

Electrical equipment for measurement, control and laboratory use — EMC requirements —

Part 1: General requirements

The European Standard EN 61326-1:2006 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 61326-1:2006. It is identical with IEC 61326-1:2005. BS EN 61326-1:2006 partially supersedes BS EN 61326:1998 which will be withdrawn on publication of all of the parts of the BS EN 61326-2 series of standards (BS EN 61326-2-1:2006, BS EN 61326-2-2:2006, BS EN 61326-2-3, BS EN 61326-2-4, BS EN 61326-2-5 and BS EN 61326-2-6:2006).

The UK participation in its preparation was entrusted by Technical Committee GEL/65, Measurement and control, to Subcommittee GEL/65/1, System considerations, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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**Electrical equipment for measurement,
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EMC requirements
Part 1: General requirements
(IEC 61326-1:2005)**

Matériel électrique de mesure,
de commande et de laboratoire –
Exigences relatives à la CEM
Partie 1: Exigences générales
(CEI 61326-1:2005)

Elektrische Mess-, Steuer-, Regel-
und Laborgeräte –
EMV-Anforderungen
Teil 1: Allgemeine Anforderungen
(IEC 61326-1:2005)

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CENELEC

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

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Foreword

The text of document 65A/456/FDIS, future edition 1 of IEC 61326-1, prepared by SC 65A, System aspects, of IEC TC 65, Industrial-process measurement and control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61326-1 on 2006-02-01.

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- latest date by which the EN has to be implemented
at national level by publication of an identical
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- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-02-01

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.

Annexes ZA and ZZ have been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61326-1:2005 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

Instruments and equipment within the scope of this standard may often be geographically widespread and may have to operate under a wide range of environmental conditions.

The limitation of undesired electromagnetic emissions ensures that no other equipment, installed nearby, is unduly influenced by the equipment under consideration. The limits are more or less specified by, and therefore taken from, IEC and International Special Committee on Radio Interference (CISPR) publications.

However, the equipment has to function without undue degradation in a typical electromagnetic environment. The limit values for immunity specified in this standard have been chosen under this assumption. Special risks, involving for example nearby or direct lightning strikes, circuit-breaking, or exceptionally high electromagnetic radiation in close proximity, are not covered.

Complex electric and/or electronic systems require EMC planning in all phases of their design and installation, taking into consideration the electromagnetic environment, any special requirements, and the severity of failures.

This part of IEC 61326 specifies the EMC requirements that are generally applicable to all equipment within its scope. For certain types of equipment, these requirements will be supplemented or modified by the special requirements of one, or more than one, particular part within IEC 61326-2. These should be read in conjunction with the IEC 61326-1 requirements.

ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE – EMC REQUIREMENTS –

Part 1: General requirements

1 Scope

This part of IEC 61326 specifies requirements for immunity and emissions regarding electromagnetic compatibility (EMC) for electrical equipment, operating from a supply or battery of less than 1 000 V a.c. or 1 500 V d.c. or from the circuit being measured, intended for professional, industrial-process, industrial-manufacturing and educational use, including equipment and computing devices for

- measurement and test;
- control;
- laboratory use;
- accessories intended for use with the above (such as sample handling equipment),

intended to be used in industrial and non-industrial locations.

Computing devices and assemblies and similar equipment within the scope of Information Technology Equipment (ITE) and complying with applicable ITE EMC standards can be used in systems within the scope of this part of IEC 61326 without additional testing, if it is suitable for the intended electromagnetic environment.

This product family standard takes precedence over generic standards.

The following equipment is covered in this standard.

a) Electrical measurement and test equipment

This is equipment, which by electrical means measures, indicates or records one or more electrical or non-electrical quantities, also non-measuring equipment such as signal generators, measurement standards, power supplies and transducers.

b) Electrical control equipment

This is equipment, which controls one or more output quantities to specific values, with each value determined by manual settings, by local or remote programming, or by one or more input variables. This includes Industrial Process Measurement and Control (IPMC) equipment, which consists of devices such as:

- process controllers and regulators;
- programmable controllers;
- power supply units for equipment and systems (centralized or dedicated);
- analogue/digital indicators and recorders;
- process instrumentation;
- transducers, positioners, intelligent actuators, etc.

c) Electrical laboratory equipment

This is equipment which measures, indicates monitors or analyses substances, or is used to prepare materials, and includes In Vitro Diagnostic (IVD) equipment. This equipment may also be used in areas other than laboratories, for example self-test IVD equipment may be used in the home.

