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INTERNATIONAL STANDARD

colour inside

Railway applications – Electromagnetic compatibility – Part 5: Emission and immunity of fixed power supply installations and apparatus

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 5: Emission and immunity of fixed power supply installations and apparatus

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 62236-5 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 50121-5:2015.

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

a) clarification of scope (Clause 1);
b) emission requirement extended in the frequency range 1 GHz to 6 GHz following IEC 61000-6-4;
c) immunity requirement extended in the frequency range 5,1 GHz to 6 GHz;
d) removal of limits for radiated H-fields in the frequency range 9 kHz to 150 kHz due to the fact that:
   – there are very few outside world victims;
   – there is low reproducibility.

This Standard is to be read in conjunction with IEC 62236-1.

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

FDIS	Report on voting
9/2340/FDIS	9/2370/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 series, published under the general title *Railway applications – Electromagnetic compatibility*, can be found on the IEC website.

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- amended.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

The requirements of this part of IEC 62236 have been specified so as to ensure a level of electromagnetic emission which will cause minimal disturbance to other equipment. The levels, however, do not cover the following cases:

~~a) where the probability of an occurrence likely to produce emissions in excess of those which would normally be experienced is extremely low,~~

a) which may occur with an extremely low probability of occurrence in any location;

b) where highly susceptible apparatus ~~will be~~ is used in close proximity of the equipment covered by this document, in which case further measures may have to be taken.

The emission limits given are on the basis that the equipment of the product family range is installed in ~~railway~~ traction substation areas.

RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 5: Emission and immunity of fixed power supply installations and apparatus

1 Scope

This part of IEC 62236 applies to emission and immunity aspects of EMC for ~~fixed power supply installations and~~ electrical and electronic apparatus and systems intended ~~to be used in these installations~~ for use in railway fixed installations for power supply. This includes the power feed to the apparatus, the apparatus itself with its protective control circuits, trackside items such as switching stations, power autotransformers, booster transformers, substation power switchgear and power switchgear to other longitudinal and local supplies.

Filters operating at railway system voltage (for example, for harmonic suppression or power factor correction) are not included in this document since each site has special requirements. Filters would normally have separate enclosures with separate rules for access. If electromagnetic limits are required, these will appear in the specification for the equipment.

~~The limits in this standard do not apply to intentional communication signals.~~

If a port is intended to transmit or receive for the purpose of radio communication (intentional radiators, e.g. transponder systems), then the radiated emission requirements in this document are not intended to be applicable to the intentional transmission from a radio-transmitter as defined by the ITU.

The frequency range considered is from DC to 400 GHz. No measurements need to be performed at frequencies where no requirement is specified.

Emission and immunity limits are given for items of apparatus which are situated:

a) within the boundary of a substation which delivers electric power to a railway;

b) beside the track for the purpose of controlling or regulating the railway power supply, including power factor correction ~~and filtering~~;

c) along the track for the purpose of supplying electrical power to the railway other than by means of the conductors used for contact current collection, and associated return conductors. Included are high voltage feeder systems within the boundary of the railway which supply substations at which the voltage is reduced to the railway system voltage;

~~NOTE 1 Examples are one conductor of a 25-0-25 kV 50 Hz system and the 110 kV 16,7 Hz supply systems.~~

~~NOTE 2 Similar conductors which are outside the railway boundary are treated as in the public area and are considered to be general overhead power lines although they feed only the railway.~~

d) beside the track for controlling or regulating electric power supplies to ancillary railway uses. This category includes power supplies to marshalling yards, maintenance depots and stations;

e) various other non-traction power supplies from railway sources which are shared with railway traction.

The immunity levels given in this document apply for:

– vital equipment such as protection devices;

– equipment having connections to the traction power conductors;

– apparatus inside the 3 m zone;

– ports of apparatus inside the 10 m zone with connection inside the 3 m zone;
– ports of apparatus inside the 10 m zone with cable length > 30 m.

