

INTERNATIONAL STANDARD



BASIC EMC PUBLICATION

**Electromagnetic compatibility (EMC) –
Part 6-4: Generic standards – Emission standard for industrial environments**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 6-4: Generic standards –
Emission standard for industrial environments**

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.
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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 61000-6-4 has been prepared by CISPR subcommittee H: Limits for the protection of radio services.

This third edition cancels and replaces the second edition published in 2006 and Amendment 1:2010. This edition constitutes a technical revision.

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

- a) possible future requirements on DC ports;
- b) possible future radiated polarity specific emission limits within a FAR;
- c) the definition of which average detector is used for emission measurements at frequencies above 1GHz and that results using a peak detector are acceptable for all measurements;
- d) the definition of different EUT test arrangements.

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

FDIS	Report on voting
CIS/H/339A/FDIS	CIS/H/350/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.

It forms Part 6-4 of the IEC 61000 series of standards. It has the status of a basic EMC publication in accordance with IEC Guide 107.

A list of all parts in the CISPR 61000 series, published under the general title *Electromagnetic compatibility*, can be found on the IEC website.

<https://standards.iteh.ai/catalog/standards/iec/32d913f3-8f13-4f51-b595-eb50eb817a9/iec-61000-6-4-2018>

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

IEC 61000 is published in separate parts according to the following structure:

Part 1: General

General considerations (introduction, fundamental principles)

Definitions, terminology

Part 2: Environment

Description of the environment

Classification of the environment

Compatibility levels

Part 3: Limits

Emission limits

Immunity limits (insofar as they do not fall under the responsibility of the product committees)

Part 4: Testing and measurement techniques

Measurement techniques

Testing techniques

Part 5: Installation and mitigation guidelines

Installation guidelines

Mitigation methods and devices

Part 6: Generic standards

[IEC 61000-6-4:2018](https://standards.iteh.ai/catalog/standards/iec/32d913f3-8f13-4f51-b595-eb50eb817a9/iec-61000-6-4-2018)

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Part 9: Miscellaneous

Each part is further subdivided into several parts published either as International Standards or technical reports/specifications, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 6-4: Generic standards – Emission standard for industrial environments

1 ~~Scope and object~~

~~This part of IEC 61000 for EMC emission requirements applies to electrical and electronic apparatus intended for use in industrial environments as described below.~~

~~Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified.~~

~~This generic EMC emission standard is applicable if no relevant dedicated product or product-family EMC emission standard exists.~~

~~This standard applies to a apparatus intended to be connected to a power network supplied from a high or medium voltage transformer dedicated to the supply of an installation feeding manufacturing or similar plant, and intended to operate in or in proximity to industrial locations, as described below. This standard applies also to apparatus, which is battery operated and intended to be used in industrial locations.~~

~~The environments encompassed by this standard are industrial, both indoor and outdoor.~~

~~Industrial locations are in addition characterised by the existence of one or more of the following examples:~~

- ~~— industrial, scientific and medical (ISM)¹⁾ apparatus;~~
- ~~— heavy inductive or capacitive loads that are frequently switched;~~
- ~~— high currents and associated magnetic fields.~~

~~The object of this standard is to define the emission test requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated disturbances.~~

~~The emission requirements have been selected so as to ensure that disturbances generated by apparatus operating normally in industrial locations do not exceed a level that could prevent other apparatus from operating as intended. Fault conditions of apparatus are not taken into account. Not all disturbance phenomena have been included for testing purposes in this standard but only those considered as relevant for the equipment covered by this standard. These requirements represent essential electromagnetic compatibility emission requirements.~~

This part of IEC 61000 for emission requirements applies to electrical and electronic equipment intended for use within the environment existing at industrial (see 3.1.12) locations.

This document does not apply to equipment that fall within the scope of IEC 61000-6-3.

The environments encompassed by this document cover both indoor and outdoor locations.

¹⁾ As defined in CISPR 11.

Emission requirements in the frequency range 9 kHz to 400 GHz are covered in this document and have been selected to provide an adequate level of protection of radio reception in the defined electromagnetic environment. No measurement needs to be performed at frequencies where no requirement is specified. These requirements are considered essential to provide an adequate level of protection to radio services.

Not all disturbance phenomena have been included for testing purposes but only those considered relevant for the equipment intended to operate within the environments included within this document.

Requirements are specified for each port considered.

This generic EMC emission standard is to be used where no applicable product or product-family EMC emission standard is available.

NOTE 1 Safety considerations are not covered by this document.

