IEC/TS 61000-3-5

Edition 2.0 2009-07

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

**Electromagnetic compatibility (EMC) –
Part 3-5: Limits – Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75 A**

**Compatibilité électromagnétique (CEM) –
Partie 3-5: Limites – Limitation des fluctuations de tension et du flicker dans les réseaux basse tension pour les équipements ayant un courant appelé supérieur à 75 A**

IEC/TS 61000-3-5:2009

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC/TS 61000-3-5, which is a technical specification, has been prepared by subcommittee 77A: Low frequency phenomena of IEC technical committee 77: Electromagnetic compatibility.

This second edition cancels and replaces IEC 61000-3-5, published as Technical Report type 2 in 1994 and constitutes a technical revision.

It includes the following significant technical changes with respect to the previous edition: the whole document and the title have been modified to eliminate any conflict with the published IEC 61000-3-11.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
77A/681/DTS	77A/693/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigenda of September 2009 and May 2010 have been included in this copy.

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 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 a second number identifying the subdivision (example: 61000-6-1).

IEC/TS 61000-3-5

This Technical Specification is presented as an informative document as it is already a requirement, in most countries, for equipment having a rated input current exceeding 75 A per phase to be subject to assessment and connection by the public supply network operator. Therefore, it is not intended, at the time of publication, to be converted into an International Standard.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 3-5: Limits – Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75 A

1 Scope

This part of IEC 61000 deals with emission of disturbances due to voltage fluctuations and flicker.

The recommendations in this Technical Specification are applicable to electrical and electronic equipment that has a rated input current exceeding 75 A per phase and is intended to be connected to a public low-voltage a.c. distribution system.

Recommendations that specify information enabling a supply authority, manufacturer, or consumer to assess equipment are given in Annex A.

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 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – 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*

IEC 61000-3-11:2000, *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*

3 Terms and definitions

For the purposes of this document the terms and definitions of IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11 and IEC 60050(161) apply.

4 Equipment assessment

4.1 General

Methods of flicker assessment for different types of voltage fluctuations are described in IEC 61000-3-3 and IEC 61000-3-11.

It is recommended that the disturbance levels present in the electricity supply are measured before and after the connection of a new load which is critical in any respect. The assessment method and data used should be verified.

An item of equipment having a rated input-current exceeding 75 A per phase, should comply with the limits for all relevant phase-to-neutral voltages given in Clause 5.

4.2 Information from a consumer

When a consumer enquires about connection of a major load to a low voltage public supply network he should, on request, provide information to enable assessment of the possible disturbances caused by the load, otherwise connection may be refused.

The basic information to facilitate the assessment of equipment is recommended in the questionnaire contained in Annex A. This questionnaire should be completed by the user, or his authorized installation engineer, when connections of electrical loads to low-voltage public power supply networks require special authorization.

The completed questionnaire should be given to the electricity supplier well in advance of purchase and installation of the equipment to be connected.

4.3 Evaluation of equipment with a rated input current exceeding 75 A per phase

For equipment with a rated input current exceeding 75 A, a detailed system study is recommended in order to facilitate conditional connection.

The equipment should be evaluated against the actual system impedance. It is recommended that IEC 61000-3-3 and IEC 61000-3-11 voltage change limits for d_{max} and d_c, given in Clause 5, are applied.

5 Recommended voltage change and flicker limits

5.1 Recommended voltage change limits

The following limits are recommended to be applicable to equipment having ratings greater than 75 A per phase:

- the relative steady state voltage change, d_c, should not exceed 3,3 %;
- the maximum relative voltage change, d_{max}, should not exceed
  a) 4 % without additional conditions;
  b) 6 % for equipment with automatic switching more than twice per day and that has a delayed restart (the order of magnitude of the delay being of a few minutes) or that has manual restart after power supply interruption;

  NOTE The cycling frequency is further limited by the P_{st} and P_{lt} limit. For example: a d_{max} of 6 % with rectangular voltage change characteristic twice per hour gives a P_{lt} of about 0,65.

  c) 7 % for equipment which is attended whilst in use, or is switched on automatically, or is intended to be switched on manually no more than twice per day and has a delayed restart (the delay being not less than a few tens of seconds) or manual restart after a power supply interruption.

In the case of equipment incorporating multiple loads, limits b) and c) should only apply if there is delayed or manual restart after a power supply interruption. For all equipment with automatic switching, that is energised immediately on restoration of supply after a power supply interruption, a) should apply. For all equipment with manual switching, limits b) or c) should apply, depending on the rate of switching.

P_{st} and P_{lt} requirements should not be applicable to voltage changes caused by manual switching.

The limits should not be applicable to emergency switching or emergency interruptions.

5.2 Recommended flicker limits

The recommended limit of P_{st} for a particular item of equipment is calculated by application of Equation (1):

$$P_{st\_LIMIT} = (S_L / S_{TR})^{1/3} \qquad \text{Equation (1)}$$

within the range $0,6 < P_{st} < 1$.

NOTE 1 All P_{st_LIMIT} values that are calculated by application of Equation (1), and are less than 0,6, should be set to 0,6.

where

S_L is the rated apparent power of the load to be connected, and

S_{TR} is the rated apparent power of the feeding MV/LV transformer.

NOTE 2 P_{st} and P_{lt} are defined in IEC 61000-3-3.

The recommended limit of P_{lt} for a particular item of equipment is determined by Equation (2):

$$P_{lt\_LIMIT} = 0{,}65(S_L / S_{TR})^{1/3} \qquad \text{Equation (2)}$$

i.e. $P_{lt\_LIMIT} = 0{,}65\ P_{st\_LIMIT}$

NOTE 3 The calculated flicker limits are recommended values, as the existing flicker level in the associated MV network, the compatibility level of the low-voltage network and any existing utility regulations should be taken into account.

Annex A
(informative)

Questionnaire to facilitate an accurate evaluation of flicker emissions

A.1 Main purpose of the equipment

Concise description of the equipment:

Type of equipment, with estimated mechanical and thermal ratings, as applicable.

A.2 Electrical characteristics of the equipment

A.2.1 Rating

Voltage .. . ...

Number of phases .....

Apparent power rating.....

Power factor ... .

Starting current .....

Power factor during start.....

Rating of the largest motor .....

Largest switched thermal load .....

Capacitive load ....

Maximum permissible system impedance

to give compliance with the limits in Clause 5.....

The largest production of harmonics should be specified in amperes for each harmonic in an appendix. For linear loads, this information is not necessary.

A.2.2 Effect on supply quality

Does the proposed load have any other characteristics, which could affect the supply quality? In particular

a) Does it produce transients? YES NO
b) Does it produce voltage unbalance? YES NO
c) Does it produce a d.c. component in the supply? YES NO
d) Does it produce commutation notches, or extra zero crossings? YES NO
e) Does it produce harmonics, or other frequencies? YES NO