S+ IEC 61000-3-3

Edition 3.0 2013-05

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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

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



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IEC 61000-3-3

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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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IEC 61000-3-3:2013

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 Assessment of voltage changes, voltage fluctuations and flicker 10
4.1 Assessment of a relative voltage change, $d(t)$ 10
4.2 Assessment of the short-term flicker value, P_{st} 10
4.2.1 General 10
4.2.2 Flickermeter 11
4.2.3 Simulation method 11
4.2.4 Analytical method 11
4.2.5 Use of P_{st} = 1 curve 12
4.3 Assessment of long-term flicker value, P_{lt} 12
5 Limits 12
6 Test conditions 13
6.1 General 13
6.2 Measurement uncertainty 14
6.3 Test supply voltage 14
6.4 Reference impedance 14
6.5 Observation period 14
6.6 General test conditions 15
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 27
Annex C (informative) Determination of steady state voltage and voltage change characteristics, as defined in IEC 61000-4-15:2010 28
Annex D (informative) Input relative voltage fluctuation ΔV/V for P_{st} = 1,0 at output [IEC/TR 61000-3-7:2008] 33
Bibliography 34

Figure 1 – Reference network for single-phase and three-phase supplies derived from a three-phase, four-wire supply 16
Figure 2 – Curve for P_{st} = 1 for rectangular equidistant voltage changes 17
Figure 3 – Shape factors F for double-step and ramp-voltage characteristics 17
Figure 4 – Shape factors F for rectangular and triangular voltage characteristics 18
Figure 5 – Shape factor F for motor-start voltage characteristics having various front times 18
Figure C.1 – Evaluation of $U_{hp}(t)$ 32

Table 1 – Assessment method 11
Table A.1 – Test conditions for hotplates 19
Table A.2 – Electrode parameters 24
Table A.3 – Frequency factor R related to repetition rate "r" 25

Table C.1 – Test specification for d_c – d_{max} – $t_{d(t)}$ > 3,3 % (from Table 12 of IEC 61000-4-15: 2010)..... 31
Table C.2 – Test specification for d_c – d_{max} – $t_{d(t)}$ > 3,3 % (from Table 13 of IEC 61000-4-15: 2010)..... 31
Table D.1 – Input relative voltage fluctuation ΔV/V for P_{st} = 1,0 at output 33

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

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International Standard IEC 61000-3-3 has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

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

This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.

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

a) This edition takes account of the changes made in IEC 61000-4-15:2010.

The text of this standard is based on the following documents:

FDIS	Report on voting
77A/809/FDIS	77A/816/RVD

Full information on the voting for the approval of this standard 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.

A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

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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.

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 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.

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.

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

NOTE 1 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 could occur.

NOTE 2 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. 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *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, *Arc welding equipment – Part 1: Welding power sources*

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

IEC 61000-3-11, *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*

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.

3.1
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 change characteristic
d(t)
time function of the relative r.m.s. 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 for at least 1 s

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

3.3
d_c
maximum steady state voltage change during an observation period

Note 1 to entry: For detailed information about the calculation of d_c see Annex C and IEC 61000-4-15:2010.

3.4
d_{max}
maximum absolute voltage change during an observation period

Note 1 to entry: For detailed information about the calculation of d_{max} see Annex C and IEC 61000-4-15:2010.

3.5
T_{max}
maximum time duration during the observation period that the voltage deviation $d(t)$ exceeds the limit for d_c

Note 1 to entry: During a voltage change characteristic the time duration T_{max} is accumulated until a new steady state condition is established.

Note 2 to entry: The T_{max} limit evaluation in this standard is generally intended to evaluate the inrush current pattern of the equipment under test. Thus, as soon as a new steady state condition is established, the T_{max} evaluation is ended. When a new voltage change occurs that exceeds the limit for d_c, a new T_{max} evaluation is started. The maximum duration that $d(t)$ exceeds the limit for d_c for any of the individual T_{max} evaluations during the observation period, is used for the comparison against the T_{max} limit, and is reported for the test.

