

INTERNATIONAL STANDARD



Electrical equipment for measurement, control and laboratory use –
EMC requirements –
Part 1: General requirements

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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	2
1 Scope.....	7
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions.....	9
3.2 Abbreviations.....	12
4 General	12
5 EMC test plan.....	13
5.1 General.....	13
5.2 Configuration of EUT during testing	13
5.2.1 General	13
5.2.2 Composition of EUT.....	13
5.2.3 Assembly of EUT.....	13
5.2.4 I/O PORTS	13
5.2.5 AUXILIARY EQUIPMENT	14
5.2.6 Cabling and earthing (grounding).....	14
5.3 Operation conditions of EUT during testing	14
5.3.1 Operation modes	14
5.3.2 Environmental conditions.....	14
5.3.3 EUT software during test	14
5.4 Specification of FUNCTIONAL PERFORMANCE	14
5.5 Test description	14
6 Immunity requirements	14
6.1 Conditions during the tests.....	14
6.2 Immunity test requirements.....	15
6.3 Random aspects.....	21
6.4 Performance criteria	22
6.4.1 General	22
6.4.2 Performance criterion A	22
6.4.3 Performance criterion B	22
6.4.4 Performance criterion C.....	22
7 Emission requirements	23
7.1 Conditions during measurements.....	23
7.2 Emission limits.....	23
8 Test results and test report.....	24
9 Instructions for use	24
Annex A (normative) Immunity test requirements for PORTABLE TEST AND MEASUREMENT EQUIPMENT powered by battery or from the circuit being measured.....	25
Annex B (informative) Guide for analysis and assessment for electromagnetic compatibility.....	27
B.1 General.....	27
B.2 Risk analysis.....	27
B.3 Risk assessment.....	27
Bibliography.....	29

Figure 1 – Examples of ports	11
Table 1 – Immunity test requirements for equipment intended to be used in a BASIC ELECTROMAGNETIC ENVIRONMENT	16
Table 2 – Immunity test requirements for equipment intended to be used in an INDUSTRIAL ELECTROMAGNETIC ENVIRONMENT	18
Table 3 – Immunity test requirements for equipment intended to be used in a CONTROLLED ELECTROMAGNETIC ENVIRONMENT	20
Table A.1 – Immunity test requirements for PORTABLE TEST AND MEASUREMENT EQUIPMENT	25

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General requirements

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61326-1 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition, published in 2012. This edition constitutes a technical revision.

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

- the immunity test levels and performance criteria have been reviewed;
- requirements for portable test and measurement equipment have been clarified and amended;
- the description of the electromagnetic environments has been improved.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65A/975/FDIS	65A/985/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.

In this document, the following print types are used:

- Terms used throughout this document which have been defined in Clause 3: SMALL CAPITALS

A list of all parts of the IEC 61326 series under the general title *Electrical equipment for measurement, control and laboratory use – EMC requirements*, 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

Instruments and equipment within the scope of this document may often be geographically widespread and hence 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 should function without undue degradation in an electromagnetic environment typical for the locations where it is intended to be operated. In this respect, the document specifies three different types of electromagnetic environment and the levels for immunity. More detailed information about issues related to electromagnetic environments are given in IEC TR 61000-2-5. 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 should 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 IEC 61326-2 (all parts). These should be read in conjunction with the IEC 61326-1 requirements.

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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 AC or 1 500 V DC or from the circuit being measured. Equipment intended for professional, industrial-process, industrial-manufacturing and educational use is covered by this part. It includes 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 ~~may~~ can be used in systems within the scope of this part of IEC 61326 without additional testing, if they are suitable for the intended electromagnetic environment.

It is generally considered that this product family standard takes precedence over the corresponding generic EMC standards.

The following equipment is covered by this document.

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.~~

- c) Electrical LABORATORY equipment, including In Vitro Diagnostic (IVD) medical equipment
This is equipment used to prepare or analyse materials, or measure, indicate or monitor physical quantities. This equipment might also be used in areas other than laboratories.
- d) Equipment a), b) or c) as above when being equipped with components having radio functionality, for example for wireless communication.

Equipment within the scope of this document might be operated in different electromagnetic environments; depending on the electromagnetic environment different emission and immunity test requirements are applicable.

This document considers three types of electromagnetic environments:

- BASIC ELECTROMAGNETIC ENVIRONMENT;
- INDUSTRIAL ELECTROMAGNETIC ENVIRONMENT;
- CONTROLLED ELECTROMAGNETIC ENVIRONMENT.

Corresponding immunity test requirements are described in Clause 6.

In terms of emission requirements, equipment shall be classified in Class A or Class B equipment, as per the requirements and procedure of CISPR 11. The corresponding emission requirements are described in Clause 7.

The specified emission and immunity requirements aim at achieving electromagnetic compatibility between equipment covered in this document and other equipment that might operate at locations with electromagnetic environments considered in this document. Guidance for an assessment concerning the risk for achieving EMC is given in Annex B.

