



BSI Standards Publication

Electromagnetic compatibility (EMC)

Part 6-2: Generic standards - Immunity standard for industrial environments

National foreword

This British Standard is the UK implementation of EN IEC 61000-6-2:2019. It is identical to IEC 61000-6-2:2016. It supersedes BS EN 61000-6-2:2005, which will be withdrawn on 22 February 2022.

The UK participation in its preparation was entrusted to Technical Committee GEL/210, EMC - Policy committee.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2019

ISBN 978 0 539 04223 8

ICS 33.100.20

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2019.

Amendments/corrigenda issued since publication

Date	Text affected
31 March 2019	Date of withdrawal corrected in national foreword

EUROPEAN STANDARD

EN IEC 61000-6-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2019

ICS 33.100.20

Supersedes EN 61000-6-2:2005

English Version

Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments (IEC 61000-6-2:2016)

Compatibilité électromagnétique (CEM) - Partie 6-2:
Normes génériques - Norme d'immunité pour les
environnements industriels
(IEC 61000-6-2:2016)

Elektromagnetische Verträglichkeit - Teil 6-2:
Fachgrundnormen - Störfestigkeit für Industriebereiche
(IEC 61000-6-2:2016)

This European Standard was approved by CENELEC on 2016-09-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 77/521/FDIS, future edition 3 of IEC 61000-6-2, prepared by IEC/TC 77 "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61000-6-2:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-08-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-02-22

This document supersedes EN 61000-6-2:2005.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61000-6-2:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61000-4-12	NOTE	Harmonized as EN 61000-4-12
IEC 61000-4-13	NOTE	Harmonized as EN 61000-4-13
IEC 61000-4-16	NOTE	Harmonized as EN 61000-4-16
IEC 61000-4-18	NOTE	Harmonized as EN 61000-4-18
IEC 61000-4-19	NOTE	Harmonized as EN 61000-4-19
IEC 61000-4-29	NOTE	Harmonized as EN 61000-4-29
IEC 61000-4-31	NOTE	Harmonized as EN 61000-4-31
CISPR 11:2009	NOTE	Harmonized as EN 55011:2009 (modified).

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-161	-	International Electrotechnical Vocabulary.- Chapter 161: Electromagnetic compatibility		-
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
+ A1	2007		+ A1	2008
+ A2	2010		+ A2	2010
IEC 61000-4-4	2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-5	2014	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2014
IEC 61000-4-6	2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2014
IEC 61000-4-8	2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	2010
IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004

EN IEC 61000-6-2:2019 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-20	2010	Electromagnetic compatibility (EMC) - Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides	EN 61000-4-20	2010
IEC 61000-4-21	2011	Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods	EN 61000-4-21	2011
IEC 61000-4-22	2010	Electromagnetic compatibility (EMC) - Part 4-22: Testing and measurement techniques - Radiated emissions and immunity measurements in fully anechoic rooms (FARs)	EN 61000-4-22	2011
IEC 61000-4-34	2005	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase	EN 61000-4-34	2007
+ A1	2009		+ A1	2009

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 6-2: Generic standards –
Immunity 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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International Standard IEC 61000-6-2 has been prepared by IEC technical committee 77: Electromagnetic compatibility.

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

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

- a) improvement of the environmental description;
- b) extension of the frequency range for the radio-frequency electromagnetic field test according to IEC 61000-4-3;
- c) amended test levels at particular frequencies for the radio-frequency electromagnetic field test according to IEC 61000-4-3;

- d) change of the repetition frequency for the fast transients immunity test according to IEC 61000-4-4;
- e) introduction of requirements according to IEC 61000-4-34;
- f) revision of the test levels;
- g) consideration of measurement uncertainty;
- h) addition of Annex A.

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

FDIS	Report on voting
77/521/FDIS	77/523/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 in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, 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 website 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.

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 these limits 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

Part 9: Miscellaneous

Each part is further subdivided into several parts, published either as International Standards or as Technical Specifications or Technical Reports, 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).

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 6-2: Generic standards –

Immunity standard for industrial environments

1 Scope

This part of IEC 61000 for EMC immunity requirements applies to electrical and electronic equipment intended for use in industrial locations, as described below. Immunity requirements in the frequency range 0 Hz to 400 GHz are covered. No tests need to be performed at frequencies where no requirements are specified.

