

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

Matériel électrique de mesure, de commande et de laboratoire – Exigences  
relatives à la CEM –  
Partie 1: Exigences générales



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2012 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### Useful links:

IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Liens utiles:

Recherche de publications CEI - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

**Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM –  
Partie 1: Exigences générales**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

**S**

ICS 17.220; 19.080; 25.040.40; 33.100

ISBN 978-2-83220-207-4

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	8
3 Terms and definitions .....	9
4 General .....	11
5 EMC test plan.....	12
5.1 General .....	12
5.2 Configuration of EUT during testing .....	12
5.2.1 General .....	12
5.2.2 Composition of EUT.....	12
5.2.3 Assembly of EUT .....	12
5.2.4 I/O ports .....	12
5.2.5 Auxiliary equipment .....	12
5.2.6 Cabling and earthing (grounding).....	12
5.3 Operation conditions of EUT during testing.....	13
5.3.1 Operation modes.....	13
5.3.2 Environmental conditions.....	13
5.3.3 EUT software during test.....	13
5.4 Specification of functional performance .....	13
5.5 Test description.....	13
6 Immunity requirements.....	13
6.1 Conditions during the tests .....	13
6.2 Immunity test requirements .....	13
6.3 Random aspects.....	16
6.4 Performance criteria .....	17
6.4.1 General .....	17
6.4.2 Performance criterion A.....	17
6.4.3 Performance criterion B .....	17
6.4.4 Performance criterion C.....	17
7 Emission requirements .....	17
7.1 Conditions during measurements .....	17
7.2 Emission limits .....	18
8 Test results and test report.....	18
9 Instructions for use .....	18
Annex A (normative) Immunity test requirements for portable test and measurement equipment powered by battery or from the circuit being measured .....	19
Bibliography.....	20
Figure 1 – Examples of ports .....	11
Table 1 – Immunity test requirements for equipment intended to be used in a basic electromagnetic environment .....	14
Table 2 – Immunity test requirements for equipment intended to be used in an industrial electromagnetic environment .....	15

Table 3 – Immunity test requirements for equipment intended to be used in a controlled electromagnetic environment ..... 16

Table A.1 – Immunity test requirements for portable test and measurement equipment..... 19

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[IEC 61326-1:2012](https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012)

<https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL EQUIPMENT FOR MEASUREMENT,  
CONTROL AND LABORATORY USE –  
EMC REQUIREMENTS –****Part 1: General requirements**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 second edition cancels and replaces the first edition, published in 2005. This edition constitutes a technical revision.

The significant technical changes with respect to the previous edition are as follows:

- 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 standard is based on the following documents:

FDIS	Report on voting
65A/628/FDIS	65A/637/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[IEC 61326-1:2012](#)

<https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012>

## INTRODUCTION

Instruments and equipment within the scope of this standard 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 standard 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 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 within IEC 61326-2 series. These should be read in conjunction with the IEC 61326-1 requirements.

[IEC 61326-1:2012](https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012)

<https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012>



# 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. 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 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 standard takes precedence over the corresponding generic EMC standards.

The following equipment is covered by 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.

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

This standard 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.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.com>)

IEC 61000-3-2:2005, *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, *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 61000-3-11:2000, *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 ≤ 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*  
Amendment 1:2007  
Amendment 2:2010

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

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

IEC 61000-4-6:2008, *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, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

CISPR 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*  
Amendment 1:2010

### 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.

#### 3.1

##### **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.

#### 3.2

##### **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

[SOURCE: derived from CISPR 11:2009, 5.3]

#### 3.3

##### **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

[SOURCE: derived from CISPR 11:2009, 5.3]

**3.4  
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

**3.6  
enclosure port**

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

**3.7  
functional performance**

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

**3.8  
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)

<https://standards.iteh.ai/catalog/standards/sist/e7a872d4-1cad-4251-8fa4-e3424455e7c8/iec-61326-1-2012>

**3.9  
laboratory  
test and measurement area**

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

**3.10  
long-distance lines**

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

**3.11  
port**

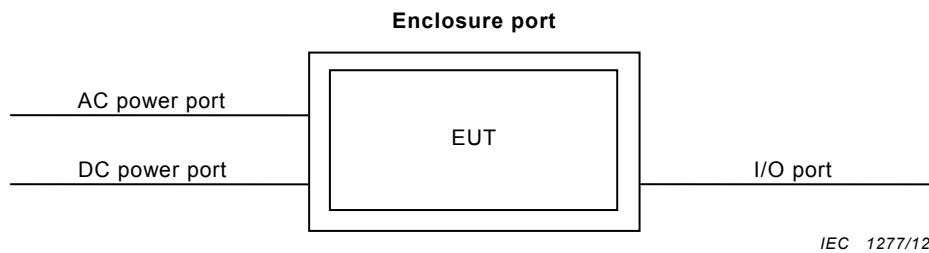
any particular interface of the specific device or system with the external electromagnetic environment

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**

### 3.12

#### **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]

### 3.13

#### **type test**

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

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

## 4 General

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

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 operated.

Equipment and individual devices of a system within the scope of this standard 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 standard 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.

NOTE 1 Higher immunity levels, different number of tests and different performance criteria than those specified can 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 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 3 The manufacturer may elect to perform all tests either on a single EUT or more than one. The testing sequence is optional.