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

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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

This standard cancels and replaces the first edition of IEC 61326-1 published in 1997, its amendment 1 (1998) and its amendment 2 (2000), and constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
65A/345/FDIS	65A/348/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 3.

The general indications given in IEC Guide 107 have been followed.

Annexes A, B, C, D, E and F form an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

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

The contents of the corrigendum of July 2002 have been included in this copy.

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 IEV 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.

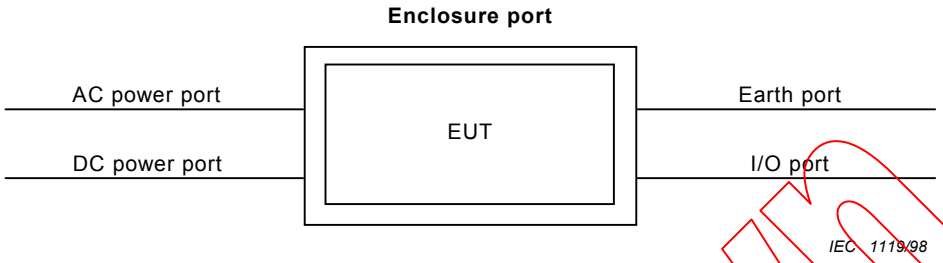

Figure 1 – Examples of ports

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