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

This standard applies to electrical and electronic equipment intended to be operated in industrial locations, as defined in 3.7, both indoor and outdoor.

This standard applies also to equipment intended to be directly connected to a DC distribution network or which is battery operated, and intended to be used in industrial locations.

This standard defines the immunity test requirements for equipment specified in the scope in relation to continuous and transient, conducted and radiated disturbances, including electrostatic discharges.

The immunity requirements have been selected to ensure an adequate level of immunity for equipment operating within industrial locations. The levels do not, however, cover extreme cases, which may occur at any location, but with an extremely low probability of occurrence. 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 test requirements represent essential electromagnetic compatibility immunity requirements. They are specified for each port considered.

NOTE 1 Information on other disturbance phenomena is given in IEC TR 61000-4-1.

NOTE 2 Safety considerations are not covered by this standard.

NOTE 3 In special cases, situations will arise where the level of disturbances may exceed the levels specified in this standard, for example where equipment is installed in proximity to industrial, scientific and medical equipment as defined in CISPR 11 or where a hand-held transmitter is used in close proximity to equipment. In these instances, special mitigation measures may have to be employed.

The industrial environment may be changed by special mitigation measures. Where such measures can be shown to produce an electromagnetic environment equivalent to the residential, commercial or light-industrial environment, then the generic standard for this environment, or the relevant product standard, may be applied.

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 60050-161, *International Electrotechnical Vocabulary – Part 161: Electromagnetic compatibility* (available at: www.electropedia.org)

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

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

IEC 61000-4-6:2013, *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, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

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

IEC 61000-4-21:2011, *Electromagnetic compatibility (EMC) – Part 4-21: Testing and measurement techniques – Reverberation chamber test methods*

IEC 61000-4-22:2010, *Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques – Radiated emissions and immunity measurements in fully anechoic rooms (FARs)*

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase*
IEC 61000-4-34:2005/AMD1:2009

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.

NOTE Additional definitions related to EMC and to relevant phenomena are given in other IEC and CISPR publications.

3.1 port

particular interface of the equipment which couples this equipment with or is influenced by the external electromagnetic environment

Note 1 to entry: Examples of ports of interest are shown in Figure 1. The enclosure port is the physical boundary of the equipment (e.g. enclosure). The enclosure port provides for radiated and electrostatic discharge (ESD) energy transfer, whereas the other ports provide for conducted energy transfer, either by direct injection or by induction.

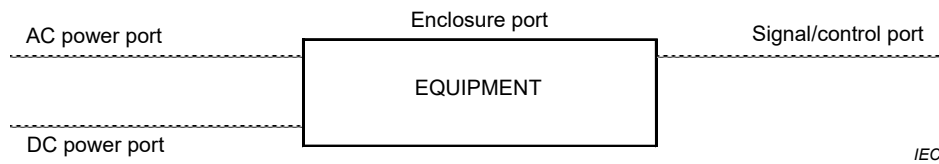


Figure 1 – Equipment ports

3.2

enclosure port

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

3.3

signal/control port

port at which a conductor or cable intended to carry signals is connected to the equipment

EXAMPLE Analog inputs, outputs and control lines; data buses; communication lines, etc.

3.4

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

3.5

long distance line

line connected to a signal/control port and which inside a building is longer than 30 m, or which leaves the building (including a line installed outdoors)

3.6

DC distribution network

local DC electricity supply network in the infrastructure of a certain site or building intended for flexible use by one or more different types of equipment and ensuring continuous power supply independently from the conditions 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.

3.7

industrial location

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

EXAMPLE Metalworking, pulp and paper, chemical plants, car production, farm building, high-voltage areas of airports.

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.

Note 2 to entry: The connection between location and electromagnetic environment is given in 3.8.

3.8

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.]

3.9

public mains network

electricity lines to which all categories of consumers have access and which are operated by an electrical power supply and/or distribution organization for the purpose of supplying electrical energy

4 Performance criteria

A functional description and a definition of specific performance criteria, during or as a consequence of immunity testing of equipment under test (EUT), shall be provided by the manufacturer and noted in the test report. They shall be consistent with one of the following general criteria for each test as specified in Table 1 to Table 4:

- a) Performance criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
- b) Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
- c) Performance criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.

