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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
ELECTROMAGNETIC COMPATIBILITY –****Part 4: Emission and immunity of the signalling
and telecommunications apparatus**

FOREWORD

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International Standard IEC 62236-4 has been prepared by IEC technical committee TC 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition, issued in 2008. It constitutes a technical revision and has been developed on the basis of EN 50121-4:2015.

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

- a) clarification of scope (Clause 1);
- b) new definition (Clause 3);
- c) emission requirement extended in the frequency range 1 GHz to 6 GHz following IEC 61000-6-4;
- d) immunity requirement extended in the frequency range 5,1 GHz to 6 GHz.

This International 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
9/2339/FDIS	9/2369/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.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This part of IEC 62236 has been prepared in the form of a Product Standard.

It defines the immunity and emission test requirements for apparatus defined in the scope in relation to the electromagnetic disturbances likely to be experienced in the railway. In particular, the test requirements represent the essential electromagnetic immunity requirements and have been selected to ensure an adequate level of immunity for apparatus installed ~~in~~ on the railway locations.

Test requirements are specified for each port considered.

Safety considerations are not covered by this document.

In ~~special~~ specific situations, where the level of disturbances may exceed the levels considered in this document, e.g. at a special location or where a hand-held transmitter is used in very close proximity to an apparatus, special mitigation measures may ~~have to be necessary~~ employed.

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RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 4: Emission and immunity of the signalling and telecommunications apparatus

1 Scope

This part of IEC 62236 applies to signalling and telecommunication apparatus that is installed inside the railway environment. Signalling and telecommunication apparatus mounted in vehicles is covered by IEC 62236-3-2:2018, signalling and telecommunication apparatus installed inside the substation and connected to substation equipment is covered by IEC 62236-5:2018.

This document specifies limits for emission and immunity and provides performance criteria for signalling and telecommunications (S&T) apparatus (including power supply systems belonging to S&T) which may interfere with other apparatus inside the railway environment, or increase the total emissions for the railway environment ~~beyond the limits defined in the appropriate standard~~ and so risk causing Electromagnetic Interference (EMI) to apparatus outside the railway system.

~~Apparatus which complies with the emission levels of IEC 61000-6-4 will meet the emission requirements of this standard provided that emissions from any d.c. power port are within the emissions limits specified for a.c. power ports. The immunity levels of IEC 61000-6-2 will also be adequate except for the special case of apparatus as defined in Note 1 of Table 1. This standard provides the immunity requirements for such apparatus.~~

~~The immunity levels given for the apparatus will in most cases allow the apparatus to perform as intended in the railway environment (see Note). The immunity level establishes a common reference for evaluating the performance of the apparatus when subject to interference resulting from direct exposure of the apparatus and associated cables to a radio frequency field, or by coupling of the interference from a remote source.~~

The requirements specified in this document apply for:

- vital equipment such as interlocking or command and control,
- 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.

Other apparatus not covered by at least one of these given cases is in compliance with IEC 61000-6-2.

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 ~~and immunity limits in this standard at the communication frequency do not apply~~ requirements in this document are not intended to be applicable to the intentional transmission from a radio-transmitter as defined by the ITU.

Immunity limits do not apply in the exclusion bands as defined in the corresponding EMC related standard for radio equipment.

This document does not specify basic personal safety requirements for apparatus such as protection against electric shock, unsafe operation, insulation co-ordination and related

dielectric tests. The requirements were developed for and are applicable to this set of apparatus when operating under normal conditions. Fault conditions of the apparatus have not been taken into account.

~~The requirements and test methods also apply to telecommunications and signalling data and power lines connected to the equipment under test (EUT).~~

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

For products in the scope of IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11 or IEC 61000-3-12, the requirements of those standards also apply.

~~Testing methods are given in the basic standards listed in Clause 2.~~

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

NOTE The immunity and emission levels do not of themselves guarantee that the integration of apparatus will necessarily be satisfactory. The document cannot cover all the possible configurations of the apparatus, but the test levels are sufficient to achieve satisfactory EMC in the majority of cases.

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*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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 61000-4-9, Electromagnetic compatibility (EMC) – Part 4-9: Testing and measurement techniques – Pulse magnetic field immunity test~~

IEC 61000-6-2:2016, Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity *standard* for industrial environments

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

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

CISPR 16-2-1:2014, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

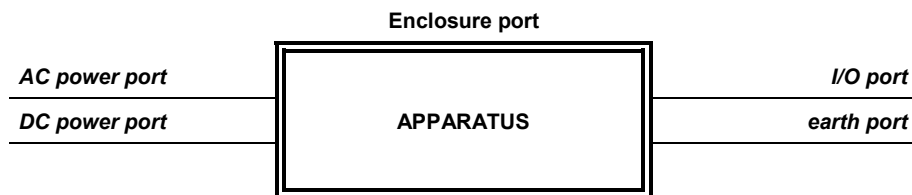
3.1.1 port <in electromagnetic compatibility>

particular interface of ~~the specified apparatus~~ an equipment which couples this equipment with the external electromagnetic environment (161-01-01) and through which the equipment is influenced by this environment

EXAMPLE AC power port, DC power port, I/O (input/output) port, earth port.

Note 1 to entry: The main categories of ports for signaling and telecommunication apparatus are presented in Figure 1.

