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Railway applications – Compatibility between rolling stock and train detection systems

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RAILWAY APPLICATIONS – COMPATIBILITY BETWEEN ROLLING STOCK AND TRAIN DETECTION SYSTEMS

FOREWORD

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IEC 62427 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

This document is based on EN 50238-1:2019.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

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

a) generic compatibility process, which is broken into a two-stage process depending on whether there are established compatibility limits or not;
b) rules for characterization of train detection systems;

c) rules for characterization of rolling stock;

d) rules for characterization of the power system;

e) informative references are provided in notes to established CENELEC standards for compatibility;

f) terminology is updated.

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

Draft	Report on voting
9/3115/FDIS	9/3142A/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

- reconfirmed,
- withdrawn, or
- revised.

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

INTRODUCTION

This document defines a process to demonstrate compatibility between rolling stock operating on an area of use or network and train detection systems installed in this area of use or network.

Currently, general rules for the maximum levels of interference allowed, and maximum susceptibility levels (or minimum required immunity levels) are not established in every country. This is due to the great diversity of rolling stock, power supply and return current systems, and train detection systems installed in each country. This diversity leads to consideration of compatibility of rolling stock and train detection systems on a "route by route" or "network by network" basis, to avoid unnecessarily restrictive specifications.

The compatibility process described in this document is generic. The process refers to all types of train detection systems (TDS), which may be influenced by electromagnetic emissions of rolling stock or traction power supply systems, (e.g. axle counters, track circuits, wheel detectors, loops).

Compatibility is determined by both physical and electromagnetic considerations. With regard to the electromagnetic compatibility, the need is not for general values for maximum levels of interference permitted, and maximum susceptibility levels (or minimum required immunity levels) but for convenient methods by which to specify the level of interference allowed for operation on routes or a network.

Main interference sources are considered to be:

– rail currents and voltage sources;
– electromagnetic fields;
– differential voltage between adjacent axles of the train;

as shown in Figure 1.

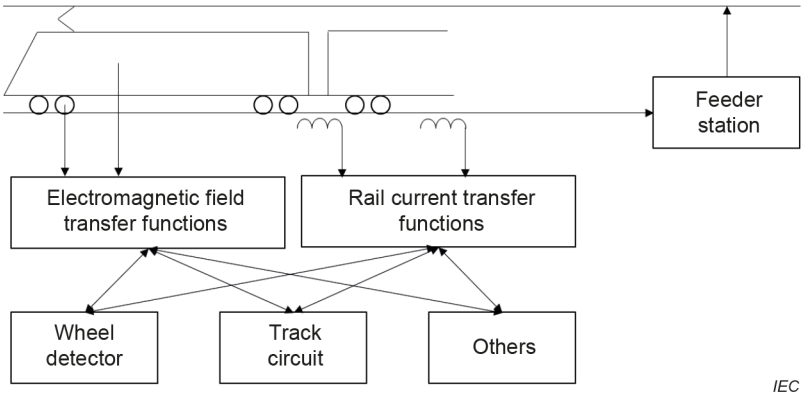

Figure 1 – Sources of electromagnetic interference

In practice, the susceptibility of the system is determined by:

– the sensitivity of individual components of the system and the type of interference it is susceptible to;
– the application of the components, i.e. the configuration of the system.

Therefore the problems concerning TDS are considered separately for each type.

- National rules or standards, including agreements among stakeholders, define compatibility limits for track circuits;
- National rules or standards, including agreements among stakeholders, define compatibility limits for axle counters and wheel detectors;
- National rules or standards, including agreements among stakeholders, define the testing method of rolling stock for electromagnetic compatibility with axle counters;
- Compatibility with other types of wheel detectors (mechanical or magnetic) is described in 5.4;
- Compatibility with loops can be established following the guidance in 5.5;
- Compatibility with any other type of TDS not explicitly covered by this document can also be established following the generic process in this document.

NOTE 1 In Europe, CLC/TS 50238-2, CLC/TS 50238-3 and EN 50592 provide compatibility limits for track circuits, compatibility limits for axle counters and wheel detectors, and the testing method of rolling stock for electromagnetic compatibility with axle counters, respectively.

For determining the susceptibility of signalling systems, laboratory/simulation testing methods and in situ tests on the "real railway" are proposed. Modelling enables worst-case conditions to be simulated. In addition, particular test sites are selected because, from experience, they are expected to provide the test evidence required.

Then, taking account of the experience of the railways, it is possible to establish a general method for determining the susceptibility of train detection systems, described in this document.

NOTE 2 In Europe, general requirements on how to establish immunity have been defined in EN 50617-1 and EN 50617-2.

Before assessing the electromagnetic emissions of rolling stock, sufficient knowledge of the electric circuit diagram of the power equipment is important, including switching frequencies of on-board power converters, type of regulation used for power converters, resonant frequency of each filter, operating limits under high and low supply voltages, degraded modes of operation.

RAILWAY APPLICATIONS – COMPATIBILITY BETWEEN ROLLING STOCK AND TRAIN DETECTION SYSTEMS

1 Scope

This document describes a process to demonstrate compatibility between rolling stock (RST) and train detection systems (TDS). It describes the characterization of train detection systems, rolling stock and traction power supply systems.

It is worth noting that the demonstration of technical compatibility between the rolling stock and infrastructure with respect to physical dimensions is not detailed in this document.

This document is not generally applicable to those combinations of rolling stock, traction power supply and train detection system which were accepted as compatible prior to the publication of this document. However, as far as is reasonably practicable, this document can be applied to modifications of rolling stock, traction power supply or train detection systems which can affect compatibility. The detailed process can be used where no rules and processes for compatibility are established.

2 Normative references

There are no normative references in this document.