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Responsible committee: GEL/210 EMC Policy and Standards Committee

Interested committees:

Title: BS EN 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

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- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



77A/1240/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61000-3-3 ED4	
DATE OF CIRCULATION: 2025-01-24	CLOSING DATE FOR COMMENTS: 2025-03-21
SUPERSEDES DOCUMENTS: 77A/1209/RR	

IEC SC 77A : EMC - LOW FREQUENCY PHENOMENA	
SECRETARIAT: France	SECRETARY: Mr Cédric LAVENU
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electromagnetic Compatibility	

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

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

NOTE FROM TC/SC OFFICERS:

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE IEC 77: Electromagnetic Compatibility

SUB-COMMITTEE IEC 77A: Low Frequency Phenomena

WG2: Voltage fluctuations and other low-frequency disturbances

Introduction

This proposal aims to a general review of the standard in order to:

- Revise parts of the standard that have been in the present form for a long time and require improvements for a clearer reading and consultation
- Align the text with the IEC directives (e.g. several notes contain requirements, use of 'shall' and 'may')
- Use only dated references to other publications
- Introduce new and improved definitions
- Clarify the principle that the voltage flicker-meter is the reference method and other methods (e.g. analytical method) may be used if certain conditions are met
- Update provisions in light of technology advancement (e.g. general test procedure, starting and stopping of testing, etc.)
- Review the approach to uncertainty in alignment with equivalent work done for IEC 61000-3-2, based on the accuracy method
- Revise the application of the tolerance of the test supply voltage and relevant requirements for the various types of power sources
- Provide clearer specifications for the reference impedance in accordance with measurement uncertainty considerations
- Implement Corrigendum 1 2022 for test conditions of coffee machines
- Introduce new test conditions, or revise existing ones, for specific types of equipment (e.g. arc welding equipment)
- Ensure consistency of the standard with the provisions of IEC 61000-4-15 – Electromagnetic compatibility (EMC) - Part 4-15: Testing and measurement techniques - Flickermeter – Functional and design specifications
- Delete informative Annex C - Determination of steady state voltage and voltage change characteristics, as defined in IEC 61000-4-15:2010 – to avoid overlap of IEC 61000-3-3 (product family standard) with IEC 61000-4-15 (basic standard)
- Delete informative Annex D - Input relative voltage fluctuation $\Delta V/V$ for $P_{st} = 1,0$ at output – as the content is already provided in IEC 61000-2-2
- Add a new informative annex for compensation methods to manage systematic errors
- Add a new informative annex for future considerations beyond the incandescent lamp

[In blue the text that has been modified.](#)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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139 International Standard IEC 61000-3-3 has been prepared by subcommittee 77A: EMC – Low
140 frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

141 This standard forms part 3-3 of IEC 61000 series of standards. It has the status of a product
142 family standard.

143 This **fourth** edition constitutes a technical revision.

144 This edition includes the following significant technical changes with respect to the previous
145 edition:

- 146 • Revise parts of the standard that have been in the present form for a long time and require
147 improvements for a clearer reading and consultation
- 148 • Align the text with the IEC directives (e.g. several notes contain requirements, use of 'shall'
149 and 'may')
- 150 • Use only dated references to other publications
- 151 • Introduce new and improved definitions
- 152 • Clarify the principle that the voltage flicker-meter is the reference method and other methods
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- 154 • Update provisions in light of technology advancement (e.g. general test procedure, starting
155 and stopping of testing, etc.)
- 156 • Review the approach to uncertainty in alignment with equivalent work done for IEC 61000-
157 3-2, based on the accuracy method
- 158 • Revise the application of the tolerance of the test supply voltage and relevant requirements
159 for the various types of power sources
- 160 • Provide clearer specifications for the reference impedance in accordance with measurement
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- 162 • Implement Corrigendum 1 2022 for test conditions of coffee machines
- 163 • Introduce new test conditions, or revise existing ones, for specific types of equipment (e.g.
164 arc welding equipment)
- 165 • Ensure consistency of the standard with the provisions of IEC 61000-4-15 – Electromagnetic
166 compatibility (EMC) - Part 4-15: Testing and measurement techniques - Flickermeter –
167 Functional and design specifications
- 168 • Delete informative Annex C - Determination of steady state voltage and voltage change
169 characteristics, as defined in IEC 61000-4-15:2010 – to avoid overlap of IEC 61000-3-3
170 (product family standard) with IEC 61000-4-15 (basic standard)
- 171 • Delete informative Annex D - Input relative voltage fluctuation $\Delta V/V$ for $P_{st} = 1,0$ at output
172 – as the content is already provided in IEC 61000-2-2
- 173 • Add a new informative annex for compensation methods to manage systematic errors
- 174 • Add a new informative annex for future considerations beyond the incandescent lamp