[SOURCE: IEC 60050-161:1990, AMD4:2014, 161-01-27, modified]



IEC

Figure 1 – Main categories of ports

3.1.2

enclosure port

physical boundary of the apparatus through which electromagnetic fields may radiate or impinge ~~(see Figure 1)~~

3.1.3

3 m zone

area along the railway line within a distance of 3 m from the centerline of the nearest track at both sides of the track

3.1.4

10 m zone

area along the railway line within a distance of 10 m from the centerline of the nearest track at both sides of the track

3.2 Abbreviated terms

AC	Alternating current
AM	Amplitude modulation
DC	Direct current
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
I/O	Input / Output
ITU	International Telecommunication Union
r.m.s.	Root mean square
S&T	Signalling and telecommunication

4 Description of location

The railway environment is characterized as described in IEC 62236-1:2018. ~~Special consideration is given in this standard to apparatus intended to be installed within 3 m of the centreline of the nearest track and as defined in Note 1 of Table 1.~~

~~NOTE Tests covering compatibility with specific items of signalling equipment may be required.~~

5 Emission limits for apparatus

Apparatus which complies with the radiated and conducted emission levels of IEC 61000-6-4 is deemed to meet the emission requirements of this document, provided that the conducted emissions from any DC power port are within the emissions limits specified for AC power ports.

~~The maximum emissions permitted by IEC 61000-6-4 limits defined in Table 1 shall be complied with. The conducted emission limits shall apply to both AC and DC power ports. A measurement distance of 10 m may be used with the limits increased by 10 dB for the radiated emission of the enclosure port.~~ Where the apparatus is intended to be used in an environment other than the railway environment, then the emission limits given in the appropriate standards shall apply.

~~If the field strength measurement at 10 m or 30 m cannot be made because of high ambient noise levels, or for other reasons, measurements may be made at a closer distance, for example 3 m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance. Care should be taken in the measurement of large EUTs at 3 m at frequencies near 30 MHz, due to the near field effects.~~

Table 1 – Emission – AC or DC power ports (input and output)

	Port	Test specification		Basic Standard	Test set-up	Applicability note	Remarks
1.1	AC or DC power ports	150 kHz to 500 kHz	79 dBµV quasi-peak 66 dBµV average	CISPR 16-2-1	CISPR 16-2-1	See ^a	
		500 kHz to 30 MHz	73 dBµV quasi-peak 60 dBµV average				

^a Impulse noise (clicks) which occurs less than five times per minute is not considered. For clicks appearing more often than 30 times per minute, the limits apply. For clicks appearing between 5 and 30 times per minute, a relaxation of the limits is allowed of 20 log 30/N dB (where N is the number of clicks per minute). Criteria for separated clicks may be found in CISPR 14-1.


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6 Immunity

6.1 Performance criteria

~~It is impossible to define precise criteria for the evaluation of the apparatus within the scope of this standard, but performance criteria are as specified in IEC 62236-1, unless otherwise stated.~~

The variety and diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results. Three general levels of performance are therefore used, as defined in IEC 62236-1.

6.2 Test Immunity requirements

The immunity requirements for apparatus covered by this document are given on a port by port basis.

Test requirements are specified for each port considered.

Tests shall be conducted in a well-defined and reproducible manner. The tests shall be carried out as single tests in sequence. The sequence of testing is optional. The description of the test, the test generator, the test methods and the test set-up are given in the basic standards referred to in Tables 2 to 6.

If the apparatus has a large number of similar ports or ports with many similar connections, then a sufficient number shall be selected to simulate actual operating conditions and to ensure that all the different types of termination are covered (e.g. 20 % of the ports or at least four ports).

The immunity levels given for the apparatus will in most cases allow the apparatus to perform as intended inside the railway environment. The immunity level establishes a common reference for evaluating the performance of the apparatus when subject to interference resulting from direct exposure of the apparatus and associated cables to a radio frequency field, or by coupling of the interference from a remote source.

The contents of the basic standards are not repeated herein; however, additional information needed for the practical application of the tests is given where appropriate.

Voltages induced by traction currents are not treated herein. They have to be covered by the functional specification.

Table 2 – Immunity – Enclosure port

Environmental phenomena	Test specification	Basic standard	Test set-up	Remarks	Performance criteria
1.1 Radio-frequency electromagnetic field, Amplitude modulated	80 MHz–1 000 MHz 10 V/m (r.m.s) 80 % AM, 1 kHz	IEC 61000-4-3	IEC 61000-4-3	The test level specified is the r.m.s. value of the unmodulated carrier	A
1.2 Radio-frequency electromagnetic field, from digital mobile telephones	800 MHz–1 000 MHz 20 V/m (r.m.s) 80 % AM, 1 kHz	IEC 61000-4-3	IEC 61000-4-3	See Notes 1 and 3 The test level specified is the r.m.s. value of the unmodulated carrier	A
	1 400 MHz–2 100 MHz 10 V/m (r.m.s) 80 % AM, 1 kHz				
	2 100 MHz–2 500 MHz 5 V/m (r.m.s)				
	2 500 MHz–5 V/m (r.m.s) 80 % AM, 1 kHz				
1.3 Power-frequency magnetic field	16,7 Hz, 50/60 Hz 100 A/m (r.m.s)	IEC 61000-4-8	IEC 61000-4-8	See Notes 1 and 2 All frequencies have to be tested See Notes 1 and 2	A
	0 Hz 300 A/m				
1.4 Electrostatic discharge	± 6 kV ± 8 kV	IEC 61000-4-2	IEC 61000-4-2	See Note 4	B
	300 A/m				
1.5 Pulsed magnetic field	300 A/m	IEC 61000-4-9	IEC 61000-4-9	See Note 1	B

NOTE 1 The tests given apply to apparatus inside 3 m zone and vital equipment such as interlocking or command and control which are mounted in areas where a high risk of interference from mobile radio telephones has been identified. For other apparatus within the railway environment, requirements of IEC 61000-6-2 apply.

NOTE 2 Test only applies to apparatus containing devices sensitive to magnetic fields, for example Hall elements, electro-dynamic microphones, etc. Unshielded CRT-displays can exhibit interference effects above 1 A/m (r.m.s.).