Apparatus and systems which are in an environment which can be described as residential, commercial or light industry, even when placed within the physical boundary of the railway substation, ~~shall comply with the relevant generic International EMC standard~~ comply with IEC 61000-6-1 for immunity and IEC 61000-6-3 for emission requirements.

Excluded from the immunity requirements of this document is power supply apparatus which is intrinsically immune to the tests defined in Table 1 to Table 6 of this document.

NOTE An example is an 18 MVA 230 kV to 25 kV power supply transformer.

These specific provisions are ~~to be~~ used in conjunction with the general provisions in IEC 62236-1.

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 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)*~~

~~IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*~~

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

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IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

~~IEC 61000-4-12, *Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test*~~

IEC 61000-4-18:2006, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-6-4:2006, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*
IEC 61000-6-4:2006/AMD1:2010

IEC 62236-1:2018, *Railway applications – Electromagnetic compatibility – Part 1: General*

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~~CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*~~

~~CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*~~

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications – Electromagnetic compatibility – Part 5: Emission and immunity of fixed power supply installations and apparatus

Applications ferroviaires – Compatibilité électromagnétique – Partie 5: Emission et immunité des installations fixes d'alimentation de puissance et des équipements associés

IEC 62236-5:2018-02(en-fr)

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 5: Emission et immunité des installations fixes d'alimentation de puissance et des équipements associés

AVANT-PROPOS

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La Norme internationale IEC 62236-5 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 50121-5:2015.

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

a) clarification du domaine d'application (Article 1);
b) exigences d'émissions étendues dans la plage de fréquences 1 GHz à 6 GHz, suivant l'IEC 61000-6-4;

c) exigences d'immunité étendues dans la plage de fréquences 5,1 GHz à 6 GHz;

d) déplacement des valeurs d'émissions pour les champs H rayonnés de largeurs de bande 9 kHz – 150 kHz pour les raisons suivantes:

   – il y a très peu de victimes du monde extérieur;

   – la reproductibilité est faible.

Cette Norme doit être lue conjointement avec l'IEC 62236-1.

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

FDIS	Rapport de vote
9/2340/FDIS	9/2370/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

Les exigences de la présente partie de l'IEC 62236 ont été spécifiées pour assurer un niveau d’émission électromagnétique qui causera des perturbations minimales pour les autres équipements. Cependant, ces niveaux ne couvrent pas les cas suivants:

a) qui peuvent se produire selon une probabilité extrêmement faible, quel que soit l'emplacement;

b) cas où des appareils à susceptibilité élevée sont utilisés à proximité d’équipements couverts par le présent document, ce qui peut devoir entraîner des mesures supplémentaires.

Les limites d’émission sont données pour des équipements de la gamme de la famille des produits installés dans les zones de sous-stations de traction.

APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 5: Emission et immunité des installations fixes d'alimentation de puissance et des équipements associés

1 Domaine d'application

La présente partie de l'IEC 62236 s'applique aux aspects d'émission et d'immunité de CEM pour les appareils et les systèmes électriques et électroniques destinés à être utilisés dans les installations fixes associées à l'alimentation. Cela concerne l'alimentation des appareils, les appareils eux-mêmes avec leurs circuits de commande de protection, les composants au bord des voies tels que les stations de sectionnement, les autotransformateurs, les transformateurs suceurs, les appareillages de coupure de sous-station et les appareillages de coupure d'autres alimentations longitudinales et locales.

Les filtres qui fonctionnent à la tension du système ferroviaire (par exemple, pour la suppression d'harmoniques ou la correction de facteur de puissance) ne sont pas inclus dans le présent document dans la mesure où chaque site répond à des exigences spéciales. Normalement, les filtres sont dans des enceintes séparées avec des règles d'accès particulières. Si des limites électromagnétiques sont nécessaires, elles apparaîtront dans la spécification pour l'équipement.

Si un accès est destiné à transmettre ou recevoir pour des besoins de radiocommunication (rayonnant intentionnel, par exemple les systèmes de transpondeur), alors les exigences d'émission rayonnée dans le présent document ne sont pas destinées à être applicables à la transmission intentionnelle d'un émetteur radioélectrique comme défini par l'UIT.