5 Conditions during testing

The equipment under test (EUT) shall be tested in the expected most susceptible operating mode, for example identified by performing limited pre-tests. This mode shall be consistent with normal applications. The configuration of the test sample shall be varied to achieve maximum susceptibility consistent with typical applications and installation practice. The configuration and mode of operation during the tests shall be precisely noted in the test report.

If the equipment is part of a system, or can be connected to auxiliary equipment, the equipment shall be tested while connected to the minimum representative configuration of auxiliary equipment necessary to exercise the ports. Auxiliary equipment may be simulated.

In cases where a manufacturer's specification requires external protection devices or measures which are clearly specified in the user's manual, the test requirements of this standard shall be applied with the external protection devices or measures in place.

If the equipment has a large number of similar ports or ports with many similar connections, a sufficient number shall be selected to simulate actual operating conditions and to ensure that all the different types of termination are covered. Justification for the selection of the tested ports shall be included in the test report.

The tests shall be carried out at one single set of parameters within the operating ranges of temperature, humidity and atmospheric pressure specified for the product and at the rated supply voltage, unless otherwise indicated in the basic standard.

6 Product documentation

If the manufacturer is using his own specification for an acceptable level of EMC performance or degradation of EMC performance during or after the testing required by this standard, this fact shall be stated in the user documentation. This specification itself shall be made available upon request.

7 Applicability

The application of tests for evaluation of immunity depends on the particular equipment, its configuration, its ports, its technology and its operating conditions.

Tests shall be applied to the relevant ports of the equipment according to Table 1 to Table 4. Tests shall only be carried out where the relevant ports exist.

It may be determined from consideration of the electrical characteristics and usage of a particular equipment that some of the tests are inappropriate and, therefore, unnecessary. In such a case, the decision and justification not to test shall be recorded in the test report.

8 Measurement uncertainty

Where guidance for the assessment of the instrumentation uncertainty of an immunity test is specified in IEC TR 61000-1-6 or in the corresponding basic standard, this should be followed.

9 Immunity test requirements

The immunity test requirements for equipment covered by this standard are given on a port by port basis and listed in Table 1 to Table 4.

Tests shall be conducted in a well-defined and reproducible manner.

The tests shall be carried out individually as single tests. The tests may be performed in any order. Identical units may be used for testing in parallel, and this information shall be recorded in the test report.

The description of the test, relevant generator, appropriate methods and the set-up to be used are given in basic standards, which are referred to in Table 1 to Table 4.

The contents of these basic standards are not repeated here, however modifications or additional information needed for the practical application of the tests are given in this standard.

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Table 1 – Immunity requirements – Enclosure ports

Environmental phenomena	Test specifications	Units	Basic standards	Remarks	Performance criterion
1.1 Power-frequency magnetic field	50, 60 30	Hz A/m	IEC 61000-4-8	Applicable only to equipment containing devices susceptible to magnetic fields. The test shall be carried out at the frequencies appropriate to the power supply frequency. Equipment intended for use in areas supplied only at one of these frequencies need only be tested at that frequency.	A
1.2 Radio-frequency electromagnetic field. Amplitude modulated	80 to 1 000 10 ^d 80	MHz V/m % AM (1 kHz)	IEC 61000-4-3 ^{a, b, c}	The test level specified is the r.m.s. value of the unmodulated carrier.	A
1.3 Radio-frequency electromagnetic field. Amplitude modulated	1,4 to 6,0 3 ^d 80	GHz V/m % AM (1 kHz)	IEC 61000-4-3 ^{a, b, c}	The test level specified is the r.m.s. value of the unmodulated carrier.	A
1.4 Electrostatic discharge	Contact discharge	±4 (charge voltage)	IEC 61000-4-2	See the basic standard for applicability of contact and/or air discharge tests.	B
	Air discharge	±8 (charge voltage)			B

^a IEC 61000-4-20 may be used for small EUTs as defined in IEC 61000-4-20.

^b A fully anechoic room (FAR) as described in IEC 61000-4-22 may also be used as a test site for radio-frequency immunity test.

^c A reverberation chamber (RVC) as described in IEC 61000-4-21 may also be used. The forward power injected into a reverberation chamber P_{input} is given by the required test electric-field strength E_{test} as follows:

$$P_{\text{input}} = \left[\frac{E_{\text{test}}}{\sqrt{\langle E^2 \rangle_{240r9}} \times \sqrt{CLF(f)}} \right]^2$$

where $CLF(f)$ is the chamber loading factor (dimensionless) at frequency f , and $\sqrt{\langle E^2 \rangle_{240r9}}$ is the average of the normalized E -field (in (V/m)/W^{0.5}), obtained from the empty chamber validation (see Annexes B and D of IEC 61000-4-21:2011).

