

Australian/New Zealand Standard™

## 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  $\leq 16$  A per phase and not subject to conditional connection**



### **AS/NZS 61000.3.3:2012**

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 30 May 2012 and on behalf of the Council of Standards New Zealand on 8 June 2012.

This Standard was published on 28 June 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 and 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 Standards may also be withdrawn.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 61000.3.3.*

---

# Australian/New Zealand Standard™

## 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 $\leq 16$ A per phase and not subject to conditional connection

Originated in Australia as AS 2279.3—1985.  
First New Zealand edition AS/NZS 61000.3.3:1998.  
Previous edition AS/NZS 61000.3.3:2006.  
Fourth 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

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-034, Power Quality, to supersede AS/NZS 61000.3.3:2006, *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  $\leq 16$  A per phase and not subject to conditional connection (IEC 61000-3-3, Ed.1.2 (2005) MOD)*.

The objective of this Standard is to specify limits of voltage changes which may be produced by equipment tested under specified conditions and to provide guidance on methods of assessment.

This Standard is identical with, and has been reproduced from IEC 61000-3-3, Ed.2.0 (2008), *Electromagnetic compatibility (EMC)—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*.

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

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

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 or Australian/New Zealand Standard</i>	
IEC		AS	
60974	Arc welding equipment	60974	Arc welding equipment
60974-1	Part 1: Welding power sources	60974.1	Part 1: Welding power sources (IEC 60974-1:2000, MOD)
		AS/NZS	
61000	Electromagnetic compatibility (EMC)	61000	Electromagnetic compatibility (EMC)
61000-3-2	Part 3-2: Limits—Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase)	61000.3.2	Part 3.2: Limits—Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase) IEC 61000-3-2, Ed. 3.0 (2005) MOD
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 $\leq 75$ A and subject to conditional connection
61000-4-15	Part 4-15: Testing and measurement techniques—Flickermeter—Functional and design specifications	61000.4.15	Part 4.15: Testing and measurement techniques—Flickermeter—Function and design specifications

The term ‘normative’ has been used in this Standard to define the application of the annex to which it applies. A ‘normative’ annex is an integral part of a Standard.

## CONTENTS

1	Scope.....	6
2	Normative references .....	6
3	Definitions .....	7
4	Assessment of voltage changes, voltage fluctuations and flicker .....	8
4.1	Assessment of a relative voltage change, "d" .....	8
4.2	Assessment of the short-term flicker value, $P_{st}$ .....	9
4.2.1	Flickermeter .....	9
4.2.2	Simulation method.....	9
4.2.3	Analytical method .....	9
4.2.4	Use of $P_{st} = 1$ curve.....	10
4.3	Assessment of long-term flicker value, $P_{lt}$ .....	10
5	Limits .....	10
6	Test conditions .....	11
6.1	General.....	11
6.2	Measurement accuracy .....	12
6.3	Test supply voltage .....	12
6.4	Reference impedance.....	12
6.5	Observation period.....	12
6.6	General test conditions.....	13
	Annex A (normative) Application of limits and type test conditions for specific equipment.....	18
	Annex B (normative) Test conditions and procedures for measuring $d_{max}$ voltage changes caused by manual switching .....	25
	Figure 1 – Reference network for single-phase and three-phase supplies derived from a three-phase, four-wire supply.....	14
	Figure 2 – Histogram evaluation of $U(t)$ .....	15
	Figure 3 – Relative voltage change characteristic .....	15
	Figure 4 – Curve for $P_{st}=1$ for rectangular equidistant voltage changes .....	16
	Figure 5 – Shape factors $F$ for double-step and ramp-voltage characteristics.....	16
	Figure 6 – Shape factors $F$ for rectangular and triangular voltage characteristics.....	17
	Figure 7 – Shape factor $F$ for motor-start voltage characteristics having various front times .....	17
	Table 1 – Assessment method .....	9
	Table A.1 – Electrode parameters.....	23
	Table A.2 – Frequency factor $R$ related to repetition rate "r" .....	24

## INTRODUCTION

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.

## AUSTRALIAN/NEW ZEALAND STANDARD

**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  $\leq 16$  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  $\leq 75$  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 The limits in this part of IEC 61000 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 referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050(161):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  $\leq 75$  A per phase*

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

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