This standard is applicable to

- equipment for use in residential, commercial and light-industrial environments, according to IEC 61000-6-1;
- equipment for use in industrial locations;
- equipment for use in laboratories or test and measurement areas with a controlled electromagnetic environment;
- portable test and measurement equipment.

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.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 61000-3-2:2000, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current $\leq 16\text{A}$ per phase)*

IEC 61000-3-3:2002, *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 $\leq 16\text{ A}$ per phase and not subject to conditional connection*

IEC 61000-3-11:2000, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current $\leq 75\text{A}$ and subject to conditional connection*

IEC 61000-3-12:2004, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low voltage systems with input current $> 16\text{A}$ and $\leq 75\text{A}$ per phase*

IEC 61000-4-2:2001, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2002, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2001, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*
Amendment 1 (2000)

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-6-1:2005, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 as well as the following apply.

Other definitions, not included in IEC 60050-161 and this standard, but nevertheless necessary for the application of the different tests, are given in the EMC basic publications of the IEC 61000 series.

3.1

type test

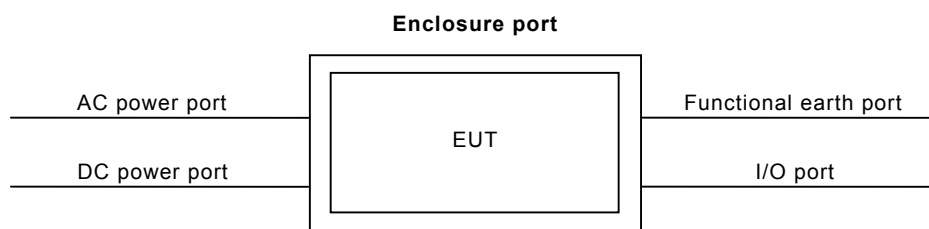
conformity test made on one or more items representative of the production
[IEV 151-16-16]

3.2

port

any particular interface of the specific device or system with the external electromagnetic environment within the scope of this part of IEC 61326 (see Figure 1 for an example of Equipment Under Test (EUT))

NOTE I/O ports are input, output or bi-directional, measurement, control, or data ports.



IEC 1119/98

Figure 1 – Examples of ports

3.3**enclosure port**

physical boundary of equipment through which electromagnetic fields may radiate or impinge

3.4**class A equipment**

equipment suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

[CISPR 11, 4.2]

3.5**class B equipment**

equipment suitable for use in domestic establishments and in establishments directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

[CISPR 11, 4.2]

3.6**long-distance lines**

lines within a building which are longer than 30 m, or which leave the building (including lines of outdoor installations)

3.7**industrial locations**

locations characterized by a separate power network, in most cases supplied from a high- or medium-voltage transformer, dedicated for the supply of installations feeding manufacturing or similar plants with one or more of the following conditions:

- frequent switching of heavy inductive or capacitive loads;
- high currents and associated magnetic fields;
- presence of Industrial, Scientific and Medical (ISM) apparatus (for example, welding machines)

3.8**laboratory or test and measurement area**

area that is specifically used for analysis, testing and servicing and where equipment is operated by trained personnel

3.9**controlled electromagnetic environment**

environment usually characterized by recognition and control of EMC threats by users of the equipment or design of the installation

3.10**functional earthing**

earthing a point or points in a system or in an installation or in equipment, for purposes other than electrical safety

[IEV 195-01-13, modified]

NOTE The EUT port used for functional earthing is called functional earth port.

4 General

Equipment and systems within the scope of this standard can be subjected to various kinds of electromagnetic disturbances, conducted by power, measurement or control lines, or radiated from the environment. The types and levels of disturbances depend on the particular conditions in which the systems, subsystems or equipment are installed and operate.

Equipment such as generators, analysers or frequency meters shall fulfil the requirements under the conditions defined by the manufacturer (that is without a test object connected, or connecting a 50 Ω termination to the output of a signal generator).

The manufacturer shall give information that emissions, which exceed the levels required by this standard, may occur when equipment is connected to a test object.

Equipment and individual devices of a system within the scope of this standard may also be a source of electromagnetic disturbances over a wide frequency range. These disturbances may be conducted through power and signal lines, or be directly radiated, and may affect the performance of other equipment, or influence the external electromagnetic environment.

For emissions, the objective of these requirements is to ensure that the disturbances generated by the equipment and systems, when operated normally, do not exceed a level which could prevent other systems from operating as intended. The emission limits are considered in 7.2

To comply with this standard, no additional EMC tests are required beyond those stated here.

