

Svenska Elektriska Kommissionen, SEK

Fastställt	Utgåva	Sida	Ingår i
2002-12-04	2	1 (1+35)	SEK Område EMC

© Copyright SEK. Reproduction in any form without permission is prohibited.

Elektromagnetisk kompatibilitet (EMC) – Del 4-7: Mät- och provningsmetoder – Vägledning vid övertonsmätning på elnät och på nätansluten utrustning

*Electromagnetic compatibility (EMC) –
Part 4-7: Testing and measurement techniques –
General guide on harmonics and interharmonics measurements
and instrumentation, for power supply systems and equipment connected thereto*

Som svensk standard gäller europastandarden EN 61000-4-7:2002. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61000-4-7:2002.

Nationellt förord

Europastandarden EN 61000-4-7:2002

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 61000-4-7, Second edition, 2002 - Electromagnetic compatibility (EMC) - Part 4-7: Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare utgiven svensk standard SS-EN 61000-4-7, utgåva 1, 1993, gäller ej fr o m 2005-10-01.

English version

Electromagnetic compatibility (EMC)
Part 4-7: Testing and measurement techniques -
General guide on harmonics and interharmonics
measurements and instrumentation,
for power supply systems and equipment connected thereto
(IEC 61000-4-7:2002)

Compatibilité électromagnétique (CEM)
Partie 4-7: Techniques d'essai
et de mesure -
Guide général relatif aux mesures
d'harmoniques et d'interharmoniques,
ainsi qu'à l'appareillage de mesure,
applicable aux réseaux d'alimentation
et aux appareils qui y sont raccordés
(CEI 61000-4-7:2002)

Elektromagnetische Verträglichkeit (EMV)
Teil 4-7: Prüf- und Messverfahren -
Allgemeiner Leitfadens für Verfahren
und Geräte zur Messung
von Oberschwingungen und
Zwischenharmonischen in
Stromversorgungsnetzen und
angeschlossenen Geräten
(IEC 61000-4-7:2002)

This European Standard was approved by CENELEC on 2002-10-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 77A/382/FDIS, future edition 2 of IEC 61000-4-7, 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 61000-4-7 on 2002-10-01.

This European Standard supersedes EN 61000-4-7:1993.

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) 2003-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2005-10-01

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 61000-4-7:2002 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 61000-3 (Series) NOTE Partly harmonized in EN 61000-3 series (not modified).

IEC 61010-1 NOTE Harmonized as EN 61010-1:2001 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-161	- ¹⁾	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility	-	-
IEC 61000-3-2	- ¹⁾	Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)	EN 61000-3-2	2000 ²⁾
IEC 61967-1	- ¹⁾	Integrated circuits - Measurement of electromagnetic emissions, 150 kHz to 1 GHz Part 1: General conditions and definitions	EN 61967-1	2002 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

CONTENTS

1	Scope	13
2	Normative references.....	13
3	Definitions, symbols and indices	15
3.1	Definitions related to frequency analysis.....	15
3.2	Definitions related to harmonics.....	17
3.3	Definitions related to distortion factors.....	19
3.4	Definitions related to interharmonics.....	21
3.5	Notations	23
3.5.1	Symbols and abbreviations	23
3.5.2	Indices.....	25
4	General concepts and common requirements for all types of instrumentation.....	25
4.1	Characteristics of the signal to be measured	25
4.2	Accuracy classes of instrumentation	25
4.3	Types of measurement	25
4.4	General structure of the instrument.....	27
4.4.1	Main instrument	27
4.4.2	Post-processing parts	29
5	Harmonic measurements	31
5.1	Current input circuit	31
5.2	Voltage input circuit.....	31
5.3	Accuracy requirements	33
5.4	Measurement set-up for emission assessment.....	35
5.5	Assessment of harmonic emissions	37
5.5.1	Grouping and smoothing	39
5.5.2	Compliance with emission limits.....	41
5.6	Assessment of voltage harmonic subgroups	41
6	Other analysis principles.....	41
7	Transitional period	43
8	General	43
	Annex A (informative) Measurement of interharmonics.....	45
	Annex B (informative) Measurements above the harmonic frequency range up to 9 kHz.....	49
	Annex C (informative) Technical considerations for grouping method.....	53
	Bibliography.....	71
	Figure 1 – General structure of the measuring instrument	29
	Figure 2 – Measurement set-up for single-phase emission measurement.....	35
	Figure 3 – Measurement set-up for three-phase emission measurements.....	35

Figure 4 – Illustration of harmonic and interharmonic groups (shown here for a 50 Hz supply)	39
Figure 5 – Realisation of a digital low-pass filter: z^{-1} designates a time window delay, α and β are the filter coefficients (see table 2 for values)	39
Figure 6 – Illustration of a harmonic subgroup and an interharmonic centred subgroup (of a 50 Hz supply)	41
Figure B.1 – Illustration of frequency bands for measurement, in the range 2 kHz to 9 kHz	51
Figure C.1 – Large 5th harmonic current fluctuation	59
Figure C.2 – Large 5th harmonic voltage fluctuation	59
Figure C.3 – Fluctuating 3rd harmonic current of a micro-wave appliance	61
Figure C.4 – Communication signal of 178 Hz together with 3rd and 5th harmonics	63
Figure C.5 – Interharmonic at 287 Hz, 5th and 6th harmonic	63
Figure C.6 – Modulated 5th harmonic and interharmonic at 287 Hz	67
Figure C.7 – Component vectors at frequencies of 245 Hz and 255Hz	69
 Table 1 – Accuracy requirements for current, voltage and power measurements	 33
Table 2 – Smoothing filter coefficients according to the window width	43

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto

1 Scope

This part of IEC 61000 is applicable to instrumentation intended for measuring spectral components in the frequency range up to 9 kHz which are superimposed on the fundamental of the power supply systems at 50 Hz and 60 Hz. For practical considerations, this standard distinguishes between harmonics, interharmonics and other components above the harmonic frequency range, up to 9 kHz.

This standard defines the measurement instrumentation intended for testing individual items of equipment in accordance with emission limits given in certain standards (for example, harmonic current limits as given in IEC 61000-3-2) as well as for the measurement of harmonic currents and voltages in actual supply systems. Instrumentation for measurements above the harmonic frequency range, up to 9 kHz is tentatively defined (see Annex B).

NOTE 1 This document deals in detail with instruments based on the discrete Fourier transform.

NOTE 2 The description of the functions and structure of the measuring instruments in this standard is very explicit and meant to be taken literally. This is due to the necessity of having reference instruments with reproducible results irrespective of the characteristics of the input signals.

NOTE 3 The instrument is defined to accommodate measurements of harmonics up to the 50th order.

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 – Chapter 161: Electromagnetic compatibility*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61967-1, *Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz – Part 1: Measurement conditions and definitions*¹

¹ To be published