

Svenska Elektriska Kommissionen, SEK

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## Järnvägsanläggningar – Elektromagnetisk kompatibilitet (EMC) – Del 1: Allmänt

*Railway applications –  
Electromagnetic compatibility –  
Part 1: General*

Som svensk standard gäller europastandarden EN 50121-1:2006. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50121-1:2006.

### Nationellt förord

Tidigare fastställd svensk standard SS-EN 50121-1, utgåva 1, 2000, gäller ej fr o m 2009-07-01.

### *Standarder underlättar utvecklingen och höjer elsäkerheten*

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

### *SEK är Sveriges röst i standardiseringsarbetet inom elområdet*

Svenska Elektriska Kommissionen, SEK, svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

### *Stora delar av arbetet sker internationellt*

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

### *Var med och påverka!*

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

#### **SEK**

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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

This European Standard was approved by CENELEC on 2006-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

This European Standard was prepared by Technical Committee TC 9X: Electrical and electronic applications for railways. The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50121-1 on 2006-07-01.

This European Standard supersedes EN 50121-1:2000.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2007-07-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2009-07-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 89/336/EEC. See Annex ZZ.

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## Introduction

The railway 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. 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 railways and also specifies the limits for the electromagnetic (EM) emission of the railway as a whole to the outside world and for the EM emission and immunity for equipment operating within the railway. The latter must be compatible with the emission limits set for the railway 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 railways. 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 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. Any specific problems in complying with the limits shall 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 from the outside world. Limits are also placed on EM emission by railways into the outside world.

The compatibility between railway emissions and their external environment is based upon emission limits from the railways being set by considering the results from measurements at the time that the EMC Directive became enforceable. Given that the general compatibility between railways 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 will have satisfactory compliance with its neighbours. In exceptional circumstances, for instance near a "special location" (as defined in the EMC Directive) 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 must 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 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" (as defined in the EMC Directive) 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 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; 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 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 stock and trainsets, as well as independent hauled stock.

The scope of this part of the Standard ends at the interface of the 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.

**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

**1.1** This Part 1 of the European standards series EN 50121 outlines the structure and the content of the whole set. This part alone is not sufficient to give presumption of conformity to the essential requirements of the EMC-Directive and must 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 and the induction effects of direct lightning strike.

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

**1.2** This European Standard is supplemented by the following specific standards:

EN 50121-2	Railway applications - Electromagnetic compatibility Part 2: Emission of the whole railway system to the outside world
EN 50121-3-1	Railway applications - Electromagnetic compatibility Part 3-1: Rolling stock - Train and complete vehicle
EN 50121-3-2	Railway applications - Electromagnetic compatibility Part 3-2: Rolling stock - Apparatus
EN 50121-4	Railway applications - Electromagnetic compatibility Part 4: Emission and immunity of the signalling and telecommunications apparatus
EN 50121-5	Railway applications - Electromagnetic compatibility Part 5: Emission and immunity of fixed power supply installations and apparatus

## 2 Normative references

The following referenced documents are indispensable for the application 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.

EN 50238	Railway applications – Compatibility between rolling stock and train detection systems
EN 61000-6-2	Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2)
IEC 60050-161	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility (EMC)