SLOVENSKI STANDARD
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Železniške naprave – Elektromagnetna združljivost – 4. del: Sevanje in odpornost signalnih in telekomunikacijskih naprav

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

Bahnanwendungen - Elektromagnetische Verträglichkeit -- Teil 4: Störaussendungen und Störfestigkeit von Signal- und Telekommunikationseinrichtungen

Applications ferroviaires - Compatibilité électromagnétique -- Partie 4: Emission et immunité des appareils de signalisation et de télécommunication

Ta slovenski standard je istoveten z: **EN 50121-4:2000**

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

Applications ferroviaires - Compatibilité électromagnétique Partie 4: Emission et immunité des appareils de signalisation et de télécommunication

Bahnanwendungen - Elektromagnetische Verträglichkeit Teil 4: Störaussendungen und Störfestigkeit von Signal- und Telekommunikationseinrichtungen

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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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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

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Foreword

This European Standard was prepared by SC 9XA, Communication, signalling and processing systems, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways, in accordance with the decision taken by TC 9X.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50121-4 on 2000-04-01.

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) 2001-04-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-04-01

This European Standard is to be read in conjunction with EN 50121-1:2000.

This standard forms part 4 of the European Standard series EN 50121, published under the general title "Railway applications - Electromagnetic compatibility". The series consists of:

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

Annexes designated “normative” are part of the body of the standard.
Annexes designated “informative” are given only for information.
In this standard, annex A is informative.

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Introduction

This European Standard 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 the railway locations.

Test requirements are specified for each port considered.

Safety considerations are not covered by this standard.

In special situations, where the level of disturbances may exceed the levels considered in this standard, 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 employed.

1 Scope

This European Standard applies to signalling and telecommunication apparatus which is installed in the railway environment. Signalling and telecommunication apparatus mounted in vehicles is covered by EN 50121-3-2.

This standard specifies limits for emission and immunity and provides performance criteria for signalling and telecommunications (S&T) apparatus which may interfere with other apparatus in the railway environment, or increase the total emissions for the railway environment beyond the limits defined in the appropriate standard, and so risk causing Electro-Magnetic Interference (EMI) to apparatus outside the railway system.

Apparatus which complies with the emission levels of EN 50081-2 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 EN 61000-6-2 will also be adequate except for the special case of apparatus installed close to the rails. 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.

If a port is intended to transmit or receive for the purpose of radio communication then the emission and immunity limits in this standard at the communication frequency does not apply.

The standard 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 limits for emission and immunity requirements are from d.c. to 400 GHz. At present testing is not defined for frequencies below 150 kHz (except for traction fundamental frequencies) and above 1 GHz because of difficulties in specifying appropriate test methods.

For products in the scope of EN 61000-3-2 or EN 61000-3-3, the requirements of those standards apply.

Testing methods are given in the basic standards listed in clause 2, Normative references.

NOTE The immunity and emission levels do not of themselves guarantee that the integration of apparatus will necessarily be satisfactory. The standard 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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited in the appropriate places in the text and the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 50081-2	1993	Electromagnetic Compatibility (EMC) - Generic emission Standard Part 2: Industrial environment
EN 50121-1		Railway applications - Electromagnetic compatibility Part 1: General
EN 50121-3-2		Part 3-2: Rolling stock - Apparatus
ENV 50204		Radiated electromagnetic field from digital radio telephones - Immunity test
EN 50238	[1)]	Railway applications - Compatibility between rolling stock and train detection systems
EN 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 61000-3-2)
EN 61000-3-3		Part 3-3: Limits - Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16 A (IEC 61000-3-3)
EN 61000-4-1		Part 4-1: Testing and measurement techniques -Overview of immunity tests (IEC 61000-4-1)
EN 61000-4-2		Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2)
EN 61000-4-3		Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3, modified)
EN 61000-4-4		Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (IEC 61000-4-4)
EN 61000-4-5		Part 4-5: Testing and measurement techniques - Surge immunity test (IEC 61000-4-5)
EN 61000-4-6		Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6)

1) In preparation.

EN 61000-4-8		Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test (IEC 61000-4-8)
EN 61000-4-9		Part 4-9: Testing and measurement techniques - Pulse magnetic field immunity test (IEC 61000-4-9)
EN 61000-4-16		Part 4-16: Testing and measurement techniques - Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz (IEC 61000-4-16)
EN 61000-6-2	1999	Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:1999)

3 Definitions

For the purpose of this part 4 of the European Standard the following definitions apply.

