

Electromagnetic compatibility (EMC) —

Part 3: Limits —

**Section 3: Limitation of voltage
changes, voltage fluctuations and
flicker in public low-voltage supply
systems, for equipment with rated
current ≤ 16 A per phase and not subject
to conditional connection**

ICS 33.100.10

National foreword

This British Standard is the UK implementation of EN 61000-3-3:1995+A2:2005. It is identical with IEC 61000-3-3:1994, incorporating amendment 1:2001 and 2:2005. It supersedes BS EN 5406-3:1988 which is withdrawn.

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**.

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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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English version

Electromagnetic compatibility (EMC) —
Part 3: Limits —
Section 3: Limitation of voltage changes, voltage
fluctuations and flicker in public low-voltage supply
systems, for equipment with rated current ≤ 16 A per phase
and not subject to conditional connection

Compatibilité électromagnétique (CEM) —
Partie 3: Limites —
Section 3: Limitation des variations de tension,
des fluctuations de tension et du papillotement
dans les réseaux publics d'alimentation basse
tension ayant un courant assigné ≤ 16 A par
phase et non soumis à un raccordement
conditionnel

Elektromagnetische Verträglichkeit (EMV) —
Teil 3: Grenzwerte —
Hauptabschnitt 3: Begrenzung von
Spannungsänderungen
Spannungsschwankungen und Flicker in
öffentlichen Niederspannungs-
Versorgungsnetzen für Geräte mit einem
Bemessungsstrom ≤ 16 A je Leiter, die keiner
Sonderanschlussbedingung unterliegen

This European Standard was approved by CENELEC on 1994-03-08. 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
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Foreword

The text of document 77A(CO)38, future edition 1 of IEC 61000-3-3:1994, 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 61000-3-3 on 1994-03-08.

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Annexes designated “normative” are part of the body of the standard. In this standard, Annex A and Annex ZA are normative. Annex ZA has been added by CENELEC.

Foreword to amendment A1

The text of document 77A/326/FDIS, future amendment 1 to IEC 61000-3-3:1994, 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 61000-3-3:1995 on 2001-05-01.

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Annexes designated “normative” are part of the body of the standard. In this standard, Annex A, Annex B and Annex ZA are normative. Annex ZA has been added by CENELEC.

Foreword to amendment A2

The text of document 77A/493/FDIS, future amendment 2 to IEC 61000-3-3:1994, 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 61000-3-3:1995 on 2005-09-01.

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- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2008-09-01

Contents

	Page	Page
Foreword	2	Figure 1 — Reference network for single-phase and three-phase supplies derived from a three-phase, four-wire supply
Introduction	5	Figure 2 — Histogram evaluation of $U(t)$
1 Scope	5	Figure 3 — Relative voltage change characteristic
2 Normative references	6	Figure 4 — Curve for $P_{st} = 1$ for rectangular equidistant voltage changes
3 Definitions	6	Figure 5 — Shape factors F for double-step and ramp-voltage characteristics
3.1 R.M.S. voltage shape, $U(t)$	6	Figure 6 — Shape factors F for rectangular and triangular voltage characteristics
3.2 voltage change characteristic, $\Delta U(t)$	6	Figure 7 — Shape factors F for motor-start voltage characteristics having various front times
3.3 maximum voltage change, ΔU_{max}	6	Table 1 — Assessment method
3.4 steady-state voltage change, ΔU_c	7	Table A.1 — Electrode parameters
3.5 voltage fluctuation	7	Table A.2 — Frequency factor R related to repetition rate « r »
3.6 flicker	7	
3.7 short-term flicker indicator, P_{st}	7	
3.8 long-term flicker indicator, P_{lt}	7	
3.9 flickermeter	7	
3.10 flicker impression time, t_f	7	
4 Assessment of voltage changes, voltage fluctuations and flicker	8	
4.1 Assessment of relative voltage change, “ d ”	8	
4.2 Assessment of the short-term flicker value, P_{st}	8	
4.2.1 Flickermeter	8	
4.2.2 Simulation method	8	
4.2.3 Analytical method	9	
4.2.3.1 Description of the analytical method	9	
4.2.3.2 Shape factor	9	
4.2.4 Use of $P_{st} = 1$ curve	9	
4.3 Assessment of long-term flicker value, P_{lt}	9	
5 Limits	10	
6 Test conditions	10	
6.1 General	10	
6.2 Measurement accuracy	11	
6.3 Test supply voltage	11	
6.4 Reference impedance	11	
6.5 Observation period	11	
6.6 General test conditions	12	
Annex A (normative) Application of limits and type test conditions for specific equipment	19	
Annex B (normative) Test conditions and procedures for measuring d_{max} voltage changes caused by manual switching	24	
Annex ZA (normative) Other international publications quoted in this standard with the references of the relevant European publications	25	

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 (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 9: Miscellaneous.*

Each part is further subdivided into sections which are to be published either as International Standards or as Technical Reports.

These standards and reports will be published in chronological order and numbered accordingly.

This **A1** part **A1** is a Product Family Standard.

A1 The limits in this standard relate to the voltage changes experienced by consumers connected at the interface between the public supply low-voltage network and the equipment user's installation. Consequently, if the actual impedance of the supply at the supply terminals of equipment connected within the equipment user's installation exceeds the test impedance, it is possible that supply disturbance exceeding the limits may occur. **A1**

1 Scope

This **A1** part of IEC 61000 **A1** is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

It specifies limits of voltage changes which may be produced by an equipment tested under specified conditions and gives guidance on methods of assessment.

