

Australian/New Zealand Standard

**Electromagnetic compatibility (EMC)**

**Part 4.15: Testing and measurement techniques—Flickermeter—Functional and design specifications**



## **AS/NZS 61000.4.15:2012**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-034, Power Quality. It was approved on behalf of the Council of Standards Australia on 4 May 2012 and on behalf of the Council of Standards New Zealand on 26 April 2012.

This Standard was published on 22 May 2012.

---

The following are represented on Committee EL-034:

Australian Chamber of Commerce and Industry  
Australian Industry Group  
Australian Information Industry Association  
Bureau of Steel Manufacturers of Australia  
Consumer Electronics Suppliers Association  
Consumers Federation of Australia  
Electrical Regulatory Authorities Council  
Electricity Engineers Association, New Zealand  
Energy Networks Association  
Engineers Australia  
Lighting Council of Australia  
Ministry of Economic Development, New Zealand  
National Measurement Institute  
New Zealand Coordinating Committee on Power & Telecommunication Systems  
New Zealand Electric Fence Energiser Manufacturers Standards WG  
Telstra Corporation  
University of Canterbury, New Zealand  
University of Wollongong

---

### **Keeping standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at [www.saiglobal.com.au](http://www.saiglobal.com.au) or Standards New Zealand web site at [www.standards.co.nz](http://www.standards.co.nz) and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

---

*This Standard was issued in draft form for comment as DR AS/NZS 61000.4.15.*

---

Australian/New Zealand Standard™

**Electromagnetic compatibility (EMC)**

**Part 4.15: Testing and measurement techniques—Flicker meter—Functional and design specifications**

First published (in part) as AS/NZS 4376:1996 and AS/NZS 4377:1996.  
Previous edition AS/NZS 61000.4.15:2005.  
Second edition 2012.

**COPYRIGHT**

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140

ISBN 978 1 74342 114 7

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-034, Power Quality, to supersede AS/NZS 61000.4.15:2005, *Electromagnetic compatibility (EMC)—Part 4.15: Testing and measurement techniques—Flickermeter—Function and design specifications*.

The objective of this Standard 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.

This Standard is identical with, and has been reproduced from IEC 61000-4-15, Ed.2.0 (2010), *Electromagnetic compatibility (EMC)—Part 4.15: Testing and measurement techniques—Flickermeter—Functional and design specifications* and incorporates its Corrigendum 1 (2012).

As this Standard is reproduced from an International Standard, the following applies:

- Its number appears on the cover and title page while the International Standard number appears only on the cover.
- In the source text ‘this part of IEC 61000’ should read ‘this part of AS/NZS 61000’.
- A full point substitutes for a comma when referring to a decimal number.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
IEC 60068	Environmental testing	AS/NZS 60068	Environmental testing
61000	Electromagnetic compatibility (EMC)	AS/NZS 61000	Electromagnetic compatibility (EMC)
61000-3-3	Part 3-3: Limits—Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection	61000.3.3	Part 3.3: Limits—Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection
61000-3-11	Part 3-11: Limits—Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems—Equipment with rated current $\leq 75$ A and subject to conditional connection	61000.3.11	Part 3.11: Limits—Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems—Equipment with rated current less than or equal to 75 A and subject to conditional connection
61010	Safety requirements for electrical equipment for measurement, control, and laboratory use	61010	Safety requirements for electrical equipment for measurement, control and laboratory use
61010-1	Part 1: General requirements	61010.1	Part 1: General requirements