- 175 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.
- 176 A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic*
177 *compatibility (EMC)*, can be found on the IEC website.
- 178 The committee has decided that the contents of the base publication and its amendment will
179 remain unchanged until the stability date indicated on the IEC web site under
180 "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the
181 publication will be
- 182 • reconfirmed,
 - 183 • withdrawn,
 - 184 • replaced by a revised edition, or
 - 185 • amended.
- 186
- 187
- 188

189 INTRODUCTION

190 IEC 61000 is published in separate parts according to the following structure:

191 Part 1: General

192 General considerations (introduction, fundamental principles)

193 Definitions, terminology

194 Part 2: Environment

195 Description of the environment

196 Classification of the environment

197 Compatibility levels

198 Part 3: Limits

199 Emission limits

200 Immunity limits (in so far as they do not fall under the responsibility of product committees)

201 Part 4: Testing and measurement techniques

202 Measurement techniques

203 Testing techniques

204 Part 5: Installation and mitigation guidelines

205 Installation guidelines

206 Mitigation methods and devices

207 Part 9: Miscellaneous

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

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

212

213

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

1 Scope

This part of IEC 61000 is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage supply [network](#).

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

This part of IEC 61000 is applicable to electrical and electronic equipment having a rated 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 with rated input current equal to or less than 16 A which require conditional connection is excluded from the scope of this standard.](#)

NOTE 1 For equipment with rated input current ≤ 16 A per phase and subjected to conditional connection see IEC 61000-3-11.

[If the largest input current specified for the equipment that can flow continuously exceeds 16 A, IEC 61000-3-11 applies and not IEC 61000-3-3.](#)

Note 2 Typically, values for the input current are specified on the nameplate.

NOTE 2 This document allows for an estimation of the voltage changes observed at the Point of Common Coupling (PCC). Consequently, in a real situation, even if the supply network impedance equals the reference impedance used for the assessment in this document, higher voltage changes could be experienced within a user's installation due to additional impedance downstream of the PCC.

NOTE 3 The limits in this standard 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.

2 Normative references

[The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/TR 60725:2012, *Consideration of reference impedances and public supply impedances for use in determining disturbance characteristics of electrical equipment having a rated current ≤ 75 A per phase*

IEC 60974-1:2021, *Arc welding equipment – Part 1: Welding power sources*

IEC 61000-3-2:2018, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

[IEC 61000-3-2:2018/AMD1:2020](#)

[IEC 61000-3-2:2018/AMD2:2024](#)

IEC 61000-4-15:2010, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

light flicker

impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time

[SOURCE: IEC 60050-161:1990, 161-08-13]

3.2

voltage flicker-meter

flicker-meter with voltage as the input

Note 1 to Entry See Annex D for further information.

3.3

voltage fluctuation

a series of voltage changes or a continuous variation of the RMS or peak value of the voltage

3.4

nominal voltage

U_n

nominal line-to-neutral voltage obtained from the EUT ratings, used to calculate percentages for the various directly measured parameters

3.5

voltage change characteristic

$d(t)$

time function of the relative RMS voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage, except during time intervals in which the voltage is in a steady-state condition

Note 1 to entry: For detailed information about the evaluation of a voltage change characteristic and the definition of a steady state condition see IEC 61000-4-15:2010.

