SLOVENSKI STANDARD
SIST EN 50412-2-1:2006

01-januar-2006

Komunikacijske naprave in sistemi elektroenergetskih vodov za nizkonapetostne inštalacije v frekvenčnem območju 1,6 MHz do 30 MHz – 2-1. del: Stanovanja, poslovni prostori in industrijska okolja – Zahteve za odpornost

Power line communication apparatus and systems used in low-voltage installations in the frequency range 1,6 MHz to 30 MHz -- Part 2-1: Residential, commercial and industrial environment - Immunity requirements

Kommunikationsgeräte und -systeme auf elektrischen Niederspannungsnetzen im Frequenzbereich 1,6 MHz bis 30 MHz -- Teil 2-1: Für den Gebrauch in Wohnbereichen, Geschäfts- und Gewerbebereichen sowie in Kleinbetrieben und in industriellen Räumlichkeiten - Störfestigkeitsanforderungen

Equipements et systèmes de communication par courants porteurs utilisés dans les installations à basse tension dans la gamme de fréquences de 1,6 MHz à 20 MHz -- Partie 2-1: Environnement résidentiel, commercial et de l'industrie légère - Exigences d'immunité

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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.

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CENELEC

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

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Contents

Foreword

This European Standard was prepared by SC 205A, Mains communicating systems, of Technical Committee CENELEC TC 205, Home and Building Electronic Systems (HBES).

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50412-2-1 on 2005-04-12.

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)	2006-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-04-01

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.

1 Scope

This standard applies to electrical equipment using signals in the frequency range 1,6 MHz to 30 MHz to transmit information on low voltage electrical systems, either on the public supply system or within installations in consumers' premises.

It does not specify the signal modulation methods nor the coding methods nor functional features. Environmental requirements and tests are not included.

The immunity requirements have been selected so as to ensure an adequate level of immunity for apparatus at residential, commercial and light industrial premises (Class 1 environment), and industrial premises supplied from a dedicated HV/MV or MV/LV transformers (Class 2 environment).

The severity levels required by this standard may not cover extreme cases which may occur in any location but with a low probability of occurrence. In special cases situations will arise where the level of disturbances may exceed the levels specified in this standard (e.g. where a hand-held transmitter is used in proximity to an apparatus). In these instances special mitigation measures may be required.

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.

When the international publication has been modified by CENELEC common modifications indicated by (mod), the relevant EN/HD applies.

IEC Publication	Title	EN/HD
IEC 60050-161	International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility	-
IEC 61000-4-2	Electromagnetic compatibility – Part 4-2: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test	EN 61000-4-2
IEC 61000-4-3	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field, immunity test	EN 61000-4-3
IEC 61000-4-4	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast/transient burst immunity test	EN 61000-4-4
IEC 61000-4-5	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	EN 61000-4-5
IEC 61000-4-6	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Conducted disturbances induced by radio-frequency fields – Immunity test	EN 61000-4-6

IEC 61000-4-8	Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power-frequency magnetic field immunity test	EN 61000-4-8
IEC 61000-4-11	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test	EN 61000-4-11
IEC 61000-6-1	Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments	EN 61000-6-1
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments	EN 61000-6-2

3 Definitions and abbreviations

3.1 Definitions

Definitions related to EMC and to relevant phenomena may be found in the EC Council Directives, in chapter 161 of the IEV (IEC 60050) and in IEC and CISPR publications. The definitions stated in EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to Electromagnetic Compatibility take precedence. The following particular definitions are used in this standard.

3.1.1
port
particular interface of the specified apparatus with the external electromagnetic environment (see Figure 1)

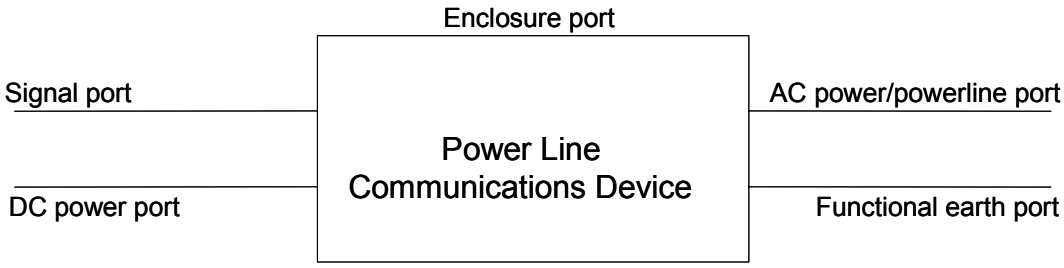

Figure 1 - Description of ports

3.1.2
degradation
the unwanted change in operational performance of a EUT due to electromagnetic disturbances. This does not necessarily mean malfunction or catastrophic failure

3.1.3
enclosure port
the physical boundary of the equipment through which electromagnetic fields may radiate or impinge. For plug in units, the physical boundary will by the host unit.

3.1.4
cable port
a point at which a conductor or a cable is connected to the equipment

3.1.5
functional earth port
cable port other than signal or power port, intended for connection to earth for purposes other than electrical safety

3.1.6
AC power/powerline port
point at which a cable for the a.c. power supply is connected to the equipment / point of connection for the powerline communications device

3.1.7
signal port
any signal connection other than the communications interface between the powerline communications device and the AC powerline

3.1.8
public mains network
electricity lines to which all categories of consumers have access and which are operated by a supply or distribution undertaking for the purpose of supplying electrical energy

3.1.9
class 1 environment
residential, commercial and light industrial locations

3.1.10
class 2 environment
industrial locations

3.1.11
type 1 equipment
a special class for equipment defined by the manufacturer as high integrity and able to operate entirely without manual intervention, for example: Head-end equipment in HV/MV or MV/LV transformer substations

3.1.12
type 2 equipment
all equipment other than that classed as Type 1

3.2 Abbreviations

EUT	Equipment under test
HV	high voltage
ISM	industrial, scientific and medical
LV	low voltage
MV	medium voltage
OFDM	Orthogonal Frequency Division Multiplexing

4 Objective

The objective of this standard is to define the immunity test requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated disturbances including electrostatic discharge.