3.6
nominal test voltage
U_n
nominal test voltage used to calculate percentages for the various directly measured parameters

SOMMAIRE

AVANT-PROPOS 38
INTRODUCTION 40
1 Domaine d'application 41
2 Références normatives 41
3 Termes et définitions 42
4 Détermination des variations de tension, des fluctuations de tension et du papillotement (flicker) 44
4.1 Détermination en valeur relative d'une variation de tension, $d(t)$ 44
4.2 Evaluation de la valeur du papillotement de courte durée, P_{st} 45
4.2.1 Généralités 45
4.2.2 Flickermètre 45
4.2.3 Méthodes de simulation 45
4.2.4 Méthode analytique 45
4.2.5 Utilisation de la courbe P_{st} = 1 46
4.3 Evaluation de la valeur du papillotement de longue durée, P_{lt} 46
5 Limites 46
6 Conditions d'essai 47
6.1 Généralités 47
6.2 Incertitude de mesure 48
6.3 Tension d'alimentation d'essai 49
6.4 Impédance de référence 49
6.5 Période d'observation 49
6.6 Conditions générales d'essai 49
Annexe A (normative) Application des limites et conditions d'essai type pour équipements particuliers 54
Annexe B (normative) Conditions et procédures pour la mesure des variations de tension d_{max} dues à une commutation manuelle 62
Annexe C (informative) Détermination de la tension permanente et des caractéristiques de variation de tension, telles que définies dans la CEI 61000-4-15:2010 63
Annexe D (informative) Variations relatives de tension $\Delta V/V$ en entrée correspondant à un niveau P_{st} = 1,0 en sortie [CEI/TR 61000-3-7:2008] 68
Bibliographie 69

Figure 1 – Réseau de référence pour alimentations monophasées et triphasées dérivées d'une alimentation triphasée, quatre conducteurs 51
Figure 2 – Courbe pour P_{st}=1 des variations de tension rectangulaires équidistantes 52
Figure 3 – Facteurs de forme F pour des caractéristiques de tension en double échelon et en rampe 52
Figure 4 – Facteurs de forme F pour des caractéristiques rectangulaires et triangulaires 53
Figure 5 – Facteurs de forme F des caractéristiques de tension de démarrage de moteurs pour différents temps de front 53
Figure C.1 – Évaluation de $U_{hp}(t)$ 67

Tableau 1 – Méthodes d'évaluation 45

Tableau A.1 – Conditions d'essai pour les plaques chauffantes 54
Tableau A.2 – Paramètres de l'électrode 59
Tableau A.3 – Facteur de fréquence R lié aux taux de répétition «r» 61
Tableau C.1 – Spécifications d'essais pour d_c – d_{max} – $t_{d(t)}$ > 3,3 % (extrait du Tableau 12 de la CEI 61000-4-15:2010) 66
Tableau C.2 – Spécifications d'essais pour d_c – d_{max} – $t_{d(t)}$ > 3,3 % (extrait du Tableau 13 de la CEI 61000-4-15:2010) 66
Tableau D.1 – Variations relatives de tension $\Delta V/V$ en entrée correspondant à un niveau P_{st} = 1,0 en sortie 68

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COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

Partie 3-3: Limites – Limitation des variations de tension, des fluctuations de tension et du papillotement dans les réseaux publics d'alimentation basse tension, pour les matériels ayant un courant assigné ≤ 16 A par phase et non soumis à un raccordement conditionnel

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La présente norme constitue la partie 3-3 de la série de normes CEI 61000. Elle a le statut d'une norme de famille de produit.

Cette troisième édition annule et remplace la seconde édition parue en 2008. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Cette édition prend en compte les changements effectués dans la CEI 61000-4-15:2010.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
77A/809/FDIS	77A/816/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/CEI, Partie 2.

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INTRODUCTION

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Partie 1: Généralités

Considérations générales (introduction, principes fondamentaux)

Définitions, terminologie

Partie 2: Environnement

Description de l'environnement

Classification de l'environnement

Niveaux de compatibilité

Partie 3: Limites

Limites d'émission

Limites d'immunité (dans la mesure où elles ne relèvent pas des comités de produit)

Partie 4: Techniques d'essai et de mesure

Techniques de mesure

Techniques d'essai

Partie 5: Guides d'installation et d'atténuation

Guides d'installation

Méthodes et dispositifs d'atténuation

Partie 9: Divers

Chaque partie est à son tour subdivisée en sections qui seront publiées soit comme Normes internationales, soit comme Rapports techniques.

Ces normes et rapports seront publiés chronologiquement et numérotés en conséquence.

COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

Partie 3-3: Limites – Limitation des variations de tension, des fluctuations de tension et du papillotement dans les réseaux publics d'alimentation basse tension, pour les matériels ayant un courant assigné ≤ 16 A par phase et non soumis à un raccordement conditionnel

1 Domaine d'application

La présente partie de la CEI 61000 traite des limitations des fluctuations de tension et du papillotement (flicker) appliquées sur le réseau de distribution public basse tension.

