BRITISH STANDARD

BS EN
61000-6-2:2001

Electromagnetic compatibility (EMC) —

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

The European Standard EN 61000-6-2:2001 has the status of a British Standard

ICS 33.100.20

National foreword

This British Standard is the official English language version of EN 61000-6-2:2001. It was derived by CENELEC from IEC 61000-6-2:1999. It supersedes BS EN 61000-6-2:1999 which will be withdrawn on 2004-07-01.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by common modification tags [D] [E]

The UK participation in its preparation was entrusted by Technical Committee GEL/210, EMC-Policy, to Subcommittee GEL/210/12, Basic and Generic standards, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 23 October 2001

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English version

Electromagnetic compatibility (EMC)
Part 6-2: Generic standards -
Immunity for industrial environments
(IEC 61000-6-2:1999, modified)

Compatibilité électromagnétique (CEM)
Partie 6-2: Normes génériques -
Immunité pour les environnements
industriels
(CEI 61000-6-2:1999, modifiée)

Elektromagnetische Verträglichkeit (EMV)
Teil 6-2: Fachgrundnormen -
Störfestigkeit - Industriebereich
(IEC 61000-6-2:1999, modifiziert)

This European Standard was approved by CENELEC on 2001-07-03. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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CENELEC

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

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Ref. No. EN 61000-6-2:2001 E

Foreword

The text of the International Standard IEC 61000-6-2:1999, prepared by IEC TC 77, Electromagnetic compatibility, together with the common modifications prepared by the Technical Committee CENELEC TC 210, Electromagnetic compatibility (EMC), was submitted to the formal vote and was approved by CENELEC as EN 61000-6-2 on 2001-07-03.

This European Standard supersedes EN 61000-6-2:1999.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-07-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61000-6-2:1999 was approved by CENELEC as a European Standard with agreed common modifications.

CONTENTS

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 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: 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

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

1 Scope and object

This part of IEC 61000 for EMC immunity requirements applies to electrical and electronic apparatus intended for use in industrial environments, as described below, for which no dedicated product or product-family immunity standard exists.

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.

Where a relevant dedicated product or product-family EMC immunity standard exists, it will take precedence over all aspects of this generic standard.

The environments encompassed by this standard are industrial, both indoor and outdoor. Apparatus covered by this standard is 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.

Apparatus intended to be used in industrial locations are characterized by the existence of one or more of the following:

- a power network exists powered by a high or medium voltage power transformer dedicated for the supply of an installation feeding manufacturing or similar plant;
- industrial, scientific and medical (ISM)[1)] apparatus;
- heavy inductive or capacitive loads are frequently switched;
- currents and associated magnetic fields are high.

The object of this standard is to define immunity test requirements for apparatus defined 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 apparatus at 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.

Test requirements are specified for each port considered.

NOTE 1 – Safety considerations are not covered by this standard.

NOTE 2 – In special cases, situations will arise where the level of disturbances may exceed the levels specified in this standard e.g. where an apparatus is installed in proximity to ISM equipment as defined in CISPR 11 or where

1) As defined in CISPR 11, ISM class A.

a hand-held transmitter is used in close proximity to an apparatus. In these instances, special mitigation measures may have to be employed.

NOTE 3 – 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, should be applied.

2 Normative references

NOTE

Normative references to international publications are listed in the annex ZA (normative).

3 Definitions

Definitions related to EMC and to relevant phenomena are given in IEC 60050(161) and in other IEC and CISPR publications.

The following particular definitions are used in this standard.

3.1
port
particular interface of the specified apparatus with the external electromagnetic environment (see figure 1)

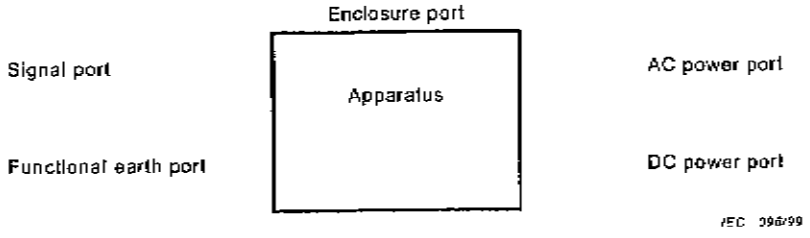

Figure 1 – Examples of ports

3.2
enclosure port
physical boundary of the apparatus which electromagnetic fields may radiate through or impinge on

3.3
cable port
port at which a conductor or a cable is connected to the apparatus. Examples are signal ports used for the transfer of data

3.4
functional earth port
cable port other than signal, control or power port, intended for connection to earth for purposes other than electrical safety

3.5
signal port
port at which a conductor or cable carrying information for transferring data is connected to the apparatus. Examples are data buses, communication networks, control networks

3.6
power port
point 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

4 Performance criteria

The variety and the diversity of the apparatus within the scope of this standard makes it difficult to define precise criteria for the evaluation of the immunity test results.