NOTE 1 Higher immunity levels than those specified may be necessary for particular applications (for example, when reliable operation of the equipment is essential for safety) or when the equipment is intended for use in harsher electromagnetic environments.

NOTE 2 This standard does not specify basic safety requirements such as protection against electric shock, unsafe operation, insulation co-ordination and related dielectric tests for equipment. See IEC 61010 for safety requirements.

NOTE 3 The emission limits of this standard may not, however, provide full protection against interference to radio and television reception when the measurement, control or laboratory equipment is used closer than 30 m to the receiving antenna for industrial or professional applications, and closer than 10 m for domestic and commercial applications.

NOTE 4 In special cases, for example when highly susceptible equipment is being used in close proximity, additional mitigation measures may have to be employed to reduce the influencing electromagnetic emission further below the specified limits.

NOTE 5 The manufacturer may elect to perform all tests either on a single EUT or more than one. The testing sequence is optional.

5 EMC test plan

5.1 General

An EMC test plan shall be established prior to testing. It shall contain, as a minimum, the elements given in 5.2 to 5.5.

It may be determined from consideration of the electrical characteristics and usage of a particular apparatus that some tests are inappropriate and therefore unnecessary. In such cases, the decision not to test shall be recorded in the EMC test plan.

5.2 Configuration of EUT during testing

5.2.1 General

Measurement, control and laboratory equipment often consists of systems with no fixed configuration. The kind, number and installation of different subassemblies within the equipment may vary from system to system. Thus it is reasonable, and also recommended, not to test every possible arrangement.

To realistically simulate EMC conditions (related both to emission and immunity), the equipment assembly shall represent a typical installation as specified by the manufacturer. Such tests shall be carried out as type tests under normal conditions as specified by the manufacturer.

5.2.2 Composition of EUT

All devices, racks, modules, boards, etc. significant to EMC and belonging to the EUT shall be documented. If relevant, the software version shall be documented.

5.2.3 Assembly of EUT

If an EUT has a variety of internal and external configurations, the type tests shall be made with one or more typical configurations that represent normal use. All types of module shall be tested at least once. The rationale for this selection shall be documented in the EMC test plan.

5.2.4 I/O ports

Where there are multiple I/O ports, which are all of the same type, connecting a cable to just one of those ports is sufficient, provided that it can be shown that the additional cables would not affect the results significantly.

If not otherwise specified in more specific parts of the IEC 61326 series, electrostatic discharges shall not be applied to inner pins of plug-in ports or cable connectors (but to connected connectors accessible during the intended use of the EUT).

5.2.5 Auxiliary equipment

When a variety of devices is provided for use with the EUT, at least one of each type of device shall be selected to simulate actual operating conditions. Auxiliary devices can be simulated.

5.2.6 Cabling and earthing (grounding)

The cables and earth (ground) shall be connected to the EUT in accordance with the manufacturer's specifications. There shall be no additional earth connections.

5.3 Operation conditions of EUT during testing

5.3.1 Operation modes

A selection of representative operation modes shall be made, taking into account that not all functions, but only the most typical functions of the electronic equipment can be tested. The estimated worst-case operating modes for normal application shall be selected.

5.3.2 Environmental conditions

The tests shall be carried out within the manufacturer's specified environmental operating range (for example, ambient temperature, humidity, atmospheric pressure), and within the rated ranges of supply voltage and frequency.

5.3.3 EUT software during test

The software used for simulating the different modes of operation shall be documented. This software shall represent the estimated worst-case operating mode for normal application.

5.4 Specification of performance criteria

For immunity tests, performance criteria for each operating mode and test shall be specified; where possible, as quantitative values.

5.5 Test description

Each test to be applied shall be specified in the EMC test plan. The description of the tests, the test methods, the characteristics of the tests, and the test set-ups are given in the basic standards, which are referred to in 6.2 and 7.2. Additional information needed for the practical implementation of the tests is given in this standard. The contents of standards need not be reproduced in the test plan. In some cases, the EMC test plan shall specify the application in detail.

NOTE Not all known disturbance phenomena have been specified for testing purposes in this part of IEC 61326, but only those which are considered as most critical.

6 Immunity requirements

6.1 Conditions during the tests

The configuration and modes of operation during the tests shall be precisely noted in the test report.

Tests shall be applied to the relevant ports in accordance with Tables 1 or 2 or 3, as applicable.

