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BASIC EMC PUBLICATION
PUBLICATION FONDAMENTALE EN CEM

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

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

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fonctionnelles et de conception**

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 61000-4-15
Edition 2.0 2010-08

ELECTROMAGNETIC COMPATIBILITY (EMC) –

**Part 4-15: Testing and measurement techniques –
Flickermeter – Functional and design specifications**

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

The text of this interpretation sheet is based on the following documents:

FDIS	Report on voting
77A/966/FDIS	77A/973/RVD

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

Interpretation of requirements for rectangular voltage modulation with duty ratio according to IEC 61000-4-15: Electromagnetic compatibility (EMC) – Testing and measurement techniques – Flickermeter – Functional and design specifications.

IEC 61000-4-15 Ed 2 gives requirements in 6.8 for what is called “Rectangular voltage changes with 20 % duty cycle”. Table 11 provides the test specification for rectangular voltage changes with duty ratio. The requirements per Table 11 and the associated tests patterns caused some questions in the past year, and therefore IEC/SC77A/WG-2 wishes to clarify the title and interpretation per 6.8 which should be read as follows:

6.8 Rectangular voltage modulation for 20 % of the time

The amplitude of the test voltage U is rectangularly modulated with a 50 % duty cycle at 28 Hz. Every minute the amplitude modulation is switched on for 12 s and off for 48 s. Table 11 specifies the modulation depth in terms of voltage fluctuation ($\Delta U/U$), which is further specified in Annex B. The transition time at the edges of the rectangular modulation shall be less than 0,5 ms.

The ten-minute P_{st} indication of the meter under test shall be 1,00 with a tolerance of ± 5 %.

Figure 1 shows a $\Delta U/U = 35$ % for illustration purposes, as a 1 % to 2 % modulation would not be visible. Only 400 ms of the time axis is depicted, showing 200 ms on each side of the modulation on/off switching at 12 s.

NOTE The above text in 6.8 will be considered as a replacement for the original text when IEC 61000-4-15 is updated either through an amendment or replaced by a new edition.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications

FOREWORD

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- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
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International Standard IEC 61000-4-15 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

IEC 61000-4-15 is based on work by the “Disturbances” Working Group of the International Union for Electroheat (UIE), on work of the IEEE, and on work within IEC itself.

It forms part 4-15 of the IEC 61000 series. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This second edition cancels and replaces the first edition published in 1997 and its Amendment 1 (2003) and constitutes a technical revision. This new edition, in particular, adds or clarifies the definition of several directly measured parameters, so that diverging interpretations are avoided.

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

FDIS	Report on voting
77A/722/FDIS	77A/730/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 of the IEC 61000 series, 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.

The contents of the corrigendum of March 2012 and Interpretation Sheet 1 of August 2017 have been included in this copy.

INTRODUCTION

IEC 61000-4 is a part of the IEC 61000 series, according to the following structure:

- Part 1: General
 - General consideration (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 the 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, as technical specifications or technical reports, some of which have already been published as sections. Others are and will be published with the part number followed by a dash and completed by a second number identifying the subdivision (example: IEC 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications

1 Scope and object

This part of IEC 61000 gives a functional and design specification for flicker measuring apparatus intended to indicate the correct flicker perception level for all practical voltage fluctuation waveforms. Information is presented to enable such an instrument to be constructed. A method is given for the evaluation of flicker severity on the basis of the output of flickermeters complying with this standard.

The flickermeter specifications in this part of IEC 61000 relate only to measurements of 120 V and 230 V, 50 Hz and 60 Hz inputs. Characteristics of some incandescent lamps for other voltages are sufficiently similar to the values in Table 1 and Table 2, that the use of a correction factor can be applied for those other voltages. Some of these correction factors are provided in the Annex B. Detailed specifications for voltages and frequencies other than those given above, remain under consideration.

