete vehicle.

– *Part 4: Emission and immunity of the signalling and telecommunications apparatus.* This part specifies limits for electromagnetic emission and immunity for signalling and telecommunications apparatus installed within a railway system. The EMC plan states if this part is also applicable for railway operational equipment mounted trackside or at platforms.

– *Part 5: Emission and immunity of fixed power supply installations and apparatus.* This part applies to emission and immunity aspects of EMC for electrical and electronic apparatus and components intended for use in railway fixed installations associated with power supply.

RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 1: General

1 Scope

~~1.1~~ This Part 1 of IEC 62236 outlines the structure and the content of the whole series.

It specifies the performance criteria applicable to the whole standards series.

Clause 5 provides information about the management of EMC.

Annex A describes the characteristics of the railway system which affect electromagnetic compatibility (EMC) behaviour.

Phenomena excluded from the series are nuclear EM pulse, abnormal operating conditions (e.g. fault conditions) and the induction effects of direct lightning strike.

Emission limits at the railway system boundary do not apply to intentional transmitters within the railway system boundaries.

Safety considerations are not covered by this series of standards.

The biological effects of non-ionising radiation as well as apparatus for medical assistance, such as pacemakers, are not considered in this series.

~~1.2 This part of IEC 62236 is supplemented by the following specific standards:~~

~~IEC 62236-2 *Railway applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world*~~

~~IEC 62236-3-1 *Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle*~~

~~IEC 62236-3-2 *Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus*~~

~~IEC 62236-4 *Railway applications – Electromagnetic compatibility – Part 4: Emission and immunity of the signalling and telecommunications apparatus*~~

~~IEC 62236-5 *Railway applications – Electromagnetic compatibility – Part 5: Emission and immunity of fixed power supply installations and apparatus*~~

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 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility* ~~*(EMC)*~~

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

~~IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*~~

~~IEC 62427, *Railway applications – Compatibility between rolling stock and train detection systems*~~

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications – Electromagnetic compatibility – Part 1: General

Applications ferroviaires – Compatibilité électromagnétique – Partie 1: Généralités

IEC 62236-1:2018-02(en-fr)

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IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 1: Généralités

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La Norme internationale IEC 62236-1 a été établie par le comité d'études 9 de l'IEC: Matériels et systèmes électriques ferroviaires.

Cette troisième édition annule et remplace la deuxième édition publiée en 2008. Elle constitue une révision technique et a été développée sur la base de EN 50121-1:2015.

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

a) Clarification du domaine d'application.
b) Introduction du paragraphe Termes abrégés.
c) La gestion de l'EMC se base dorénavant sur la série IEC 61000, car la référence précédente n'est pas adéquate.

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

FDIS	Rapport de vote
9/2335/FDIS	9/2365/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.

Une liste de toutes les parties de la série IEC 62236, publiées sous le titre général *Applications ferroviaires – Compatibilité électromagnétique*, peut être consultée sur le site web de l'IEC.

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- amendé.

INTRODUCTION

Cette série de Normes internationales de produits comprend cinq parties qui sont décrites à la fin de cette introduction.

Cette série de normes fournit à la fois un cadre pour la gestion de la CEM à l'intérieur du domaine ferroviaire et spécifie également les limites d'émission électromagnétique (EM) du système ferroviaire dans son ensemble vers le monde extérieur ainsi que les limites d'émission et d'immunité EM des équipements qui fonctionnent dans le système ferroviaire. Ces dernières sont destinées à être compatibles avec les limites d'émission définies pour le système ferroviaire dans son ensemble et également apporter l'assurance que les équipements sont adaptés pour l'environnement ferroviaire. En statique, des limites d'émission différentes sont définies pour les trams/trolleybus et les métros/grandes lignes. La fréquence couverte par ces normes va du courant continu à 400 GHz. Aucun mesurage n'est nécessaire aux fréquences pour lesquelles aucune exigence n'est spécifiée. Les limites pour les phénomènes de CEM sont fixées de manière à ce que le système ferroviaire pris dans son ensemble obtient la compatibilité électromagnétique avec le monde extérieur, et entre les différents éléments du système ferroviaire. Dans cette série de normes, les niveaux d'immunité sont choisis pour assurer un niveau raisonnable de CEM avec les autres appareils dans l'environnement ferroviaire local et avec les émissions qui pénètrent le système ferroviaire et qui proviennent du monde extérieur. Sont également fixées des limites pour les émissions EM produites par les systèmes ferroviaires et affectant le monde extérieur.

La compatibilité entre les émissions des chemins de fer et l'environnement extérieur est basée sur les limites d'émission ferroviaires établies en tenant compte des résultats de mesures effectuées. Étant donné que la compatibilité générale entre les chemins de fer et leur environnement était satisfaisante au moment où les mesures ont été réalisées et que l'expérience tirée de l'application des limites a confirmé leur acceptabilité, il a été jugé que la conformité au présent document donnait une CEM satisfaisante. Les niveaux d'émission et d'immunité ne garantissent pas par eux-mêmes une conformité satisfaisante du système ferroviaire à celui de ses voisins. Dans des circonstances exceptionnelles, par exemple à proximité d'un "emplacement spécial" qui a des niveaux d'interférences EM exceptionnellement élevés, le système ferroviaire peut requérir de prendre des mesures complémentaires pour assurer une compatibilité convenable. Il convient d'apporter un soin particulier à proximité d'équipements, tels que les appareils de transmission radio, les installations médicales ou militaires. Une attention toute particulière est portée aux équipements à imagerie magnétique dans les hôpitaux qui peuvent être près des transports urbains. Dans tous ces cas, il convient que la compatibilité soit atteinte après consultation et coopération entre les parties intéressées.