Elle spécifie les limites des variations de tension pouvant être produites par un équipement essayé dans des conditions spécifiées et formule des recommandations pour les méthodes d'évaluation.

La présente partie de la CEI 61000 s'applique aux matériels électriques et électroniques ayant un courant appelé inférieur ou égal à 16 A par phase et destinés à être raccordés à des réseaux publics de distribution basse tension présentant une tension nominale phase-neutre comprise entre 220 V et 250 V à 50 Hz et non soumis à un raccordement conditionnel.

Les matériels qui ne sont pas conformes aux limites indiquées dans cette partie de la CEI 61000 lorsqu'ils sont soumis à essai sur l'impédance de référence Z_{ref} de 6.4, et qui de ce fait ne peuvent être déclarés conformes à cette partie, peuvent être à nouveau soumis à essai ou évalués pour démontrer la conformité aux exigences de la CEI 61000-3-11, qui s'appliquent aux matériels ayant un courant appelé assigné ≤ 75 A par phase et soumis à un raccordement conditionnel.

Les essais effectués selon la présente partie sont des essais types. Les conditions d'essai pour des équipements particuliers sont données en Annexe A, et les circuits d'essai sont indiqués en Figure 1.

NOTE 1 Les limites mentionnées dans la présente norme concernent les variations de tension rencontrées par les consommateurs connectés au point de raccordement entre le réseau public d'alimentation basse tension et les matériels de l'installation de l'utilisateur. Par conséquent, il est possible que des perturbations dépassant les limites aient lieu si l'impédance d'alimentation aux bornes d'alimentation de l'appareil connecté à l'intérieur de l'installation de l'utilisateur est supérieure à l'impédance d'essai.

NOTE 2 Les limites de la présente norme sont principalement fondées sur la sévérité subjective du papillotement provenant de la lumière émise par une lampe à filament bi-spiralé de 230 V 60 W soumise à des fluctuations de la tension d'alimentation. Pour les réseaux dont la tension nominale phase-neutre est inférieure à 220 V et/ou la fréquence est de 60 Hz, les limites et les valeurs de référence du circuit sont à l'étude.

2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CEI/TR 60725, *Etude des impédances de référence et des impédances des réseaux publics d'alimentation aux fins de la détermination des caractéristiques de perturbation des équipements électriques utilisant un courant nominal ≤ 75 A par phase*

CEI 60974-1, *Matériel de soudage à l'arc – Partie 1: Sources de courant de soudage*

CEI 61000-3-2, *Compatibilité électromagnétique (CEM) – Partie 3-2: Limites – Limites pour les émissions de courant harmonique (courant appelé par les appareils ≤ 16 A par phase)*

CEI 61000-3-11, *Compatibilité électromagnétique (CEM) – Partie 3-11: Limites – Limitation des variations de tension, des fluctuations de tension et du papillotement dans les réseaux publics d'alimentation basse tension – Equipements ayant un courant appelé ≤ 75 A et soumis à un raccordement conditionnel*

CEI 61000-4-15:2010, *Compatibilité électromagnétique (CEM) – Partie 4-15: Techniques d'essai et de mesure – Flickermètre – Spécifications fonctionnelles et de conception*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

3.1
flicker
papillotement
impression d'instabilité de la sensation visuelle due à un stimulus lumineux dont la luminance ou la répartition spectrale fluctue dans le temps

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

3.2
caractéristique de la variation de tension
d(t)
fonction temporelle de la variation de tension efficace relative évaluée comme valeur unique pour chaque demi-période consécutive comprise entre les passages par zéro de la tension source, à l'exception des intervalles de temps dont la tension est en régime permanent pendant au moins 1 s

Note 1 à l'article: Pour des informations détaillées concernant l'évaluation d'une caractéristique de variation de tension et la définition du régime permanent, voir Annexe C et la CEI 61000-4-15:2010.

3.3
d_c
variation maximale de tension permanente au cours d'une période d'observation

Note 1 à l'article: Pour des informations détaillées concernant les calculs de d_c voir l'Annexe C et la CEI 61000-4-15:2010.

3.4
d_{max}
valeur absolue maximale des variations de tension au cours d'une période d'observation

Note 1 à l'article: Pour des informations détaillées concernant les calculs de d_{max} voir l'Annexe C et la CEI 61000-4-15:2010.