3.1
port
the particular interface of the specified apparatus with the external environment e.g. a.c. power port, d.c. power port, I/O (input/output) port, earth port

3.2
enclosure port
the physical boundary of the apparatus through which electromagnetic fields may radiate or impinge

Enclosure port

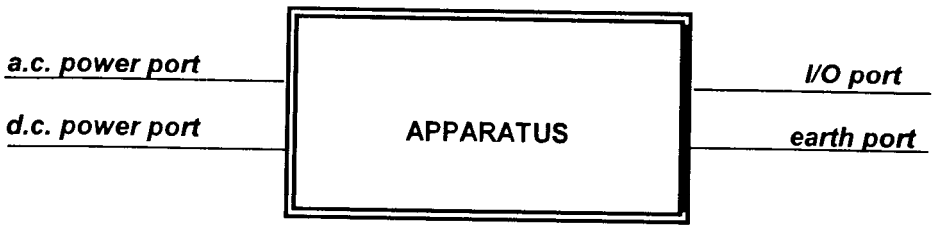

Figure 1

4 Description of location

The railway environment is characterised as described in EN 50121-1. Special consideration is given in this standard to apparatus intended to be installed within 3 m of the centreline of the nearest track.

NOTE Specific tests covered in EN 50238 may be required.

5 Emission limits for apparatus

The maximum emissions permitted by EN 50081-2:1993 shall be complied with. The conducted emission limits shall apply to both a.c. and d.c. power ports. A measurement distance of 10 m may be used with the limits increased by 10 dB or a measurement distance of 3 m may be used with the limits increased by 20 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.

6 Immunity

6.1 Performance criteria

It is impossible to define precise criteria for the evaluation of the apparatus within the scope of this document, but performance criteria are specified in EN 50121-1, unless otherwise stated.

6.2 Test requirements

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

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 1 to 5. If the apparatus has a large number of similar 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.

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

Table 1: Immunity - Enclosure port

	Environmental phenomena	Test specification	Units	Basic Standard	Test set-up	Remarks	Performance criteria
1.1	Radiated electromagnetic field	80-1000 10 80	MHz V/m (rms unmodulated) % AM (1 kHz)	EN 61000-4-3	EN 61000-4-3		A
1.2	Radiated electromagnetic field	900 ± 5 20 50 200	MHz V/m pulse modulated, Duty cycle % Rep. Frequency Hz	ENV 50204	ENV 50204	See note 1	A
1.3	Power - frequency magnetic field	50 16,7 0 100	Hz Hz Hz (d.c.) A/m (rms)	EN 61000-4-8	EN 61000-4-8	See note 1 & 2 CRT display interference is allowed above 3A/m rms All frequencies have to be tested	A
1.4	Electrostatic discharge	± 6 ± 8	kV (Contact discharge) kV (Air discharge)	EN 61000-4-2	EN 61000-4-2	See note 1 and note 3	B
1.5	Pulsed magnetic field	300	A/m	EN 61000-4-9	EN 61000-4-9	See note 1	B

NOTE 1 The tests given apply only to apparatus inside 3 m - zone. For apparatus located outside this area, but within the railway environment, requirements of EN 61000-6-2:1999 applies.

NOTE 2 Test only applies to apparatus containing devices sensitive to magnetic fields e.g. Hall elements, electrodynamic microphones etc.

NOTE 3 Test not applicable to apparatus exposed to outdoor ambient conditions. If the apparatus can be placed inside and outside the more severe test level shall apply.

Table 2: Immunity - I/O port

	Environmental phenomena	Test specification	Units	Basic Standard	Test set-up	Remarks	Performance criteria
2.1	Radio frequency Common mode Amplitude modulated	0,15 - 80 10 80 150	MHz V (rms unmodulated) % AM (1 kHz) Source impedance Ω	EN 61000-4-6	EN 61000-4-6	See note 1 & 2. The test level is prior to modulation	A
2.2	Fast transient	± 2 5/50 5	kV (peak) Tr / Th ns Rep. frequency kHz	EN 61000-4-4	EN 61000-4-4 (capacitive clamp)	See note 1	A
2.3	Surge voltage	1,2 / 50 ± 2 ± 1 ± 2	µs kV (common mode) kV (differential mode) kV (diff. mode in unbalanced system)	EN 61000-4-5	EN 61000-4-5	See notes 1, 3 & 4	B

NOTE 1 This test applies to I/O Port connected to cable inside 3 m - boundary or connected to cable longer than 30 m within 10 m boundary.
I/O ports connected to cable other than above shall comply with the requirements of EN 61000-6-2:1999 except that Note 2 of Table 3 of EN 61000-6-2 is not applicable.

NOTE 2 Applicable only to ports interfacing with cables whose total length according to the manufacturer's specification may exceed 3 m.

NOTE 3 This test is intended to replicate the phenomena known as indirect coupling; hence an output impedance of 42 Ω (40 Ω and 2 Ω generator) and a coupling capacitance of 0,5 µF is recommended.

NOTE 4 For telecommunication ports and other ports intended for connection to highly balanced pairs a differential mode test is not required.