Les niveaux d'immunité et d'émission ne garantissent pas par eux-mêmes que l'intégration des appareils à l'intérieur du système ferroviaire est nécessairement satisfaisante. Le présent document ne peut pas couvrir toutes les configurations possibles d'appareils mais les niveaux d'essai sont suffisants pour obtenir une CEM satisfaisante dans la majorité des cas. Dans des circonstances exceptionnelles, par exemple à proximité d'un "emplacement spécial" qui a des niveaux d'interférences EM exceptionnellement élevés, le système peut requérir de prendre des mesures complémentaires pour assurer un fonctionnement correct. Une telle décision fait l'objet d'une discussion entre le fournisseur de l'équipement et le chef de projet, le responsable d'infrastructure ou une personne de responsabilité équivalente.

Les appareils ferroviaires sont assemblés dans de grands systèmes et installations, tels que les trains et les centres de commande de la signalisation. Des informations plus précises sont données à l'Annexe A. Il n'est donc pas possible d'établir des essais et des limites d'immunité pour ces ensembles de grande taille. Les niveaux d'immunité pour les appareils assurent normalement un fonctionnement fiable mais il est nécessaire de préparer un plan de CEM pour traiter les situations complexes ou les circonstances particulières. Par exemple, le passage d'une ligne de chemin de fer à proximité d'un émetteur radiofréquence de grande puissance qui produit des champs anormalement élevés. Des conditions spéciales peuvent s'appliquer pour les équipements ferroviaires qui fonctionnent à proximité d'un tel émetteur et celles-ci sont acceptées comme conditions nationales pour la spécification.

La série de Normes IEC 62236, *Applications ferroviaires – Compatibilité électromagnétique* se compose des parties suivantes:

– *Partie 1: Généralités.* Cette partie donne une description du comportement électromagnétique du système ferroviaire. Elle spécifie les critères d'aptitude à la fonction pour l'ensemble de la série. Un processus de gestion pour obtenir la compatibilité électromagnétique à l'interface de l'infrastructure ferroviaire et des trains est mentionné.

– *Partie 2: Émission du système ferroviaire dans son ensemble vers le monde extérieur.* Cette partie définit les limites d'émission du système ferroviaire vers le monde extérieur aux radiofréquences. Elle définit les méthodes d'essai appliquées et donne des informations sur les valeurs typiques des champs aux fréquences de traction et en radiofréquence (cartographie).

– *Partie 3-1: Matériel roulant – Trains et véhicules complets.* Cette partie spécifie les exigences d'émission et d'immunité pour tous les types de matériels roulants. Elle couvre le matériel de traction et les rames, ainsi que le matériel tracté. Le domaine d'application de cette partie de la série s'arrête à l'interface du matériel et de ses entrées et sorties d'énergie respectives.

– *Partie 3-2: Matériel roulant – Appareils.* Cette partie s'applique aux aspects d'émission et d'immunité de la CEM pour les appareils électriques et électroniques destinés à être utilisés à bord du matériel roulant ferroviaire. Elle est également utilisée comme moyen de traiter l'impossibilité de faire des essais d'immunité sur le véhicule en totalité.

– *Partie 4: Émission et immunité des appareils de signalisation et de télécommunication.* Cette partie spécifie les limites d'émission électromagnétique et d'immunité pour les appareils de signalisation et de télécommunication installés à l'intérieur d'un système ferroviaire. Le plan CEM énonce si cette partie s'applique également aux équipements opérationnels ferroviaires installés le long de la voie ou sur des quais.

– *Partie 5: Émission et immunité des installations fixes d'alimentation de puissance et des équipements associés.* Cette partie s'applique aux aspects d'émission et d'immunité de la CEM pour les appareils et les composants électriques et électroniques destinés à être utilisés dans les installations ferroviaires fixes associées à l'alimentation.

APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 1: Généralités

1 Domaine d'application

La présente Partie 1 de la série IEC 62236 donne la structure et le contenu de l'ensemble de la série.

Elle spécifie les critères d'aptitude à la fonction applicables à l'ensemble de la série de normes.

L'Article 5 donne des informations relatives à la gestion de la CEM.

L'Annexe A décrit les caractéristiques du système ferroviaire qui affectent la compatibilité électromagnétique (CEM).

Les phénomènes exclus de cette série de normes sont l'impulsion électromagnétique nucléaire, les conditions anormales de fonctionnement (conditions de défaut, par exemple) et les effets d'induction dus à un choc direct de la foudre.

Les limites d'émission à la limite du système ferroviaire ne s'appliquent pas aux émetteurs intentionnels dans les limites du système ferroviaire.

Les aspects relatifs à la sécurité ne sont pas couverts par cette série de normes.

Les effets biologiques des rayonnements non ionisants ainsi que les appareils d'assistance médicale, tels que les stimulateurs cardiaques, ne sont pas traités dans cette série.

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 60050-161, *Vocabulaire Electrotechnique International. Chapitre 161: Compatibilité électromagnétique*

IEC 61000 (toutes les parties), *Compatibilité électromagnétique (CEM)*