La plage de fréquences concernée va du courant continu à 400 GHz. Aucune mesure n'est nécessaire aux fréquences pour lesquelles aucune exigence n'est spécifiée.

Les limites d'émission et d'immunité sont données pour les composants des appareils qui sont situés:

a) dans les limites de la sous-station qui alimente le réseau de traction en électricité;

b) près des voies pour contrôler et réguler l'alimentation électrique du réseau de traction, y compris la correction de facteur de puissance;

c) le long de la voie pour fournir de l'énergie électrique au système ferroviaire par d'autres moyens que les conducteurs utilisés pour le captage du courant de contact et les conducteurs de retour associés. Ceci englobe les systèmes d'alimentation à haute tension dans les limites du système ferroviaire qui alimentent les sous-stations dans lesquelles la tension est ramenée à la valeur de la tension du système ferroviaire;

d) près des voies pour contrôler et réguler les alimentations électriques utilisées à différents usages ferroviaires auxiliaires. Cette catégorie englobe les alimentations des installations de triage, des dépôts de maintenance et des gares;

e) différentes alimentations qui ne concernent pas la traction alimentées par une des sources ferroviaires qui sont partagées avec la traction ferroviaire.

Les niveaux d'immunité donnés dans le présent document s'appliquent aux:

– équipements vitaux tels que les dispositifs de protection;

– équipements dotés de raccordements vers les conducteurs de puissance de traction;

– appareils situés dans la zone de 3 m;

– accès des appareils situés dans la zone de 10 m avec connexion dans la zone de 3 m;
– accès des appareils situés dans la zone de 10 m avec longueur de câble > 30 m.

Les appareils et les systèmes qui sont dans un environnement qui peut être décrit comme résidentiel, commercial ou d'industrie légère, même s'ils sont situés dans les limites physiques de la sous-station ferroviaire, sont conformes à l'IEC 61000-6-1 pour l'immunité et l'IEC 61000-6-3 pour les exigences d'émission.

Les appareils d'alimentation qui ont une immunité intrinsèque aux essais définis aux Tableau 1 à Tableau 6 du présent document sont exclus des exigences relatives à l'immunité du présent document.

NOTE Un transformateur 18 MVA 230 kV / 25 kV en est un exemple.

Ces dispositions spécifiques sont utilisées avec les dispositions générales données dans l'IEC 62236-1.

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 61000-4-2:2008, *Compatibilité électromagnétique (CEM) – Partie 4-2: Techniques d'essai et de mesure – Essai d'immunité aux décharges électrostatiques*

IEC 61000-4-3:2006, *Compatibilité électromagnétique (CEM) – Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques*

IEC 61000-4-4:2012, *Compatibilité électromagnétique (CEM) – Partie 4-4: Techniques d'essai et de mesure – Essai d'immunité aux transitoires électriques rapides en salves*

IEC 61000-4-5:2014, *Compatibilité électromagnétique (CEM) – Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes de choc*

IEC 61000-4-6:2013, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs radioélectriques*

IEC 61000-4-8:2009, *Compatibilité électromagnétique (CEM) – Partie 4-8: Techniques d'essai et de mesure – Essai d'immunité au champ magnétique à la fréquence du réseau*

IEC 61000-4-18:2006, *Compatibilité électromagnétique (CEM) – Partie 4-18: Techniques d'essai et de mesure – Essai d'immunité à l'onde oscillatoire amortie*

IEC 61000-6-4:2006, *Compatibilité électromagnétique (CEM) – Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels*
IEC 61000-6-4:2006/AMD1:2010

IEC 62236-1:2018, *Applications ferroviaires – Compatibilité électromagnétique – Partie 1: Généralités*

IEC 62236-2:2018, *Applications ferroviaires – Compatibilité électromagnétique – Partie 2: Émission du système ferroviaire dans son ensemble vers le monde extérieur*