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 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility*

IEC 60050-161:1990/AMD1:1997

IEC 60050-161:1990/AMD2:1998

IEC 60050-161:1990/AMD3:2014

IEC 60050-161:1990/AMD4:2014

IEC 60050-161:1990/AMD5:2015

IEC 60050-161:1990/AMD6:2016

IEC 60050-161:1990/AMD7:2017

IEC 60050-161:1990/AMD8:2018

(available at <<http://www.electropedia.org>>)

IEC 61000-3-2:2005/2018, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤16 A per phase)*

~~Amendment 1:2008~~

~~Amendment 2:2009~~

IEC 61000-3-3:2008/2013, *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 61000-3-3:2013/AMD1:2017

IEC 61000-3-11:~~2000~~2017, *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 ≤75 A and subject to conditional connection*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase*

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 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:~~2004~~2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*
~~Amendment 1:2010~~

IEC 61000-4-5:~~2005~~2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:~~2008~~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 61000-4-11:~~2004~~2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

CISPR 11:~~2009~~2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

~~Amendment 1:2010~~

CISPR 11:2015/AMD1:2016

CISPR 11:2015/AMD2:2019

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 and the following 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**basic electromagnetic environment**

environment existing at locations characterized by being supplied directly at low voltage from the public mains network

EXAMPLES

- residential properties, for example houses, apartments;
- retail outlets, for example shops, supermarkets;
- business premises, for example offices, banks;
- areas of public entertainment, for example cinemas, public bars, dance halls;
- outdoor locations, for example petrol stations, car parks, amusement and sports centres;
- light-industrial locations, for example workshops, laboratories, service centres.

3.1.2**class A equipment**

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

[SOURCE: derived from CISPR 11:20092015, 5.32]

3.1.3**class B equipment**

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

[SOURCE: derived from CISPR 11:20092015, 5.32]

3.1.4**controlled electromagnetic environment**

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

3.5**d.c. distribution network**

~~local d.c. electricity supply network in the infrastructure of a certain site or building intended for connection to the d.c. power port of any type of equipment~~

3.1.5**enclosure port**

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

3.1.6**functional performance**

operational performance characteristics ~~specified by the manufacturer of the equipment,~~ defining the ability of equipment to achieve the intended functions

Note 1 to entry: Characteristics can be based on the related technical documentation.

3.1.7**industrial electromagnetic environment**

environment existing at 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) equipment (for example, welding machines)

3.1.8 laboratory

test and measurement ~~area~~

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

3.1.9 long-distance lines

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

3.1.10 port

any particular interface of the specific ~~device~~ equipment or system with the external electromagnetic environment

EXAMPLE See Figure 1 for an example of Equipment Under Test (EUT).

Note 1 to entry: I/O PORTS are input, output or bi-directional, measurement, control, or data PORTS.

Note 2 to entry: Within this document, PORTS intended to be connected with earth potential for functional reasons (functional earth PORTS) are considered as I/O PORTS.

Note 3 to entry: Within this document, the protective earth PORT (if any) is considered as part of the POWER PORT.

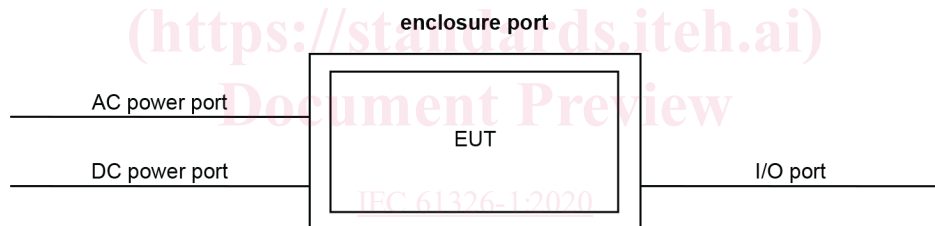


Figure 1 – Examples of ports

3.1.11 power port

port at which a conductor or cable, carrying the electrical input/output power needed for the operation (functioning), is connected to the equipment

3.12 portable (measuring) instrument

~~measuring instrument designed to be easily carried by hand and to be connected and disconnected by the user~~

[SOURCE: IEC 60050-300:2001, 312-02-18]

3.1.12 portable test and measurement equipment

test and/or measuring equipment designed to be easily carried by hand and to be connected and disconnected by the user

3.1.13 type test

conformity test made on one or more items representative of the production

[SOURCE: IEC 60050-151:2001, 151-16-16]

3.1.14**auxiliary equipment**

equipment necessary to provide the equipment under test (EUT) with the signals required for normal operation and equipment to verify the performance of the EUT

3.1.15**performance level**

specified operation of equipment under conditions of intended use

3.1.16**degradation (in performance)**

an undesired departure in the operational performance of any device, equipment or system from its intended performance

Note 1 to entry: The term "degradation" can apply to temporary or permanent failure.

[SOURCE: IEC 60050-161:1990, 161-01-19]

3.1.17**loss of performance**

operation of equipment outside a specified PERFORMANCE LEVEL

3.1.18**loss of function**

operation of equipment with one (or more) of the equipment's function unusable

3.2 Abbreviations

AE	AUXILIARY EQUIPMENT
EMC	electromagnetic compatibility
ESD	electrostatic discharge
EUT	equipment under test
I/O	input/output
RF	radio frequency
UPS	uninterruptable power supply

4 General

Equipment and systems within the scope of this document can be subjected to various kinds of electromagnetic disturbances, ~~conducted by~~ sources of which include power, measurement or control lines or those 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 operated.

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

For emissions, the objective of the requirements given in this document 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.

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