^d For information regarding situations with a high concentration of mobile transmitters, see for example IEC TR 61000-2-5:2011, 9.3.

Table 2 – Immunity requirements – Signal/control ports

Environmental phenomena	Test specifications	Units	Basic standards	Remarks	Performance criterion
2.1 Radio-frequency common mode	0,15 to 80 10 80	MHz V % AM (1 kHz)	IEC 61000-4-6	The test level specified is the r.m.s. value of the unmodulated carrier. a, b	A
2.2 Surges line-to-earth	1,2/50 (8/20) ±1	T_r/T_d μs kV (open circuit test voltage)	IEC 61000-4-5	c, d, e	B
2.3 Fast transients	±1 5/50 5 or 100	kV (open circuit test voltage) t_r/t_w ns Repetition frequency kHz	IEC 61000-4-4	Capacitive clamp used. b, f	B

a The test level can also be defined as the equivalent current into a 150 Ω load.

b Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.

c Applicable only to ports interfacing with long distance lines (see 3.5).

d Where normal functioning cannot be achieved because of the impact of the coupling/decoupling network (CDN) on the EUT, the test shall be done with the reduced functionality. A rationale shall be given in the test report for doing so. After the test and the removal of the CDN, the normal function shall not be affected.

e Signal ports directly connected to AC power network shall be treated as AC power ports.

f The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.

Table 3 – Immunity requirements – Input and output DC power ports

Environmental phenomena	Test specifications	Units	Basic standards	Remarks	Performance criterion
3.1 Radio-frequency common mode	0,15 to 80 10 80	MHz V % AM (1 kHz)	IEC 61000-4-6	The test level specified is the r.m.s. value of the unmodulated carrier. a, g	A
3.2 Surges line-to-earth line-to-line	1,2/50 (8/20) ±1 ±0,5	T_r/T_d µs kV (open circuit test voltage) kV (open circuit test voltage)	IEC 61000-4-5	b, e, f	B
3.3 Fast transients	±1 5/50 5 or 100	kV (open circuit test voltage) t_r/t_w ns Repetition frequency kHz	IEC 61000-4-4	c, d, h	B
DC ports which are not intended to be connected to a DC distribution network shall be tested as signal ports.					
a The test level can also be defined as the equivalent current into a 150 Ω load.					
b Applicable only to ports interfacing with long distance lines; not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the equipment for recharging.					
c Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the equipment for recharging.					
d Equipment with a DC power input port intended for use with a dedicated AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer (see the test level of Table 4). Where no adaptor is specified, the test shall be done on the DC power port using the test level of Table 4. Where an adaptor is specified, the test is applicable to DC power input ports only when intended to be connected permanently to cables longer than 3 m.					
e For supply voltages where no test equipment is commercially available (e.g. CDNs), this test is not required.					
f Equipment with a DC power input port intended for use with an AC-DC power adaptor shall be tested on the AC power input of the AC-DC power adaptor specified by the manufacturer or, where no adaptor is specified, the test shall be done on the DC power port using the test levels of this table.					
g Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.					
h The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.					

Table 4 – Immunity requirements – Input and output AC power ports

Environmental phenomena	Test specifications	Units	Basic standards	Remarks	Performance criterion
4.1 Radio-frequency common mode	0,15 to 80 10 80	MHz V % AM (1 kHz)	IEC 61000-4-6	The test level specified is the r.m.s. value of the unmodulated carrier. ^a	A
4.2 Voltage dips	0 1	% residual voltage cycle	IEC 61000-4-11 IEC 61000-4-34	Voltage shift at zero crossings. ^{b, e}	B ^c
	40 10/12 at 50/60 Hz	% residual voltage cycle			
4.3 Voltage interruptions	0 250/300 at 50/60 Hz	% residual voltage cycle	IEC 61000-4-11 IEC 61000-4-34	Voltage shift at zero crossings. ^{b, e}	C ^c
4.4 Surges line-to-earth line-to-line	1,2/50 (8/20) ±2 ±1	T_r/T_d μ s kV (open circuit test voltage) kV (open circuit test voltage)	IEC 61000-4-5	See Clause 5, paragraph 3 of this standard. ^d	B
	±2 5/50 5 or 100	kV (open circuit test voltage) t_r/t_w ns Repetition frequency kHz	IEC 61000-4-4	^f	B
^a The test level can also be defined as the equivalent current into a 150 Ω load.					
^b Applicable only to input ports.					
^c For electronic power converters, the operation of protective devices (e.g. undervoltage protection) and the performance criterion C are allowed.					
^d For supply voltages where no test equipment is commercially available (e.g. CDNs), this test is not required.					
^e The test shall be carried out at the frequencies appropriate to the power supply frequency. Equipment intended to be used in regions where only one of these frequencies is applied needs to be tested at this specific frequency only.					
^f The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.					