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

## CONTENTS

1	Scope and object.....	7
2	Normative references.....	7
3	Parameters and symbols.....	8
3.1	Directly measured parameters and characteristics .....	8
3.1.1	General .....	8
3.1.2	Half period rms value of the voltage .....	8
3.1.3	Half period rms value characteristics.....	8
3.1.4	Relative half period rms value characteristics.....	8
3.1.5	Steady state voltage and voltage change characteristics .....	9
3.1.6	Steady state voltage change .....	9
3.1.7	Maximum voltage change during a voltage change characteristic .....	9
3.1.8	Maximum steady state voltage change during an observation period.....	9
3.1.9	Maximum absolute voltage change during an observation period.....	10
3.1.10	Voltage deviation .....	10
3.1.11	Centre voltage .....	10
3.2	Symbols .....	10
4	Description of the instrument .....	11
4.1	General .....	11
4.2	Block 1 – Input voltage adaptor.....	11
4.3	Block 2 – Squaring multiplier.....	11
4.4	Block 3 – Weighting filters .....	12
4.5	Block 4 – Squaring and smoothing .....	12
4.6	Block 5 – On-line statistical analysis .....	12
4.7	Outputs .....	13
4.7.1	General .....	13
4.7.2	$P_{lin}$ output.....	13
4.7.3	$P_{inst}$ output .....	13
4.7.4	$P_{st}$ output .....	13
4.7.5	$P_{lt}$ output .....	13
4.7.6	d-meter outputs .....	13
5	Specification.....	13
5.1	Response and accuracy.....	13
5.2	Input voltage ranges .....	18
5.3	Input voltage adaptor .....	18
5.4	Weighting filters.....	18
5.5	Weighting filter response in block 3.....	18
5.6	Squaring multiplier and sliding mean filter .....	19
5.7	General statistical analysis procedure .....	19
5.7.1	General .....	19
5.7.2	Short-term flicker evaluation .....	19
5.7.3	Long-term flicker evaluation .....	20
6	Flickermeter tests .....	20
6.1	General .....	20
6.2	Sinusoidal/rectangular voltage changes .....	21

	Page
6.3 Rectangular voltage changes and performance testing.....	21
6.4 Combined frequency and voltage changes – Class F1 flickermeters .....	22
6.5 Distorted voltage with multiple zero crossings – Class F1 flickermeters .....	23
6.6 Bandwidth test using harmonic and inter-harmonic side band modulation .....	23
6.7 Phase jumps – Class F1 flickermeters .....	24
6.8 Rectangular voltage changes with 20 % duty cycle .....	24
6.9 <i>d</i> parameter test, $d_c$ , $d_{max}$ , and $t_{(d(t))} > 3,3\%$ .....	25
7 Environmental and other requirements .....	27
7.1 General .....	27
7.2 Insulation, climatic, electromagnetic compatibility, and other tests .....	27
Annex A (normative) Techniques to improve accuracy of flicker evaluation .....	30
Annex B (informative) Meaning of $\Delta U/U$ and number of voltage changes, $d_c$ , $d(t)$ , $d_{max}$ examples .....	32
Annex C (informative) Sample protocols for type testing .....	36
Bibliography .....	40
Figure 1 – Illustration of 28 Hz modulated test voltage with 20 % duty cycle .....	25
Figure 2 – Functional diagram of IEC flickermeter .....	28
Figure 3 – Basic illustration of the time-at-level method for $f_{st} = 2,000$ .....	29
Figure B.1 – Rectangular voltage change $\Delta U/U = 10\%$ , 8,8 Hz, 17,6 changes/second.....	33
Figure B.2 – Illustration of “ <i>d</i> ” parameter definitions .....	35
Table 1a – Normalized flickermeter response 120 V / 50 Hz and 120 V / 60 Hz for sinusoidal voltage fluctuations .....	14
Table 1b – Normalized flickermeter response 230 V / 50 Hz and 230 V / 60 Hz for sinusoidal voltage fluctuations .....	15
Table 2a – Normalized flickermeter response 120 V / 50 Hz and 120 V / 60 Hz for rectangular voltage fluctuations .....	16
Table 2b – Normalized flickermeter response 230 V / 50 Hz and 230 V / 60 Hz for rectangular voltage fluctuations .....	17
Table 3 – Indicative values for the parameters of lamps.....	19
Table 4 – Test specifications for flickermeter .....	21
Table 5 – Test specification for flickermeter classifier .....	22
Table 6 – Test specification for combined frequency and voltage changes – Class F1 flickermeters .....	23
Table 7 – Test specification for distorted voltage with multiple zero crossings – Class F1 flickermeters .....	23
Table 8 – 8,8 Hz modulation depth for distorted voltage test – Class F 1 flickermeters .....	23
Table 9 – Test specification for Harmonics with side band – Class F1 flickermeters .....	24
Table 10 – Test specification for phase jumps – Class F1 flickermeters .....	24
Table 11 – Test specification for rectangular voltage changes with duty ratio .....	24
Table 12 – Test specification for $d_c$ , $d_{max}$ , $t_{(d(t))} > 3,3\%$ .....	25
Table 13 – Test specification for $d_c$ , $d_{max}$ , $t_{(d(t))} > 3,3\%$ .....	26
Table B.1 – Correction factor for other voltage/frequency combinations .....	33

## FOREWORD

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 contents of the corrigendum of March 2012 have been included in this copy.

Currently in preview, click buy full version

## AUSTRALIAN/NEW ZEALAND STANDARD

**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*