The tests shall be conducted in accordance with the basic standards. The tests shall be carried out one at a time. If additional methods are required, the method and rationale shall be documented.

6.2 Immunity test requirements

The basic immunity testing requirements are given in Table 1.

Particular immunity requirements for equipment intended for use in industrial locations are given in Table 2.

Particular immunity requirements for equipment intended for use in laboratories or test and measurement areas with a controlled electromagnetic environment are given in Table 3.

Table 1 – Basic immunity test requirements

Port	Phenomenon	Basic standard	Test value	Performance criteria
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV/4 kV contact/air	B
	EM field	IEC 61000-4-3	3 V/m (80 MHz to 1 GHz) 3 V/m (1,4 GHz to 2 GHz) 1 V/m (2,0 GHz to 2,7 GHz)	A
AC power (including protective earth)	Voltage dip	IEC 61000-4-11	0 % during half cycle 0 % during 1 cycle 70 % during 25/30 ^{e)} cycles	B B C
	Short interruptions	IEC 61000-4-11	0 % during 250/300 ^{e)} cycles	C
	Burst	IEC 61000-4-4	1 kV (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	0,5 kV ^{a)} /1 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V (150 kHz to 80 MHz)	A
DC power ^{d)} (including protective earth)	Burst	IEC 61000-4-4	1 kV(5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	0,5 kV ^{a)} /1 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V (150 kHz to 80 MHz)	A
I/O signal/control (including lines connected to functional earth port)	Burst	IEC 61000-4-4	0,5 kV ^{d)} (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	1 kV ^{b)} , c)	B
	Conducted RF	IEC 61000-4-6	3 V ^{d)} (150 kHz to 80 MHz)	A
I/O signal/control connected directly to mains supply	Burst	IEC 61000-4-4	1 kV(5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	0,5 kV ^{a)} /1 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V (150 kHz to 80 MHz)	A
a) Line to line. b) Line to earth (ground). c) Only in the case of long-distance lines (see 3.6). d) Only in the case of lines >3 m. e) 25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test.				

Table 2 – Immunity test requirements for equipment intended for use in industrial locations

Port	Phenomenon	Basic standard	Test value	Performance criteria
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV/8 kV contact/air	B
	EM field	IEC 61000-4-3	10 V/m (80 MHz to 1 GHz) 3 V/m (1,4 GHz to 2 GHz) 1 V/m (2,0 GHz to 2,7 GHz)	A
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m ^{e)}	A
AC power	Voltage dip	IEC 61000-4-11	0 % during 1 cycle 40 % during 10/12 ^{h)} cycles 70 % during 25/30 ^{h)} cycles	B C C
	Short interruptions	IEC 61000-4-11	0 % during 250/300 ^{h)} cycles	C
	Burst	IEC 61000-4-4	2 kV(5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	1 kV ^{a)} /2 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V ^{f)} (150 kHz to 80 MHz)	A
DC power ^{g)}	Burst	IEC 61000-4-4	2 kV (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	1 kV ^{a)} /2 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V ^{f)} (150 kHz to 80 MHz)	A
I/O signal/ control (including functional earth lines)	Burst	IEC 61000-4-4	1 kV (5/50 ns, 5 kHz) ^{d)}	B
	Surge	IEC 61000-4-5	1 kV ^{b)} , c)	B
	Conducted RF	IEC 61000-4-6	3 V ^{d)} , f)	A
I/O signal/ control connected directly to power supply network	Burst	IEC 61000-4-4	2 kV (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	1 kV ^{a)} /2 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	3 V ^{f)} (150 kHz to 80 MHz)	A

a) Line to line.

b) Line to ground.

c) Only in the case of long-distance lines (see 3.6).

d) Only in the case of lines > 3 m.

e) Only to magnetically sensitive equipment. CRT display interference is allowed above 1 A/m.

f) The test level for the conducted RF test is lower than the level for the EM field test because the conducted RF test simulates the resonance condition at each frequency and is thus a more severe test.

g) DC connections between parts of equipment/system which are not connected to a d.c. distribution network are treated as I/O signal/control ports.

h) 25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test.

