

Electromagnetic compatibility (EMC) —

**Part 4-27: Testing and measurement
techniques — Unbalance, immunity test
for equipment with input current not
exceeding 16 A per phase**

ICS 33.100.20

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National foreword

This British Standard is the UK implementation of EN 61000-4-27:2000+A1:2009. It is identical with IEC 61000-4-27:2000, incorporating amendment 1:2009. It supersedes BS EN 61000-4-27:2001 which will be withdrawn on 1 March 2012.

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, EMC – Policy committee, 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.

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Date	Comments
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**Electromagnetic compatibility (EMC)
Part 4-27: Testing and measurement techniques -
Unbalance, immunity test for equipment with
input current not exceeding 16 A per phase
(IEC 61000-4-27:2000)**

Compatibilité électromagnétique (CEM)
Partie 4-27: Techniques d'essai et
de mesure -
Essai d'immunité aux déséquilibres
(CEI 61000-4-27:2000)

Elektromagnetische Verträglichkeit (EMV)
Teil 4-27: Prüf- und Messverfahren -
Prüfung der Störfestigkeit gegen
Unsymmetrie (der Versorgungsspannung)
(IEC 61000-4-27:2000)

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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, Czech Republic, 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 77A/308/FDIS, future edition 1 of IEC 61000-4-27, 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 61000-4-27 on 2000-09-01.

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) 2001-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-09-01

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, C and D are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61000-4-27:2000 was approved by CENELEC as a European Standard without any modification.

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

IEC 60898 NOTE: Harmonized as EN 60898:1991 (modified).

Foreword to amendment A1

The text of document 77A/672/FDIS, future amendment 1 to IEC 61000-4-27:2000, 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 A1 to EN 61000-4-27:2000 on 2009-03-01.

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- latest date by which the amendment has to be
implemented at national level by publication of
an identical national standard or by endorsement (dop) 2009-12-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2012-03-01

Endorsement notice

The text of amendment 1:2009 to the International Standard IEC 61000-4-27:2000 was approved by CENELEC as an amendment to the European Standard without any modification.

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INTRODUCTION

This standard is part of 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 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 completed by a second number identifying the subdivision (example: 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-27: Testing and measurement techniques – Unbalance, immunity test for equipment with input current not exceeding 16 A per phase

1 Scope and object

This part of IEC 61000 is a basic EMC (electromagnetic compatibility) publication. It considers immunity tests for electric and/or electronic equipment (apparatus and system) in its electromagnetic environment. Only conducted phenomena are considered, including immunity tests for equipment connected to public and industrial networks.

The object of this standard is to establish a reference for evaluating the immunity of electrical and electronic equipment when subjected to unbalanced power supply voltage.

This standard applies to 50 Hz/60 Hz three-phase powered electrical and/or electronic equipment with rated line current up to 16 A per phase.

This standard does not apply to equipment with three-phase plus neutral connection if that equipment operates as a group of single-phase loads connected between phase and neutral.

This standard does not apply to electrical and/or electronic equipment connected to a.c. 400 Hz distribution networks.

This standard does not include tests for the zero-sequence unbalance factor.

The immunity test levels required for a specific electromagnetic environment together with performance criteria are indicated in the product, product family or generic standards as applicable. This immunity test should be included in product, product family or generic standards when equipment is likely to show reduced performance or function when exposed to a supply voltage with voltage unbalance.

The verification of the reliability of electrical components (capacitors, motors, etc.) and long-term effects (greater than a few minutes) is not considered in this standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61000. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61000 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

IEC 61000-2-4, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 4: Compatibility levels in industrial plants for low-frequency conducted disturbances*

3 Definitions

For the purposes of this part of IEC 61000, the following definitions apply.

3.1

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]

3.2

voltage unbalance

in a polyphase system, condition in which the r.m.s. values of the phase voltages or the phase angles between consecutive phases are not all equal

[IEV 161-08-09]

3.3

unbalance factor k_{u2} (%)

ratio of the negative sequence component to the positive sequence component measured at mains frequency (50 Hz or 60 Hz) as defined by the method of symmetrical components

$$k_{u2} = 100 \% (U_2 / U_1) \text{ (negative-sequence voltage/positive-sequence voltage)}$$

NOTE The negative-sequence voltages in a network mainly result from the negative currents of unbalanced loads flowing in the network.

3.4

malfunction

termination of the ability of an equipment to carry out intended functions or the execution of unintended functions by the equipment

4 General

Three-phase electrical and electronic equipment may be affected by voltage unbalance. Annex A describes the sources, effects and measurement of this disturbance.

Unbalance is caused by either voltage amplitude or phase-shift variations. A formula for the calculation of the unbalance factor, based upon these parameters, is given in annex B.

The purpose of the test is to investigate the influence of unbalance in a three-phase voltage system on equipment which may be sensitive to this disturbance, which could cause:

- overcurrents in a.c. rotating machines;
- generation of non-characteristic harmonics in electronic power converters;
- synchronization problems or control errors in the control part of electrical equipment (see annex A).