

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**

ICS 33.100.20

National foreword

This British Standard is the UK implementation of EN 61000-4-16:1998+A2:2011. It is identical to IEC 61000-4-16:1998, incorporating amendments 1:2001 and 2:2009. It supersedes BS EN 61000-4:16:1998, which will be withdrawn on 1 January 2014.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. 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**.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, Electromagnetic compatibility, to Subcommittee GEL/210/12, EMC basic, generic and low frequency phenomena Standardization.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 May 1998

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English version

**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 61000-4-16:1998)
(includes amendment A1:2004)

Compatibilité électromagnétique (CEM)
Partie 4-16: Techniques d'essai et de mesure —
Essai d'immunité aux perturbations conduites
en mode commun dans la gamme de fréquences
de 0 Hz à 150 kHz
inclut l'amendement A1:2004
(CEI 61000-4-16:1998)

Elektromagnetische Verträglichkeit (EMV)
Teil 4-16: Prüf- und Meßverfahren —
Prüfung der Störfestigkeit gegen
leitungsgeführte, asymmetrische Störgrößen
im Frequenzbereich von 0 Hz bis 150 kHz
enthält Änderung A1:2004
(IEC 61000-4-16:1998)

This European Standard was approved by CENELEC on 1998-01-01, amendment A1 was approved by CENELEC on 2004-05-01. 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 77A/201/FDIS, future edition 1 of IEC 61000-4-16, prepared by SC 77A, Low-frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61000-4-16 on 1998-01-01.

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) 1998-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-10-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annexes A, B and C are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61000-4-16:1998 was approved by CENELEC as a European Standard without any modification.

In the official version, for Annex C, Bibliography, the following note has to be added for the standard indicated:

IEC 61000-4-6 NOTE: Harmonized as EN 61000-4-6:1996 (not modified)

Foreword to Amendment A1

The text of amendment 1:2001 to the International Standard IEC 61000-4-16:1998, prepared by SC 77B, High frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A1 to EN 61000-4-16:1998 on 2004-05-01 without any modification.

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- latest date by which the national standards conflicting with the amendment have to be withdrawn

(dow) 2007-05-01

Endorsement notice

The text of the amendment 1:2001 to the International Standard IEC 61000-4-16:1998 was approved by CENELEC as an amendment to the European Standard without any modification.

Foreword to Amendment A2

The text of document 77A/691/FDIS, future amendment 2 to IEC 61000-4-16:1998, prepared by SC 77A, Low frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 61000-4-16:1998 on 2011-01-01.

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

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) 2011-10-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2014-01-01

Endorsement notice

The text of amendment 2:2009 to the International Standard IEC 61000-4-16:1998 was approved by CENELEC as an amendment to the European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

4 IEC 61000-4-6 NOTE Harmonized as EN 61000-4-6.

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INTRODUCTION

This standard is part of the IEC 61000 series, 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 (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 6: Generic standards

Part 9: Miscellaneous

[A₂] 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). **[A₂]**

This part is an international standard which gives immunity requirements and test procedures related to conducted, common mode disturbances in the range d.c. to 150 kHz.

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

1 Scope

This part of IEC 61000 relates to the immunity requirements and test methods for electrical and electronic equipment to conducted, common mode disturbances in the range d.c. to 150 kHz.

The object of this standard is to establish a common and reproducible basis for testing electrical and electronic equipment with the application of common mode disturbances to power supply, control, signal and communication ports.

This standard defines

- test voltage and current waveform;
- range of test levels;
- test equipment;
- test set-up;
- test procedures.

For some types of ports, for example ports intended to be used with highly balanced lines, additional test provisions may be established by product committee specifications.

The test is intended to demonstrate the immunity of electrical and electronic equipment when subjected to conducted, common mode disturbances such as those originating from power line currents and return leakage currents in the earthing/grounding system.

The disturbances produced by 400 Hz mains systems are not included in the scope of this standard.

Actual interference due to these disturbance phenomena is relatively rare, except in industrial plants. Product Committees should therefore consider whether there is a justification for applying this standard in their Product/Product Family standards (see also clause 3).

This test is not relevant for equipment ports intended to be connected to short cables, having a length less than 20 m or less.

The immunity to harmonics and interharmonics, including mains signalling, on a.c. power ports (in differential mode) is not included in the scope of this standard and is covered by IEC 61000-4-13.

The immunity to conducted disturbances generated by intentional radio-frequency transmitters is not included in the scope of this standard and is covered by IEC 61000-4-6.

 Text deleted 

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

 IEC 60050(161), *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60068-1, *Environmental testing – Part 1: General and guidance* 

3 General

The conducted, common mode disturbances in the frequency range d.c. to 150 kHz may influence the reliable operation of equipment and systems installed in residential areas, industrial areas and electrical plants.

Only those ports of an EUT which are likely to be subjected to the disturbances dealt with by this standard shall be considered for the application of its requirements.

The disturbances are typically generated by

- 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.

At the mains frequency, and harmonics of the mains frequency, the disturbances are usually generated by the power distribution system (fault and leakage currents in the ground and earthing systems).

At frequencies above the range of harmonics of the mains frequency (up to 150 kHz) the disturbances are usually generated by power electronic equipment, which is often found in industrial and electrical plants.

The coupling of the source of disturbances with the power supply, signal, control and communication cables, transfer these disturbances to the ports of the equipment under test.

Because the coupling mechanisms defined above cannot be completely eliminated, it is necessary for equipment to have adequate immunity to the disturbances.

Depending on the type of installation, the disturbances may be classified as follows:

- a) voltage/current at power frequency: d.c., 16^{2/3} Hz, 50 Hz and 60 Hz;
- b) voltage/current in the frequency range 15 Hz-150 kHz (including the harmonics of the mains frequency).

This standard defines the test procedures for both the categories of disturbance defined above. The applicability of the tests should be defined in the product standard.

Annex A contains more information on the phenomena.

4 Definitions

For the purpose of this part of IEC 61000, the following definitions are used and apply to the restricted field of conducted, common mode disturbances in the range d.c. to 150 kHz (not all of these definitions are included in IEC 60050-161).

4.1

EUT

equipment under test

4.2

auxiliary equipment (AE)

equipment that is necessary for setting up all functions and assessing the correct performance (operation) of the EUT during the test

4.3

port

particular interface of the specified equipment with the external electromagnetic environment (see figure 1)

4.4

coupling

interaction between circuits, transferring energy from one circuit to another

4.5

coupling network

electrical circuit for the purpose of transferring energy from one circuit to another

4.6

decoupling network

electrical circuit for the purpose of preventing test voltage applied to the equipment under test from affecting other devices, equipment or systems which are not under test

4.7

immunity (to a disturbance)

ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance [IEV 161-01-20]