A1 This part of IEC 61000 is applicable to electrical and electronic equipment having an input current equal to or less than 16 A per phase, intended to be connected to public low-voltage distribution systems of between 220 V and 250 V line to neutral at 50 Hz, and not subject to conditional connection.

Equipment which does not comply with the limits of this part of IEC 61000 when tested with the reference impedance Z_{ref} of 6.4, and which therefore cannot be declared compliant with this part, may be retested or evaluated to show conformity with IEC 61000-3-11. Part 3-11 is applicable to equipment with rated input current ≤ 75 A per phase and subject to conditional connection. **A1**

The tests according to this **A1** part **A1** are type tests. Particular test conditions are given in Annex A and the test circuit is shown in Figure 1.

A1 NOTE The limits in this part of IEC 61000 are based mainly on the subjective severity of flicker imposed on the light from 230 V/60 W coiled-coil filament lamps by fluctuations of the supply voltage. For systems with nominal voltage less than 220 V line to neutral and/or frequency of 60 Hz, the limits and reference circuit values are under consideration. **A1**

2 Normative references

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

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) — Chapter 161: Electromagnetic compatibility*.

Ⓐ₁

Ⓐ₁

IEC 60335-2-11:1993, *Safety of household and similar electrical appliances — Part 2: Particular requirements for tumble dryers*.

IEC 60725:1981, *Considerations on reference impedances for use in determining the disturbance characteristics of household appliances and similar electrical equipment*.

IEC 60868:1986, *Flickermeter — Functional and design specifications*. Amendment No. 1 (1990)¹⁾.

Ⓐ₁ IEC 60974-1, *Arc welding equipment — Part 1: Welding power sources*. Ⓐ₁

Ⓐ₁ IEC 61000-3-2, *Electromagnetic compatibility (EMC) — Part 3-2: Limits — Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*. Ⓐ₁

IEC 61000-3-5:1994, *Electromagnetic compatibility (EMC) — Part 3: Limits — Section 5: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current greater than 16 A per phase and not subject to conditional connection*.

Ⓐ₁ IEC 61000-3-11, *Electromagnetic compatibility (EMC) — Part 3-11: Limits — Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems — Equipment with rated current ≤ 75 A and subject to conditional connection*. Ⓐ₁

3 Definitions

For the purpose of this Ⓐ₁ part Ⓐ₁ of IEC 61000-3, the following definitions apply.

3.1

r.m.s. voltage shape, $U(t)$

Ⓐ₁ the time function of the r.m.s. voltage, evaluated as a single value for each successive half period between zero-crossings or the source voltage (see Figure 2) Ⓐ₁

3.2

voltage change characteristic, $\Delta U(t)$

Ⓐ₁ the time function of the r.m.s voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage between time intervals in which the voltage is in a steady-state condition for at least 1 s (see Figure 2)

NOTE Since this characteristic is only used for assessments using calculations, the voltage in the steady-state condition is assumed to be constant within the measurement accuracy (see 6.2). Ⓐ₁

3.3

maximum voltage change characteristic, $\Delta U_{\max}$

Ⓐ₁ the difference between maximum and minimum r.m.s. values of a voltage change characteristic (see Figure 2) Ⓐ₁

¹⁾ Ⓐ₁ IEC 60868 will be withdrawn and replaced by IEC 61000-4-15 in 2003. Flickermeter complying with IEC 61000-4-15 may also be used for flicker measurements associated with this part of IEC 61000-3. Ⓐ₁

3.4

steady-state voltage change, ΔU_c

the difference between two adjacent steady-state voltages separated by at least one voltage change characteristic (see Figure 2)

NOTE Definitions 3.2, 3.3 and 3.4 relate to absolute phase-to-neutral voltages. The ratios of these magnitudes to the phase-to-neutral value of the nominal voltage (U_n) of the reference network in Figure 1 are called:

- relative voltage change characteristic: $d(t)$ (definition 3.2);
- maximum relative voltage change: $d_{\max}$ (definition 3.3);
- relative steady-state voltage change: d_c (definition 3.4).

These definitions are explained by the example in Figure 3.

3.5

voltage fluctuation

$\langle A_1 \rangle$ series of changes of r.m.s voltage evaluated as a single value for each successive half-period between zero-crossings of the source voltage $\langle A_1 \rangle$

3.6

flicker

impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time [IEV 161-08-13]

3.7

short-term flicker indicator, P_{st}

the flicker severity evaluated over a short period (in minutes); $P_{st} = 1$ is the conventional threshold of irritability

3.8

long-term flicker indicator, P_{lt}

the flicker severity evaluated over a long period (a few hours) using successive P_{st} values

3.9

flickermeter

an instrument designed to measure any quantity representative of flicker

NOTE Measurements are normally P_{st} and P_{lt} . [IEV 161-08-14]

3.10

flicker impression time, t_f

$\langle A_1 \rangle$ value with a time dimension which describes the flicker impression of a voltage change characteristic

3.11

conditional connection

connection of equipment requiring the user's supply at the interface point to have an impedance lower than the reference impedance Z_{ref} in order that the equipment emissions comply with the limits in this part

NOTE Meeting the voltage change limits may not be the only condition for connection; emission limits for other phenomena such as harmonics, may also have to be satisfied.

3.12

interface point

interface between a public supply network and a user's installation $\langle A_1 \rangle$