NOTE 2 In special cases, situations will arise where the levels specified in this document will not offer adequate protection; for example where a sensitive receiver is used in close proximity to an ~~apparatus~~ equipment. In these instances, special mitigation measures may have to be employed.

NOTE 3 Disturbances generated in fault conditions of equipment are not covered by this document.

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, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguide*

CISPR 11:2015, *Industrial, scientific and medical (ISM) radio-frequency equipment – ~~Electromagnetic~~ Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

CISPR 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2003 2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – ~~Ancillary equipment~~ Coupling devices for conducted disturbances & measurements*

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

CISPR 16-1-4:2010/AMD1:2012

CISPR 16-1-4:2010/AMD2:2017

CISPR 16-1-6:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-6: Radio disturbance and immunity measuring apparatus – EMC antenna calibration*

CISPR 16-1-6:2014/AMD1:2017

CISPR 16-2-1:~~2003~~ 2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-1:2014/AMD1:2017

CISPR 16-2-3:2016, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-4-2:2011, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – ~~Uncertainty in EMC measurements~~ Measurement instrumentation uncertainty*

CISPR 16-4-2:2011/AMD1:2014

~~CISPR 22, Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement~~

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

~~NOTE Definitions related to EMC and to relevant phenomena are given in IEC 60050-161 and in other IEC and CISPR publications.~~

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

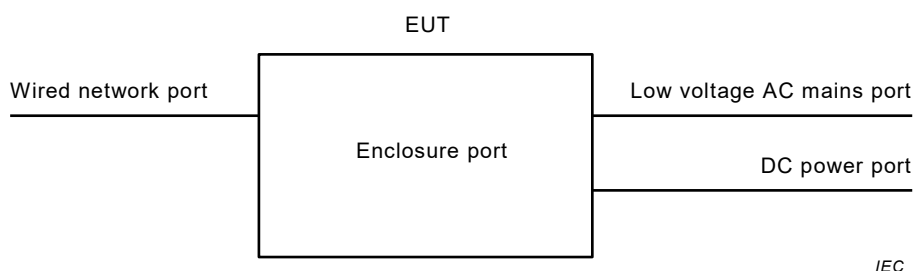
- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

port

~~particular~~ physical interface of the specified ~~apparatus~~ equipment with the external electromagnetic environment

Note 1 to entry: See Figure 1.



IEC

Figure 1 – Examples of ports

3.1.2 enclosure port

physical boundary of the ~~apparatus~~ equipment which electromagnetic fields may radiate through or impinge on

3.1.3 cable port

port at which a conductor or a cable is connected to the ~~apparatus~~ equipment

Note 1 to entry: Examples are signal, ~~wired network~~, control and power ports.

3.1.4 ~~telecommunications/~~ wired network port

point of connection for voice, data and signalling transfers intended to interconnect widely-dispersed systems ~~via such means as~~ by direct connection to a ~~single-user~~ or multi-user ~~telecommunications networks (e.g. public switched telecommunications networks (PSTN), integrated services digital networks (ISDN), x-type digital subscriber lines (xDSL), etc.), local area networks (e.g. Ethernet, Token Ring, etc.) and similar networks)~~

Note 1 to entry: Examples of these include CATV, PSTN, ISDN, xDSL, LAN and similar networks.

Note 2 to entry: These ports may support screened or unshielded cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.

Note 3 to entry: A port generally intended for interconnection of components of an ~~ITE~~ system under test (e.g. RS-232, RS-485, field buses in the scope of IEC 61158, IEEE Standard 1284 (parallel printer), Universal Serial Bus (USB), IEEE Standard 1394 ("Fire Wire"), etc.) and used in accordance with its functional specifications (e.g. for the maximum length of cable connected to it), is not considered to be a ~~telecommunications~~ ~~wired network~~ port.

Note 4 to entry: In previous editions of this document and many product standards, this port was defined as a telecommunications or network port.

3.1.5 power port

port ~~at which a conductor or cable carrying the primary electrical power needed for the operation (functioning) of an apparatus or associated apparatus is connected to the apparatus~~ for the connection of the equipment to the primary electrical power supply

3.1.6 public mains network

electricity lines to which all categories of consumers have access and which are operated by a supply or distribution undertaking for the purpose of supplying electrical energy

3.1.7 low voltage LV

~~low tension voltage having a value below a conventionally adopted limit~~

a set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted to be 1 000 V AC or 1 500 V DC

~~NOTE—For the distribution of AC electric power, the upper limit is generally accepted to be 1 000 V.~~

[SOURCE: IEC 60050-601:1985, 601-01-26, modified – addition of the words "or 1 500 V DC"]

3.1.8 DC distribution network

local supply network in the infrastructure of a site or building intended for use by one or more different types of equipment and providing power independent of the public mains network

Note 1 to entry: Connection to a remote local battery is not regarded as a DC distribution network, if such a link comprises only power supply for a single piece of equipment.