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

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria.

4.1 Performance criterion A

The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. 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 from what the user may reasonably expect from the apparatus if used as intended.

4.2 Performance criterion B

The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. 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 from what the user may reasonably expect from the apparatus if used as intended.

4.3 Performance criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

5 Conditions during testing

The equipment under test (EUT) shall be tested in the most susceptible operating mode consistent with normal applications. The configuration of the test sample shall be varied to achieve maximum susceptibility consistant with typical applications and installation practice.

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

In cases where a manufacturer's installation instructions require the use of external protection devices or measures which are clearly specified in the user's manual, the tests shall be performed with the external protection devices or measures in place.

The configuration and mode of operation during the tests shall be precisely noted in the test report. It is not always possible to test every function of the apparatus; in such cases the most critical mode(s) of operation shall be selected.

If the apparatus 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.

The tests shall be carried out within the operating ranges of temperature, humidity and 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 shall be stated in the product documentation available to the user.

7 Applicability

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

Tests shall be applied to the relevant ports of the apparatus according to tables 1 to 5. 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 apparatus that some of the tests are inappropriate and, therefore, unnecessary. In such a case, it is required that the decision and justification not to test be recorded in the test report.

8 Immunity test requirements

The immunity test requirements for apparatus covered by this standard are given on a port by port basis.

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

The tests shall be carried out individually as single tests in sequence. The sequence of testing is optional.

The description of the test, the test generator, the test methods and the test set-up to be used are given in the basic standards which are referred to in the following tables.

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.

Table 1 – Immunity – 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	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 those frequencies need only be tested at that frequency See note 1	A Note 2
1.2	Radio-frequency amplitude modulated electromagnetic field		80 to 1 000 10 80	MHz V/m % AM (1 kHz)	IEC 61000-4-3	The test level specified is the r.m.s. value of the unmodulated carrier See notes 3 D E	A
1.3	Electrostatic discharge	Contact discharge	±4 (charge voltage)	kV	IEC 61000-4-2	See basic standard for applicability of contact and/or air discharge tests	B
		Air discharge	±8 (charge voltage)	kV			B

NOTE 1 – Applicable only to apparatus containing devices susceptible to magnetic fields.

NOTE 2 – For CRTs, the acceptable jitter depends upon the character size and is calculated for a test level of 1 A/m as follows:

$$J = \frac{(3C + 1)}{40}$$

where jitter J and character size C are in millimetres.

As jitter is linearly proportional to the magnetic field strength, tests can be carried out at other test levels extrapolating the maximum jitter level appropriately.

NOTE 3 – Except for the ITU broadcast frequency bands 87 MHz to 108 MHz, 174 MHz to 230 MHz, and 470 MHz to 790 MHz, where the level shall be 3 V/m.

D E

Table 2 – Immunity – Signal 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	See notes 1, 2, 3 Ⓒ Ⓒ The test level specified is the r.m.s. value of the unmodulated carrier	A
2.2	Fast transients	±1 5/50 5	kV (charge voltage) Tr/Th ns Repetition frequency kHz	IEC 61000-4-4	See note 3 Capacitive clamp used	B
2.3	Surges line-to-earth	1,2/50 (8/20) ±1	Tr/Th µs kV (open circuit voltage)	IEC 61000-4-5	Ⓓ See notes 4 and 5 Ⓓ	B

NOTE 1 – The test level can also be defined as the equivalent current into a 150 Ω load.

NOTE 2 – Except for the ITU broadcast frequency band 47 MHz to 68 MHz, where the level shall be 3 V.

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

NOTE 4 – Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 30 m.