Table 3 – Immunity test requirements for equipment used in controlled EM environments

Port	Phenomenon	Basic standard	Test value	Performance criteria
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV/8 kV contact/air	B
	EM field	IEC 61000-4-3	1 V/m (80 MHz to 1 GHz) 1 V/m (1,4 GHz to 2 GHz) 1 V/m (2,0 GHz to 2,7 GHz)	A
AC power	Voltage dip	IEC 61000-4-11	0% during half cycle	B
	Burst	IEC 61000-4-4	1 kV (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	0,5 kV ^{a)} /1 kV ^{b)}	B
	Conducted RF	IEC 61000-4-6	1 V (150 kHz to 80 MHz)	A
DC power ^{c), d)}	Burst	IEC 61000-4-4	1 kV (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	Not required	-
	Conducted RF	IEC 61000-4-6	1 V (150 kHz to 80 MHz)	A
I/O signal/ control (including functional earth wire)	Burst	IEC 61000-4-4	0,5 kV ^{c)} (5/50 ns, 5 kHz)	B
	Surge	IEC 61000-4-5	Not required	-
	Conducted RF	IEC 61000-4-6	1 V ^{c)} (150 kHz to 80 MHz)	A
Measurement I/O ^{c)}	Burst	IEC 61000-4-4	X ^{e)}	-
	Surge	IEC 61000-4-5	Not required	-
	Conducted RF	IEC 61000-4-6	X ^{e)}	-
a) Line to line. b) Line to ground. c) Only in the case of lines >3 m. d) DC connections between parts of equipment/system which are not connected to a d.c. distribution network are treated as I/O signal/control ports. e) The rated disturbance values shall be stated in the product specification by the manufacturer.				

The manufacturer shall state that equipment fulfilling the requirements in Table 3 is designed to operate in a controlled electromagnetic environment, i.e. where r.f. transmitters such as mobile telephones may not be used in close proximity.

NOTE In general, analysis, test and service laboratories have controlled EM environments, and personnel in these areas are usually trained to be able to interpret results. Such environments normally contain equipment which requires protection by such apparatus as Uninterruptible Power Supplies (UPS), filters, or surge suppressers. Hence, the test values shown in Table 3 are relaxed from those in Table 1.

6.3 Random aspects

The performance criterion shall be observable during the test and shall not be a random phenomenon. The duration of the test and number of tests shall be sufficient to test each function of the EUT as specified in the EMC test plan. Special care shall be given to ensure that this is covered with automatic (processor) controlled EUTs.

NOTE For instance, in the case of electrostatic discharge testing of a digital device, the EUT should be exposed to at least 10 discharges at each polarity, test point and test level to exclude random effects. In case of burst testing, it may be advisable to extend the testing time to more than 1 min.

6.4 Performance criteria

The general principles (performance criteria) for the evaluation of the immunity test results are the following.

6.4.1 Performance criterion A

During testing, normal performance within the specification limits.

Example 1

If electronic equipment is required to work with high reliability, the EUT shall operate without any apparent degradation from the manufacturer's specification.

6.4.2 Performance criterion B

During testing, temporary degradation, or loss of function or performance which is self-recovering.

Example 1

A data transfer is controlled/checked by parity check or by other means. In the case of malfunctioning, such as caused by a lightning strike, the data transfer will be repeated automatically. The reduced data transfer rate at this time is acceptable.

Example 2

During testing, an analogue function value may deviate. After the test, the deviation vanishes.

Example 3

In the case of a monitor used only for man-machine monitoring, it is acceptable that some degradation takes place for a short time, such as flashes during the burst application.

6.4.3 Performance criterion C

During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Example 1

In the case of an interruption in the mains longer than the specified buffer time, the power supply unit of the equipment is switched off. The switch-on may be automatic or carried out by the operator.

Example 2

After a programme interruption caused by a disturbance, the processor functions of the equipment stops at a defined position and is not left in a "crashed state". The operator's decision prompts may be necessary.

Example 3

The test results in an opening of an over-current protection device that is replaced or reset by the operator.

7 Emission requirements

7.1 Conditions during measurements

The measurements shall be made in the operating mode in accordance with the EMC test plan (see Clause 5).

The description of the tests, the test methods, and the test set-ups are given in the reference standards as stated in 7.2. The contents of the reference standards are not reproduced here; however, modifications or additional information needed for the practical implementation of application of the tests may be given in the different parts of the IEC 61326 series.

7.2 Emission limits

For Class B equipment, the limits, the measuring methods and the provisions given in CISPR 11, IEC 61000-3-2 (or IEC 61000-3-12) and IEC 61000-3-3 (or IEC 61000-3-11) apply. For Class A equipment, the limits, the measuring methods and the provisions given in CISPR 11 apply. Equipment classification and choice of respective limits shall be determined after taking into account the intended environment and emission requirement in the areas of use.