3.1.9

low voltage AC mains port

port used to connect to the low voltage AC mains supply network to power the equipment

Note 1 to entry: Equipment with a DC power port is considered low voltage AC mains powered if it is powered from an AC/DC power converter.

Note 2 to entry: The low voltage AC mains supply could be public or non-public.

3.1.10

highest internal frequency F_x

highest fundamental frequency generated or used within the EUT, or the highest frequency at which it operates

3.1.11

small equipment

equipment, either positioned on a table top or standing on the floor which, including its cables fits in a cylindrical test volume of 1,2 m in diameter and 1,5 m above the ground plane

Note 1 to entry: These dimensions are currently under discussion in CISPR.

3.1.12

industrial location

location characterized by a separate power network, supplied from a high- or medium-voltage transformer, dedicated for the supply of the installation

Note 1 to entry: Industrial locations can generally be described by the existence of an installation with one or more of the following characteristics:

- items of equipment installed and connected together and working simultaneously;
- significant amount of electrical power generated, transmitted and/or consumed;
- frequent switching of heavy inductive or capacitive loads;
- high currents and associated magnetic fields;
- presence of industrial, high power scientific and medical (ISM) equipment (for example, welding machines).

The electromagnetic environment at an industrial location is predominantly produced by the equipment and installation present at the location. There are types of industrial locations where some of the electromagnetic phenomena appear in a more severe degree than in other installations.

Example locations include metalworking, pulp and paper, chemical plants, car production, farm building, high-voltage areas of airports

Note 2 to entry: The connection between location and electromagnetic environment is given in 3.1.13.

3.1.13

electromagnetic environment

totality of electromagnetic phenomena existing at a given location

Note 1 to entry: In general, the electromagnetic environment is time-dependent and its description may need a statistical approach.

Note 2 to entry: It is very important not to confuse the electromagnetic environment and the location itself.

[SOURCE IEC 60050-161:1990, 161-01-01, modified – Note 2 to entry has been added.]

3.2 Abbreviated terms

AAN Asymmetric Artificial Network

AC Alternating Current

AMN Artificial Mains Network

CATV Cable TV network

DC Direct Current

DSL	Digital Subscriber Line
EUT	Equipment Under Test
FAR	Fully Anechoic Room
FSOATS	Free Space Open Area Test Site
ISDN	Integrated Services Digital Network
ITE	Information Technology Equipment
LAN	Local Area Network
MME	Multi Media Equipment
OATS	Open Area Test Site
PSTN	Public Switched Telephone Network
SAC	Semi Anechoic Chamber
TEM	Transverse Electromagnetic Mode
USB	Universal Serial Bus
xDSL	Generic term for all types of DSL technology

4 Conditions during testing

The EUT shall be tested in the operating mode producing the largest emission in the frequency band being ~~investigated, e.g. based on limited pre-tests and~~ measured, consistent with normal applications. The configuration of the test sample shall be varied to achieve maximum emission consistent with typical applications and installation practice. Pre-testing may be used to reduce test time.

If the ~~apparatus~~ EUT is part of a system, or can be connected to ~~auxiliary apparatus~~ associated equipment, the ~~apparatus~~ EUT shall be tested while connected to the minimum representative configuration of ~~auxiliary apparatus~~ associated equipment necessary to exercise the ports in a similar manner to that described in CISPR 11 ~~and~~ or CISPR ~~22~~ 32.

The EUT shall be arranged in accordance with the requirements of Table 1.

Table 1 – Test arrangements of EUT

Intended operational arrangement(s) of EUT	Test arrangement	Remarks
Table-top only	Table-top	
Floor-standing only	Floor-standing	
Can be floor-standing or table-top	Table-top	
Rack mounted	In a rack or table-top	
Other, for example wall mounted, ceiling mounted, handheld, body worn	Table-top	With normal orientation If the equipment is designed to be mounted on a ceiling, the downward-facing portion of the EUT may be oriented facing upward.
If a physical hazard would be caused by testing the device on a table-top, then it can be tested as floor standing and the test report shall document the decision and justification.		

In cases where a manufacturer's specification requires external filtering and/or shielding devices or measures that are clearly specified in the user's manual, the test requirements of this document shall be applied with the specified devices or measures in place.