Test requirements are specified for each port considered.

5 Description of locations

Locations which are characterized by being supplied directly at low voltage from the public mains network are considered to be Class 1 environments.

Examples of Class 1 locations are as follows:

– residential properties, e.g. houses and apartments;

– retail outlets, e.g. shops and supermarkets;

– business premises, e.g. offices and banks;

– areas of public entertainment e.g. cinemas, public bars and dance halls;

– outdoors locations e.g. petrol locations, car parks, amusements and sports centres;

– light-industrial locations e.g. workshops, laboratories and service centres.

Class 2 locations are characterised by the existence of one or more of the following conditions:

– a power network exists powered by a high or medium voltage power transformer dedicated for the supply of an installation feeding manufacturing or similar plant;

– industrial, scientific and medical (ISM) apparatus are present;

– heavy inductive or capacitive loads are frequently switched;

– currents and associated magnetic fields are high.

6 Conditions during testing

A minimum test configuration consists of two pieces of powerline communications equipment interconnected with manufacturer specified physical cable. Associated equipment necessary to the function of the powerline network shall be included in the test configuration.

The system shall be capable of transmitting and receiving data at the nominal transmission rate specified by the manufacturer.

The powerline equipment shall execute a programme that exercises all the functions available to the end user. As a minimum the functions described in Clause 7 of this standard “Performance criteria” shall be tested.

7 Performance criteria

Performance criterion A

During and after the test, the EUT shall operate without

– protocol failure,

– loss of link,

– any other loss of functions relevant to the user,

– reduction in performance below that declared by the manufacturer. The manufacturer shall choose the most appropriate performance measurement criteria for their apparatus or system e.g. bit error rate, block error rate, throughput, re-transmissions etc.

Performance criterion B

Degradation of the performance beyond that as described in criterion A is permitted during the application of the test provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test.

Performance criterion C

Degradation of the performance beyond that as described in criterion A is permitted during the application of the test provided that the normal operation of the EUT is self recoverable to the condition immediately before the application of the test or can be restored after the test by the operator.

8 Narrow band responses & radio-frequency continuous conducted tests

This clause is applicable to Clause 10, Applicability, tests 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1

8.1 Tests on narrow band devices

A narrow band device is defined as a device that uses a maximum of two simultaneous carriers e.g. one upstream and one downstream carrier.

Narrow band devices shall benefit from exclusion bands in which radio-frequency continuous conducted common mode tests are not made.

The exclusion bands are determined the same way for both the transmitter and the receiver of a device.

Exclusion band definition for receivers or receivers which are part of transceivers:

Responses of receivers or the receiver part of (duplex) transceivers occurring during the immunity tests at discrete frequencies which are narrow band responses (spurious responses), are identified by the following method.

If during the test, the immunity RF test signal causes non-compliance of the receiver with the specified performance criteria (see Clause 7), it is necessary to establish whether this non-compliance is due to a narrow band response or a wideband phenomenon. Therefore, the frequency of the test signal is increased by an amount equal to twice the nominal 6 dB bandwidth of the IF filter immediately preceding the demodulator of the receiver, or if appropriate, the bandwidth over which the apparatus is intended to operate, as declared by the manufacturer. The test is repeated with the frequency of the test signal decreased by the same amount.

If the receiver is then in either or both frequency offset cases in compliance with the specified performance criteria, the response is considered as a narrow band response.

If the receiver still does not comply with the specified performance criteria, this may be due to the fact that the offset has made the frequency of the unwanted signal correspond to the frequency of another narrow band response. Under these circumstances the procedure is repeated with an increase and decrease of the frequency of the test signal adjusted two and a half times the bandwidth referred to above.

If the receiver still does not comply with the specified performance criteria in either or both frequency offset cases, the phenomena is considered wide band and therefore an EMC problem and the equipment fails the test.

For immunity tests, narrow band responses shall be disregarded.

It is recommended that for narrow-band systems the manual should contain a warning that the equipment may be susceptible to interference.

8.2 Tests on broad band devices

A broadband device is a device that uses 3 or more carriers simultaneously, OFDM, multicarrier modulation, spread spectrum technologies etc.

Broadband devices shall not benefit from an exclusion band for the radio-frequency continuous conducted common mode tests.

Broadband devices may incorporate adaptive algorithms that interact with the swept frequency test signal used for radio-frequency continuous conducted tests. Radio frequency ingress, in practice, will typically be a combination of multiple single frequency fixed interferers and broadband noise. Consequently, the dwell time of the swept frequency test signal shall be chosen such that the apparatus or system performance is not adversely affected beyond that which would occur with a fixed or broadband interferer.

9 Product documentation

The specification used by the manufacturer to define the performance criteria for the testing required by this standard shall be made available upon request.

10 Applicability

Tests shall be applied to the relevant ports of the equipment according to Tables 1 to 9. Tests shall only be carried out where the relevant port exists.

It may be determined from consideration of the electrical characteristics and usage of a particular equipment that some of the tests are inappropriate and therefore unnecessary. In such a case, it is required that both the decision and the justification not to apply any particular test to any particular port be recorded in the test report.