The equipment shall be classified and respective information is provided per the applicable group and class as specified within CISPR 11, Clause 4.

For equipment using frequencies in the ISM bands, see CISPR 11.

8 Test results and test report

The test results shall be documented in a comprehensive test report with sufficient detail to provide for test repeatability.

The test report shall contain the following minimum information:

- EUT description;
- EMC test plan;
- test data and results;
- test equipment and set-up.

9 Instructions for use

If required in some part of the IEC 61326 series, relevant instructions for use may be included in the user documentation.

Annex A (normative)

Immunity test requirements for portable test and measurement equipment

Equipment covered within this Annex is portable test and measurement equipment that is powered by battery or from the circuit being measured. Equipment that can be operated while charging is excluded from this Annex.

NOTE 1 Test and measurement instruments within the scope of this part of IEC 61326 can be used in a wide range of locations, but by personnel capable of interpreting the results obtained. If these instruments are connected to a mains supply, it is normally only by their test or measurement leads and only for a short duration of the test. Hence, the number of em phenomena shown in Table A.1 is reduced in relation to Table 1.

NOTE 2 If r.f. transmitters are used in close proximity, they may disturb equipment within the scope of this standard.

Table A.1 – Immunity test requirements for portable test and measurement equipment

Port	Phenomenon	Basic standard	Test value
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV/8 kV contact/air
	EM field	IEC 61000-4-3	3 V/m (80 MHz to 1 GHz) 3 V/m (1,4 GHz to 2 GHz) 1 V/m (2,0 GHz to 2,7 GHz)

There are no further immunity requirements for the mains chargers used by the products within the scope of this part of IEC 61326.

Bibliography

The following referenced documents may be used as additional information. The latest edition of the referenced document (including any amendments) should be used.

IEC 60050-151, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050-351, *International Electrotechnical Vocabulary (IEV) – Chapter 351: Automatic control*

IEC 60359, *Electrical and electronic equipment - Expression of performance*

NOTE Harmonized as EN 60359:2002 (not modified).

IEC 61010 (all parts), *Safety requirements for electrical equipment for measurement, control, and laboratory use*

NOTE Harmonized in the EN 61010 series (not modified).

IEEE 488.1, *IEEE standard digital interface for programmable instrumentation*

IEEE 1284, *IEEE standard signalling method for a bi-directional parallel peripheral interface for personal computers*

TIA/EIA-232-F, *Interface between data terminal equipment and data circuit-terminating equipment employing serial binary data interchange*

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-161	– ¹⁾	International Electrotechnical Vocabulary Chapter 161: Electromagnetic compatibility	–	–
IEC 61000-3-2 (mod)	2000	Electromagnetic compatibility (EMC) Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16A per phase)	EN 61000-3-2 ²⁾	2000
IEC 61000-3-3 A1	1994 2001	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	EN 61000-3-3 A1	1995 2001
IEC 61000-3-11	2000	Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75A and subject to conditional connection	EN 61000-3-11	2000
IEC 61000-3-12	2004	Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low voltage systems with input current > 16A and ≤ 75A per phase	EN 61000-3-12	2005
IEC 61000-4-2 A1 A2	1995 1998 2000	Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	EN 61000-4-2 A1 A2	1995 1998 2001
IEC 61000-4-3	2002	Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2002
IEC 61000-4-4	2004	Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	EN 61000-4-4	2004
IEC 61000-4-5 A1	1995 2000	Part 4-5: Testing and measurement techniques – Surge immunity test	EN 61000-4-5 A1	1995 2001

¹⁾ Undated reference.

²⁾ EN 61000-3-2 is superseded by EN 61000-3-2:2006, which is based on IEC 61000-3-2:2005.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-6	2003	Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	– ³⁾	–
IEC 61000-4-8 A1	1993 2000	Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	EN 61000-4-8 A1	1993 2001
IEC 61000-4-11	2004	Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
IEC 61000-6-1	2005	Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments	– ⁴⁾	–
CISPR 11	2003	Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement	– ⁵⁾	–

³⁾ IEC 61000-4-6:1996 + A1:2000 are harmonized as EN 61000-4-6:1996 + A1:2001.

⁴⁾ IEC 61000-6-1 (mod.) is harmonized as EN 61000-6-1:2001.

⁵⁾ CISPR 11:1997 (mod.) + A1:1999 + A2:2002 are harmonized as EN 55011:1997 + A1:1999 + A2:2002.

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Article 4 of the EC Directive 89/336/EEC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.

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