

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

The European Standard EN 61326:1997 with the incorporation of amendments A1:1998, A2:2001 and A3:2003 has the status of a British Standard

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National foreword

This British Standard is the English language version of EN 61326:1997 including amendments A1:1998, A2:2001 and A3:2003. It is identical with IEC 61326:2002, including corrigendum July 2002, which replaced IEC 61326:1997 and its amendments 1:1998 and 2:2001.

The UK participation in its preparation was entrusted by Technical Committee GEL/65, Measurement and control, to Subcommittee GEL/65/1, Systems 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 the 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.

Cross-references

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(IEC 61326:2002)

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Prescriptions relatives à la CEM
(inclut les amendements A1:1998, A2:2001 et A3:2003)
(CEI 61326:2002)

Elektrische Betriebsmittel für Leittechnik und Laboreinsatz — EMV-Anforderungen
(enthält Änderungen A1:1998, A2:2001 und A3:2003)
(IEC 61326:2002)

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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, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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/211/FDIS, future edition 1 of IEC 61326-1, prepared by SC 65A, System aspects, of IEC TC 65, Industrial-process measurement and control, and by IEC TC 66, Safety of measuring, control, and laboratory equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61326-1 on 1997-03-11.

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Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61326-1:1997 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

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Annexes designated “normative” are part of the body of the standard.

In this standard, Annex A, Annex B, Annex C and Annex ZA are normative.

Annex ZA has been added by CENELEC.

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Foreword to amendment A3

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Annexes designated “normative” are part of the body of the standard. In this standard, Annex E, Annex F and Annex ZA are normative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of Annex E and Annex F of the International Standard IEC 61326:2002 and of the corrigendum July 2002 to IEC 61326:2002 was approved by CENELEC as an amendment to the 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.

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

1 Scope

This International Standard specifies minimum requirements for immunity and emissions regarding electromagnetic compatibility (EMC) for electrical equipment, operating from a supply 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 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 without additional testing.

Where a relevant dedicated EMC standard exists, it shall take precedence over all aspects of this product-family standard.

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 (PC);
- power supply units of 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.

This standard is applicable to

- equipment for use in industrial locations;
- equipment for use in laboratories or test and measurement areas with a controlled electromagnetic environment;
- test and measurement equipment which is portable and powered by battery or from the circuit being measured.

This equipment may also be used in areas other than laboratories.

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.

2.1 General standards

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60359, *Expression of the performance of electrical and electronic measuring equipment*

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

IEC 61557 (all parts), *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures*

IEEE 488.1:1987, *IEEE standard digital interface for programmable instrumentation*

IEEE 1284:1994, *IEEE standard signalling method for a bidirectional parallel peripheral interface for personal computers*

TIA/EIA-232-F:1997, *Interface between data terminal equipment and data circuit-terminating equipment employing serial binary data interchange*

2.2 Immunity standards

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test – Basic EMC Publication*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test – Basic EMC Publication*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:1996, *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 – Basic EMC Publication*

IEC 61000-4-11:1994, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

2.3 Emission standards

IEC 61000-3-2:2000, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3:1994, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A*

CISPR 11:1990, *Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment*

CISPR 14-1:2000, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1:1999, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

CISPR 16-2:1996, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2: Methods of measurement of disturbances and immunity*

CISPR 22:1997, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Definitions

For the purposes of this International Standard the definitions in IEC 60050(161) apply, together with the following.

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.

3.1

type test

test of one or more samples of equipment (or parts of equipment) made to a particular design, to show that the design and construction meet one or more requirements of this standard. Statistical sampling is not required for measurement, control, and laboratory equipment

NOTE This definition is an amplification of IEC 151-04-15 to cover both design and construction requirements.

3.2**port**

any particular interface of the specific device or system with the external electromagnetic environment within the scope of this standard (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.

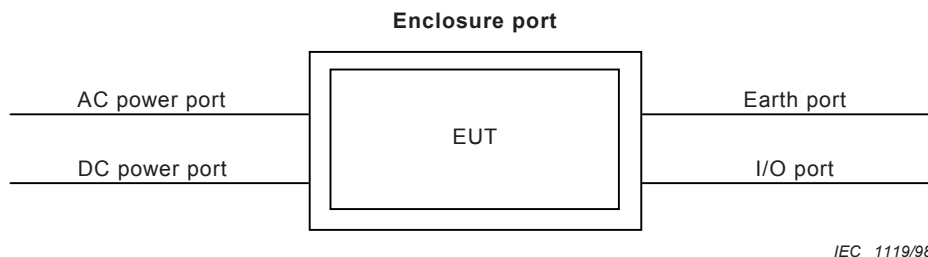


Figure 1 – Examples of ports

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 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. Equipment within the scope has to be 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

intrinsic error

error of a test or measuring instrument when used under reference conditions

[IEC 60359, definition 4.20, modified]

3.11

variation

difference between the indicated values for the same value of the measured quantity of an indicating or recording instrument when a single influence quantity assumes successively two different values

[IEC 60359, definition 4.21, modified]

3.12

Void

3.13

transducer with integrated signal conditioning

transducer in which all components for signal conditioning are integrated in the enclosure (see figure F.1).

3.14

transducer with remote signal conditioning

transducer whose components for signal conditioning are installed in separate enclosures (see figure F.2)

3.15

transmission link

connection between the individual components of a transducer with remote signal conditioning

3.16

nominal range

clearly specified value or upper limit of the measuring range

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, frequency meters shall fulfil the requirements under 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.

The acceptance criteria regarding the immunity requirements are structured taking into account the functionality and dependability aspects.

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. Emission limits for industrial locations are given in table 3. Emission limits for non-industrial locations are given in table 4.

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.