3.6

half period RMS value of the voltage

U_{hp}

RMS voltage of the mains supply voltage, determined over a half period, between consecutive zero crossings of the fundamental frequency voltage

3.7

half period RMS value characteristics

$U_{hp}(t)$

characteristics vs. time of the half period RMS value, determined from successive U_{hp} values

Note 1 to entry: See IEC 61000-4-15:2010, Annex B for more explanation.

d_c

maximum absolute steady state voltage change during an observation period

300 Note 1 to entry: For detailed information about the calculation of d_c see IEC 61000-4-15:2010, 3.1.8.

301 **3.9**

302 $d_{\max}$

303 maximum absolute voltage change during an observation period

304 Note 1 to entry: For detailed information about the calculation of $d_{\max}$ see IEC 61000-4-15:2010, 3.1.9.

305 **3.10**

306 $T_{\max}$

307 maximum of the accumulated time durations determined from each voltage change
308 characteristic for which, during the observation period, $d(t)$ exceeds 3.3 %

309 Note 1 to entry: For detailed information about $d(t)$ see IEC 61000-4-15:2010, 3.1.10.

310 **3.11**

311 P_{st}

312 short-term flicker severity

313 Note 1 to entry: For detailed information about P_{st} calculation see IEC 61000-4-15:2010, 5.7.2.

314 **3.12**

315 P_{lt}

316 long-term flicker severity calculated according to 4.3

317 **3.13**

318 flicker impression time

319 t_f

320 time parameter calculated in accordance with 4.2.4.2

321 **3.14**

322 point of common coupling

323 the point on a public power supply network, electrically nearest to a particular load, at which
324 other loads are, or could be, connected

325 SOURCE IEC 61000-2-2:3.1.6 [IEV 161-07-15 modified]

326

327 **3.15**

328 conditional connection

329 connection of equipment requiring the user's supply at the interface point to have an impedance
330 lower than the reference impedance Z_{ref}

331 **3.16**

332 manual switching

333 manual operation of controls to switch the equipment on, off, or between different power settings

334 Note 1 to Entry Examples are manual switching obtained by pushing an electromechanical switch or button located
335 on the equipment itself or a remote control, or by triggering a sensor. The switch or button could be simulated on a
336 display (e.g. smartphones, digital control displays).

337 **3.17**

338 balanced 3-phase equipment

339 3-phase equipment for which the difference between the current of the three phases is less
340 than or equal to 10%

341 **3.18 Abbreviated terms**

342 EUT Equipment Under Test

343 RMS Root Mean Square

PCC point of common coupling

4 Assessment of voltage changes, voltage fluctuations and flicker

4.1 Assessment of a relative voltage change, $d(t)$

The evaluation of the voltage change characteristic specified in IEC 61000-4-15 2010 clause 3 shall apply.

The nominal voltage U_n shall be used for the calculation of the relative voltage change d . If a voltage range is stipulated for the EUT, the nominal voltage U_n shall be 230 V.

The methods given in Table 1 shall allow for an evaluation of all the relevant d parameters.

In particular, the $d_{\max,i}$ evaluation ends as soon as a new steady state condition is established, or at the end of the observation period. The polarity of change(s) may be indicated as follows: if the maximum voltage deviation is observed during a reduction in voltage with respect to the previous $d_{\text{end},i}$ the resulting $d_{\max,i}$ value is positive; if the maximum voltage deviation is observed during a voltage increase with respect to the previous $d_{\text{end},i}$ the resulting $d_{\max,i}$ value is negative.

4.2 Assessment of the short-term flicker value, P_{st}

4.2.1 General

Table 1 shows the methods for evaluating P_{st} , based on voltage fluctuations of different types. The first method (voltage flicker-meter) is the reference method for application of the limits. The other methods may be applied if the relevant conditions are met.

Table 1 – Assessment methods

Types of voltage fluctuations	Method for evaluating P_{st}
All voltage fluctuations	Voltage flicker-meter (direct evaluation)
All voltage fluctuations where $d(t)$ is known	Simulation
Voltage changes characteristics according to Figures 3 to 5 with an occurrence rate less than 1 per second	Analytical
Rectangular voltage changes at equal intervals	Use of the $P_{\text{st}} = 1$ curve of Figure 2

4.2.2 Voltage flicker-meter

All types of voltage fluctuations shall be assessed by direct measurement using a voltage flicker-meter which complies with the specifications given in IEC 61000-4-15:2010.

4.2.3 Simulation method

If the relative voltage change characteristic $d(t)$ is known, P_{st} may be evaluated using a computer simulation.