Annex A (informative)

Guidance for product committees

According to IEC Guide 107 generic immunity standards specify a set of requirements, test procedures and generalized performance criteria applicable to such products or systems intended to be operated at locations having the respective electromagnetic environment. The normative part of this document defines a minimum set of immunity requirements for equipment operating at locations in industrial environments.

However, there are electromagnetic phenomena which are expected to occur or increase in the future which might be relevant for some products or product families or interference cases. EMC committees should provide advice and support to the product committees in setting of corresponding immunity levels.

The purpose of Annex A is to indicate tests which might be relevant for such future situations or for some products or product families. The product committees are requested to consider those tests and test levels given in Table A.1. As these tests are not formally referenced in this standard they are not needed for demonstrating compliance with this standard.

Table A.1 – Immunity tests and test levels to be considered in future or for particular product families

Electromagnetic phenomenon	Basic standard	Test levels according to basic standard	Remarks
Ring wave	IEC 61000-4-12	3	Should be considered for equipment which is likely exposed to oscillatory transients, induced in low-voltage cables due to the switching of electrical networks and reactive loads, faults and insulation breakdown of power supply circuits or lightning.
Harmonics/ interharmonics/ signalling	IEC 61000-4-13	3	Should be considered for equipment which contains phase-controls or other zero-crossing detection techniques.
Common mode conducted disturbances below 150 kHz	IEC 61000-4-16	3	Should be considered for equipment which is likely exposed to disturbances (for example in case of long cabling) typically generated by <ul style="list-style-type: none"> the power distribution system, with its fundamental frequency, significant harmonics and interharmonics; power electronic equipment (e.g. power convertors), which may inject disturbances into the ground conductors and earthing system (through stray capacitance or filters), or generate disturbances in signal and control lines by induction.
Slow damped oscillatory wave	IEC 61000-4-18	3	Should be considered for equipment in industrial plants being exposed to repetitive oscillatory transients generated by switching transients and the injection of impulsive currents in power systems (networks and electrical equipment).
Differential mode conducted disturbances below 150 kHz	IEC 61000-4-19	4	Should be considered for equipment sensitive to AC power supply disturbances in the frequency range 2 kHz to 150 kHz, generated for example by power line communication (PLC) systems or power electronic equipment.
Voltage dips, short interruptions and voltage variations on DC input power ports	IEC 61000-4-29	2	Should be considered for equipment sensitive to these phenomena.
Broadband disturbances	IEC 61000-4-31 ^a		Should be considered for equipment sensitive to AC power supply disturbances in the frequency range above 150 kHz, generated for example by broadband communication systems operating on mains.
^a This basic standard is currently under development.			

Bibliography

IEC TR 61000-1-6, *Electromagnetic compatibility (EMC) – Part 1-6: General – Guide to the assessment of measurement uncertainty*

IEC TR 61000-2-5:2011, *Electromagnetic compatibility (EMC) – Part 2-5: Environment – Description and classification of electromagnetic environments*

IEC 61000-4-1, *Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of IEC 61000-4 series*

IEC 61000-4-12, *Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test*

IEC 61000-4-13, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-16, *Electromagnetic compatibility (EMC) – Part 4-16: Testing and measurement techniques – Test for immunity to conducted common mode disturbances in the frequency range 0 Hz to 150 kHz*

IEC 61000-4-18, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-4-19, *Electromagnetic compatibility (EMC) – Part 4-19: Testing and measurement techniques – Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at a.c. power ports*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

IEC 61000-4-31¹, *Electromagnetic compatibility (EMC) – Part 4-31: Testing and measurement techniques – AC mains ports broadband conducted disturbance immunity test*

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

IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*

¹ Under consideration.

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