Ⓓ NOTE 5 – Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, this test is not required. Ⓒ

Table 3 – Immunity – Input and output d.c. 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	See notes 1, 2 Ⓒ Ⓒ The test level specified is the r.m.s. value of the unmodulated carrier	A
3.2	Fast transients	±2 5/50 5	kV (charge voltage) Tr/Th ns Repetition frequency kHz	IEC 61000-4-4	See note 3	B
3.3	Surges line-to-earth line-to-line	1,2/50 (8/20) ±0,5 ±0,5	Tr/Th µs kV (open circuit voltage) kV (open circuit voltage)	IEC 61000-4-5	See note 3	B

NOTE 1 – The test level can also be defined as the equivalent current into a 150 Ω load.

NOTE 2 – Except for the ITU broadcast frequency band 47 MHz to 68 MHz, where the level shall be 3 V.

NOTE 3 – Not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c.-d.c. power adaptor shall be tested on the a.c. power input of the a.c.-d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c.-d.c. power adaptor. The test is not applicable to d.c. power input ports intended to be permanently connected to cables less than 10 m in length.

Ⓒ Ⓒ

Table 4 – Immunity – Input and output a.c. 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	See notes 1, 2 Ⓒ Ⓓ The test level specified is the r.m.s. value of the unmodulated carrier	A
4.2	Fast transients	±2 5/50 5		kV (charge voltage) Tr/Th ns Repetition frequency kHz	IEC 61000-4-4		B
4.3	Surges line-to-earth line-to-line	1,2/50 (8/20) ±2 ±1		Tr/Th µs kV (open circuit voltage) kV (open circuit voltage)	IEC 61000-4-5	See clause 5, paragraph 3	B
4.4	Voltage dips	30 0,5		% reduction periods	IEC 61000-4-11	Voltage shift at zero crossing See note 3	B for 0,5 period
		60 5	60 50	% reduction periods			C for 5 and 50 periods See note 4
4.5	Voltage interruptions	>95 250		% reduction periods	IEC 61000-4-11	See note 3	C See note 4

NOTE 1 – The test level can also be defined as the equivalent current into a 150 Ω load.

NOTE 2 – Except for the ITU broadcast frequency band 47 MHz to 68 MHz, where the level shall be 3 V.

NOTE 3 – Applicable only to input ports. Temporary changes in luminance are allowed.

NOTE 4 – For electronic power converters, the operation of protective devices is allowed.

Ⓒ Ⓓ

Table 5 – Immunity – Functional earth ports

	Environmental phenomena	Test specifications	Units	Basic standards	Remarks	Performance criterion
5.1	Radio-frequency common mode	0,15 to 80 10 80	MHz V % AM (1 kHz)	IEC 61000-4-6	See notes 1, 2 Ⓔ Ⓒ The test level specified is the r.m.s. value of the unmodulated carrier	A
5.2	Fast transients	±1 5/50 5	kV (charge voltage) Tr/Th ns Repetition frequency kHz	IEC 61000-4-4	Ⓔ See note 3 Ⓒ Capacitive clamp used	B

NOTE 1 – The test level can be defined as the equivalent current into a 150 Ω load.

NOTE 2 – Except for the ITU broadcast frequency band 47 MHz to 68 MHz, where the level shall be 3 V.

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

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

When there is an undated reference to a generic, product or product-family standard which has been listed in the OJEC, then either the latest edition or (if the date of cessation of presumption of conformity associated with the latest edition has not expired) the superseded edition may be applied. After the date of cessation of presumption of conformity, the latest edition shall be applied.

When there is an undated reference to a basic standard, then either the latest edition or (if the date of withdrawal of conflicting standards associated with the latest edition has not expired) the superseded edition may be applied. After the date of withdrawal, the latest edition shall be applied.

Publication	Title	EN/HD
IEC 60050-161	International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility	-
IEC 61000-4-2	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2
IEC 61000-4-3	Electromagnetic compatibility (EMC) Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3
IEC 61000-4-4	Electromagnetic compatibility (EMC) Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	EN 61000-4-4
IEC 61000-4-5	Electromagnetic compatibility (EMC) Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5
IEC 61000-4-6	Electromagnetic compatibility (EMC) Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6
IEC 61000-4-8	Electromagnetic compatibility (EMC) Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8
IEC 61000-4-11	Electromagnetic compatibility (EMC) Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11
CISPR 11	Industrial, scientific and medical (ISM) radio-frequency equipment – Radio disturbance characteristics – Limits and methods of measurement	EN 55011
CISPR 22	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement	EN 55022

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