The object of this part of IEC 61000 is to provide basic information for the design and the instrumentation of an analogue or digital flicker measuring apparatus. It does not give tolerance limit values of flicker severity.

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 60068 (all parts), *Environmental testing*

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, *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 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

Partie 4-15: Techniques d'essai et de mesure – Flickermètre – Spécifications fonctionnelles et de conception

AVANT-PROPOS

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La Norme internationale CEI 61000-4-15 a été établie par le sous-comité 77A: Phénomènes basse fréquence, du Comité d'études 77 de la CEI: Compatibilité électromagnétique.

La CEI 61000-4-15 s'appuie sur les travaux du Groupe de Travail «Perturbations» de l'Union Internationale de l'Electrothermie (UIÉ), sur les travaux de l'IEEE et sur les travaux effectués au sein de la CEI.

Elle constitue la partie 4-15 de la série CEI 61000. Elle a le statut de publication fondamentale en CEM en accord avec le Guide 107 de la CEI.

Cette deuxième édition annule et remplace la première édition publiée en 1997 et son amendement 1 (2003), et constitue une révision technique. Cette nouvelle édition, en

particulier, ajoute ou clarifie la définition de plusieurs paramètres mesurés directement, de telle façon que l'on évite des interprétations divergentes.

Le texte de cette norme est basé sur les documents suivants:

FDIS	Rapport de vote
77A/722/FDIS	77A/730/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.

Une liste de toutes les parties de la série CEI 61000, sous le titre général *Compatibilité électromagnétique (CEM)*, peut être trouvée sur le site internet de la CEI.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de la CEI sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

Le contenu du corrigendum de mars 2012 et de la feuille d'interprétation 1 d'août 2017 a été pris en considération dans cet exemplaire.

INTRODUCTION

La CEI 61000-4 fait partie de la série des normes 61000 de la CEI, selon la répartition suivante:

- 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
 - Guide d'installation
 - Méthodes et dispositifs d'atténuation
- Partie 6: Normes génériques
- Partie 9: Divers

Chaque partie est, à son tour, subdivisée en plusieurs parties, publiées soit sous forme de normes internationales soit sous forme de spécifications techniques ou rapports techniques, dont certaines ont déjà été publiées en tant que sections. D'autres parties sont publiées ou le seront avec le numéro de partie suivi d'un tiret et complétées par un second numéro identifiant la sous-partie (par exemple: CEI 61000-6-1).

COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

Partie 4-15: Techniques d'essai et de mesure – Flickermètre – Spécifications fonctionnelles et de conception

1 Domaine d'application et objet

La présente partie de la CEI 61000 traite des spécifications fonctionnelles et de conception d'un appareil mesurant le flicker, destiné à indiquer le niveau correct de perception du flicker du flux lumineux (le flicker) pour toutes les formes d'ondes de fluctuation de la tension rencontrées dans la pratique. On y présente des informations permettant de construire un tel instrument. Une méthode d'évaluation de la sévérité du flicker est fournie à partir des résultats obtenus avec des flickermètres en conformité avec cette norme.

Les spécifications du flickermètre dans cette partie concernent uniquement les mesures des entrées de 120 V et 230 V, 50 Hz et 60 Hz. Les caractéristiques de certaines lampes à incandescence pour d'autres tensions sont suffisamment similaires aux valeurs des Tableaux 1 et 2 pour que l'utilisation d'un facteur de correction puisse être appliquée à ces autres tensions. Certains de ces facteurs de correction sont fournis à l'Annexe B. Des spécifications détaillées pour des tensions et des fréquences autres que celles données ci-dessus sont à l'étude.

L'objet de la présente partie de la CEI 61000 est de fournir les informations nécessaires à la conception et à la réalisation d'un flickermètre analogique ou numérique. Elle ne spécifie pas les valeurs limites tolérables du flicker.

