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Railway applications - Electromagnetic compatibility -- Part 1: General

EESTI STANDARDIKESKUS
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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 50121-1:2015 sisaldab Euroopa standardi EN 50121-1:2015 ingliskeelset teksti.	This Estonian standard EVS-EN 50121-1:2015 consists of the English text of the European standard EN 50121-1:2015.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 27.03.2015.	Date of Availability of the European standard is 27.03.2015.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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English Version

Railway applications - Electromagnetic compatibility - Part 1: General

Applications ferroviaires - Compatibilité électromagnétique - Partie 1: Généralités

Bahnanwendungen - Elektromagnetische Verträglichkeit - Teil 1: Allgemeines

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European Committee for Electrotechnical Standardization
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Contents

Foreword

This document (EN 50121-1:2015) has been prepared by CLC/TC 9X: "Electrical and electronic applications for railways".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-01-05
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2018-01-05

This document supersedes EN 50121-1:2006.

EN 50121-1:2015 includes the following significant technical changes with respect to EN 50121-1:2006:

- deleting of references to 91/440/EEC and EN 50238 (Clause 4).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Introduction

The railway system EMC set of product-specific European Standards is intended, in the main, to permit compliance with the EMC Directive, but also to provide a means of prescribing compatibility between internal parts of the railway system. It consists of five parts described at the end of this introduction.

The set of standards provides both a framework for managing the EMC for railway 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 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 systems. The frequency covered by the standards is in the range from d.c. 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 satisfies the Directive on electromagnetic compatibility with the outside world, and so that EMC is achieved between the various parts of the railway system. Any specific problems in complying with the limits are intended to be addressed by the procedures given in the EMC Directive. Throughout the set 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 systems into the outside world.

The compatibility between railway system emissions and their external environment is based upon emission limits from the railway systems being set by considering the results from measurements at the time that the EMC Directive became enforceable. Given that the general compatibility between railway 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 Standard 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 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 not covered by the EMC Directive 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 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 standard 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 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 work near such a transmitter and these will be accepted as National Conditions for the specification.

The series of standards EN 50121, *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. 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 has to state, 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.

EN 50121-1 and EN 50121-2 are product family standards which take precedence over generic standards.

EN 50121-3-1, EN 50121-3-2, EN 50121-4, and EN 50121-5 are product standards.

1 Scope

This Part 1 of the European standards series EN 50121 outlines the structure and the content of the whole set.

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

Clause 4 provides information about the EMC management.

This part alone is not sufficient to give presumption of conformity to the essential requirements of the EMC-Directive and is intended to be used in conjunction with other parts of this standard.

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

Phenomena excluded from the set 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 set of standards.

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

2 Abbreviations

a.c.	alternating current
d.c.	direct current
E	electric (field)
EM	electromagnetic
EMC	electromagnetic compatibility
GTO	gate turnoff (transistor)
H	magnetic (field)
IGBT	insulated gate bipolar transistor
MVA	megavoltampere
RF	radio frequency

For the purpose of this document, definitions related to EMC and to relevant phenomena may be found in IEC 60050-161.

Other parts of this European Standard may contain specific definitions.

3 Performance criteria

NOTE This clause is based on EN 61000-6-2:2005.

The variety and the diversity of the apparatus within the scope of this set of standards makes it difficult to define precise criteria for the evaluation of the immunity test results.

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria:

Performance criterion A: The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product