3.5
T_{max}
durée maximale au cours de la période d'observation où l'écart de tension $d(t)$ dépasse la limite pour d_c

Note 1 à l'article: Au cours d'une variation de tension, la durée T_{max} est cumulée jusqu'à ce qu'un nouveau régime permanent soit établi.

Note 2 à l'article: L'évaluation de la limite de la valeur T_{max} dans la présente norme est généralement destinée à évaluer l'appel de courant de l'appareil en essai. Ainsi, dès qu'un nouveau régime permanent est établi,

IEC 61000-3-3

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REDLINE VERSION

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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 61000-3-3:2013

CONTENTS

FOREWORD 4
INTRODUCTION 6

1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 Assessment of voltage changes, voltage fluctuations and flicker 10
4.1 Assessment of a relative voltage change, ~~"d"~~ $d(t)$ 10
4.2 Assessment of the short-term flicker value, P_{st} 11
4.2.1 General 11
4.2.2 Flickermeter 12
4.2.3 Simulation method 12
4.2.4 Analytical method 12
4.2.5 Use of P_{st} = 1 curve 13
4.3 Assessment of long-term flicker value, P_{lt} 13
5 Limits 13
6 Test conditions 14
6.1 General 14
6.2 Measurement ~~accuracy~~ uncertainty 15
6.3 Test supply voltage 15
6.4 Reference impedance 15
6.5 Observation period 16
6.6 General test conditions 16

Annex A (normative) Application of limits and type test conditions for specific equipment 23
Annex B (normative) Test conditions and procedures for measuring d_{max} voltage changes caused by manual switching 31
Annex C (informative) Determination of steady state voltage and voltage change characteristics, as defined in IEC 61000-4-15:2010 32
Annex D (informative) Input relative voltage fluctuation ΔV/V for P_{st} = 1,0 at output [IEC/TR 61000-3-7:2008] 37

Bibliography 38

Figure 1 – Reference network for single-phase and three-phase supplies derived from a three-phase, four-wire supply 18
~~Figure 2 – Histogram evaluation of *U*(*t*) .....~~
~~Figure 3 – Relative voltage change characteristic .....~~
Figure ~~4~~ 2 – Curve for P_{st} = 1 for rectangular equidistant voltage changes 19
Figure ~~5~~ 3 – Shape factors F for double-step and ramp-voltage characteristics 20
Figure ~~6~~ 4 – Shape factors F for rectangular and triangular voltage characteristics 21

PREVIEW

Figure ~~7~~ 5 – Shape factor F for motor-start voltage characteristics having various front times 22
Figure C.1 – Evaluation of $U_{hp}(t)$ 36

Table 1 – Assessment method 12
Table A.1 – Test conditions for hotplates 23
Table A.~~1~~ 2 – Electrode parameters 28
Table A.~~2~~ 3 – Frequency factor R related to repetition rate "r" 30
Table C.1 – Test specification for d_c – d_{max} – $t_{d(t)} > 3{,}3$ % (from Table 12 of IEC 61000-4-15:2010) 35
Table C.2 – Test specification for d_c – d_{max} – $t_{d(t)} > 3{,}3$ % (from Table 13 of IEC 61000-4-15:2010) 35
Table D.1 – Input relative voltage fluctuation ΔV/V for P_{st} = 1,0 at output 37

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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

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This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 61000-3-3 has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

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

This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.

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

a) This edition takes account of the changes made in IEC 61000-4-15:2010.

The text of this standard is based on the following documents:

FDIS	Report on voting
77A/809/FDIS	77A/816/RVD

Full information on the voting for the approval of this standard 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.

A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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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 part is a Product Family Standard.~~

~~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.~~

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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 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.

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.

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

NOTE 1 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 could occur.

NOTE 2 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. 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*~~

IEC/TR 60725, *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, *Arc welding equipment – Part 1: Welding power sources*

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IEC 61000-3-2~~:2005~~, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

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*

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.

~~**3.1**~~
~~**r.m.s. voltage shape, *U(t)***~~
~~the time function of r.m.s. voltage, evaluated as a single value for each successive half period between zero-crossings of the source voltage (see Figure 2)~~

~~**3.6**~~ **3.1**
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 change characteristic
~~***ΔU(t)***~~ ***d(t)***
time function of the relative r.m.s. voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage ~~between~~, except during 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).~~

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

~~**3.3**~~
~~**maximum voltage change characteristic, ΔU_{max}**~~
~~the difference between maximum and minimum r.m.s. values of a voltage change characteristic (see Figure 2)~~

~~**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 to 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.~~