2 Références normatives

Les documents de référence suivants sont indispensables pour l'application du présent document. 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 60068 (toutes les parties), *Essais d'environnement*

CEI 61000-3-3, *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*

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 61010-1, *Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire – Partie 1: Exigences générales*

CEI 61326-1, *Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM – Partie 1: Exigences générales*

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –

**Part 4-15: Testing and measurement techniques –
Flickermeter – Functional and design specifications**

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61000-4-15 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

IEC 61000-4-15 is based on work by the “Disturbances” Working Group of the International Union for Electroheat (UIE), on work of the IEEE, and on work within IEC itself.

It forms part 4-15 of the IEC 61000 series. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This second edition cancels and replaces the first edition published in 1997 and its Amendment 1 (2003) and constitutes a technical revision. This new edition, in particular, adds or clarifies the definition of several directly measured parameters, so that diverging interpretations are avoided.

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

FDIS	Report on voting
77A/722/FDIS	77A/730/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 of the IEC 61000 series, 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 publication using a colour printer.

INTRODUCTION

IEC 61000-4 is a part of the IEC 61000 series, according to the following structure:

- Part 1: General
 - General consideration (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 the 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, as **technical specifications** or technical reports, some of which have already been published as sections. Others are and will be published with the part number followed by a dash and completed by a second number identifying the subdivision (example: IEC 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications

1 Scope and object

This part of IEC 61000 gives a functional and design specification for flicker measuring apparatus intended to indicate the correct flicker perception level for all practical voltage fluctuation waveforms. Information is presented to enable such an instrument to be constructed. A method is given for the evaluation of flicker severity on the basis of the output of flickermeters complying with this standard.

~~This section is based on specifications prepared by the “Disturbances” working group of the International Union for Electroheat (UIE) and published in 1992. Consequently the flickermeter specifications in this section relate only to measurements of 230 V, 50 Hz inputs; specifications for other voltages and other frequencies are under consideration.~~

The flickermeter specifications in this part of IEC 61000 relate only to measurements of 120 V and 230 V, 50 Hz and 60 Hz inputs. Characteristics of some incandescent lamps for other voltages are sufficiently similar to the values in Table 1 and Table 2, that the use of a correction factor can be applied for those other voltages. Some of these correction factors are provided in the Annex B. Detailed specifications for voltages and frequencies other than those given above, remain under consideration.

The object of this part of IEC 61000 is to provide basic information for the design and the instrumentation of an analogue or digital flicker measuring apparatus. It does not give tolerance limit values of flicker severity.

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 60068-2-1:1990, Environmental testing – Part 2: Tests – Tests A: Cold~~

~~IEC 60068-2-2:1974, Environmental testing – Part 2: Tests – Tests B: Dry heat~~

~~IEC 60068-2-3:1969, Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state~~

~~IEC 60068-2-14:1984, Environmental testing – Part 2: Tests – Test N: Change of temperature~~

IEC 60068 (all parts), *Environmental testing*

IEC 61000-3-3:1994, *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, 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 61000-4-2:1995, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test~~

~~IEC 61000-4-3:1995, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test~~

~~IEC 61000-4-4:1995, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test~~

~~IEC 61000-4-5:1995, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test~~

~~IEC 61000-4-6:1996, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances induced by radio-frequency fields~~

~~IEC 61000-4-8:1993, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 8: Power frequency magnetic field immunity test~~

~~IEC 61000-4-9:1993, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 9: Pulse magnetic field immunity test~~

~~IEC 61000-4-11:1994, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 11: Voltage dips, short interruptions and voltage variations immunity tests~~

~~IEC 61000-4-12:1995, Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 12: Oscillatory waves immunity test~~

~~IEC 61010-1:1990, Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements~~

~~IEC 61326-1:1997, Electrical equipment for measurement, control and laboratory use — EMC requirements — Part 1: General requirements~~

~~IEC 61326-10, Electrical equipment for measurement, control and laboratory use — Electromagnetic compatibility (EMC) requirements — Part 10: Particular requirements for equipment used in industrial locations~~