

Electromagnetic compatibility (EMC) —

Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test

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Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

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National foreword

This British Standard has been prepared under the direction of the General Electrotechnical Standards Policy Committee and is the English language version of EN 61000-4-8:1993 *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test* including amendment A1:2001, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 61000-4-8 including amendment 1:2000 published by the International Electrotechnical Commission (IEC).

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

IEC 61000 has been designated a Basic EMC Publication for use in the preparation of dedicated product, product family and generic EMC standards.

IEC 61000 will be published in separate Parts in accordance with 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 (in so far 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 9: *Miscellaneous*.

Each Part will be subdivided into Sections each of which may be published as either a standard or a Technical Report.

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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Summary of pages

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Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test

(including amendment A1:2001)
(IEC 61000-4-8:1993 + A1:2000)

Compatibilité électromagnétique (CEM) —
Partie 4-8: Techniques d'essai et de mesure —
Essai d'immunité au champ magnétique à la
fréquence du réseau
(inclut l'amendement A1:2001)
(CEI 61000-4-8:1993 + A1:2000)

Elektromagnetische Verträglichkeit (EMV) —
Teil 4-8: Prüf- und Meßverfahren —
Prüfung der Störfestigkeit gegen Magnetfelder
mit energietechnischen Frequenzen
(enthält Änderung A1:2001)
(IEC 61000-4-8:1993 + A1:2000)

This European Standard was approved by CENELEC on 1992-06-16. Amendment A1 was approved by CENELEC on 2000-12-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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Foreword

The text of document 77B(CO)7, as prepared by Sub-Committee 77B: High frequency phenomena, of IEC Technical Committee 77: Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote in September 1991.

The reference document was approved by CENELEC as EN 61000-4-8 on 16 June 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-06-01
- latest date of withdrawal of conflicting national standards (dow) 1994-06-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information. In this standard, Annex A, Annex B and Annex ZA are normative and Annex C and Annex D are informative.

Foreword to amendment A1

The text of documents 77B/291 + 293/FDIS, future amendment 1 to IEC 61000-4-8:1993, prepared by SC 77B, High-frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61000-4-8:1993 on 2000-12-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-09-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2003-12-01

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1 Scope

This international standard relates to the immunity requirements of equipment, only under operational conditions, to magnetic disturbances at power frequency related to:

- residential and commercial locations;
- industrial installations and power plants;
- medium voltage and high voltage substations.

The applicability of this standard to equipment installed in different locations is determined by the presence of the phenomenon, as specified in clause 3.

This standard does not consider disturbances due to capacitive or inductive coupling in cables or other parts of the field installation.

Other IEC standards dealing with conducted disturbances cover these aspects.

The object of this Standard is to establish a common and reproducible basis for evaluating the performance of electrical and electronic equipment for household, commercial and industrial applications when subjected to magnetic fields at power frequency (*continuous and short duration field*).

The standard defines:

- recommended test levels;
- test equipment;
- test set-up;
- test procedure.

Other kinds of magnetic fields would be object of standardization:

- fields at other power frequencies (16 2/3 – 20 or 30 – 400 Hz);
- fields of harmonic currents (100 Hz to 2 000 Hz);
- fields of higher frequencies (up to 150 kHz, e.g. for mains signalling systems);
- D.C. fields.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 1000-4. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 1000-4 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 68-1:1988, *Environmental testing — Part 1: General and guidance*.

3 General

The magnetic fields to which equipment is subjected may influence the reliable operation of equipment and systems.

The following tests are intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields related to the specific location and installation condition of the equipment (e.g. proximity of equipment to the disturbance source). The power frequency magnetic field is generated by power frequency current in conductors or, more seldom, from other devices (e.g. leakage of transformers) in the proximity of equipment.

As for the influence of nearby conductors, one should differentiate between:

- the current under normal operating conditions, which produces a steady magnetic field, with a comparatively small magnitude;
- the current under fault conditions which can produce comparatively high magnetic fields but of short duration, until the protection devices operate (a few milliseconds with fuses, a few seconds for protection relays).

The test with a steady magnetic field may apply to all types of equipment intended for public or industrial low voltage distribution networks or for electrical plants.

The test with a short duration magnetic field related to fault conditions, requires test levels that differ from those for steady state conditions; the highest values apply mainly to equipment to be installed in exposed places of electrical plants.

The test field waveform is that of power frequency.

In many cases (household areas, substations and power plant under normal conditions), the magnetic field produced by harmonics is negligible. However, in very special cases like heavy industrial areas (large power convertors, etc.) they occur, and will be considered in a future revision of this standard.

4 Definitions

The following definitions and terms are used in this standard and apply to the restricted field of magnetic disturbances; not all of them are included in IEC(50)161.

4.1

EUT

equipment under test

4.2

induction coil

conductor loop of defined shape and dimensions, in which flows a current, generating a magnetic field of defined constancy in its plane and in the enclosed volume

4.3

induction coil factor

ratio between the magnetic field strength generated by an induction coil of given dimensions and the corresponding current value; the field is that measured at the centre of the coil plane, without the EUT

4.4

immersion method

method of application of the magnetic field to the EUT, which is placed in the centre of an induction coil (Figure 1)

4.5

proximity method

method of application of the magnetic field to the EUT, where a small induction coil is moved along the side of the EUT in order to detect particularly sensitive areas

4.6

ground (reference) plane (GRP)

a flat conductive surface whose potential is used as a common reference for the magnetic field generator and the auxiliary equipment (the ground plane can be used to close the loop of the induction coil, as in Figure 4
(IEV 161-04-36, modified)

4.7

decoupling network, back filter

electrical circuit intended to avoid reciprocal influence with other equipment not submitted to the magnetic field test

5 Test levels

The preferential range of test levels, respectively for continuous and short duration application of the magnetic field, applicable to distribution networks at 50 Hz and 60 Hz, is given in Table 1 and Table 2.

The magnetic field strength is expressed in A/m; 1 A/m corresponds to a free space induction of 1,26 μ T.