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Power Quality

Recommendations for the application of AS/NZS 61000.3.6 and AS/NZS 61000.3.7

Standards Australia

Handbook

Power quality—Recommendations for the application of AS/NZS 61000.3.6 and AS/NZS 61000.3.7

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INTRODUCTION

The purpose of this handbook is to provide a coherent and practical guide to the application of the current Australian/New Zealand Standards for limiting harmonic voltages and voltage fluctuations in medium voltage (MV) and high voltage (HV) networks, AS/NZS 61000.3.6 and AS/NZS 61000.3.7 respectively. The handbook is intended to serve as a supporting document to the National Electricity Code and is the initial release of the Standards Australia guideline referred to in Schedule 5.1 of Chapter 5 of the Code.

In line with Standards Australia's policy of encouraging maximum alignment with international Standards, the old AS 2279 series of harmonics and voltage fluctuations Standards have been replaced by adoptions (the AS/NZS 61000 series) of the appropriate IEC 61000 Standards. These Standards are different in concept and application, and are not trivial to interpret. Hence, this handbook has been prepared to assist distribution systems engineers, consumers' consultants, and any other interested parties to apply the new Standards in a systematic and consistent way.

The handbook has been prepared by Professor Vic Gosbell's power quality team at the University of Wollongong, School of Electrical, Computer and Telecommunications Engineering, with review by selected members of the power quality standards committee.

In preparing this handbook, new methodologies have been developed. Some of these methods expand the procedures given in the Standards, others simplify the approach given, while others are totally new and are offered as a way ahead. This is particularly the case with the setting of utility planning levels. Ultimately, field results will be used to fine-tune the methods given.

This handbook specifically deals with distribution networks (132 kV or less) with radial network topologies. It is anticipated that those parts of the Standards that are concerned with meshed systems and systems at higher voltage levels will be covered in future publications.

The handbook is divided into four sections:

1. Application guide to AS/NZS 61000.3.6 for distorting loads
2. Methods for establishing harmonic planning levels
3. Application guide to AS/NZS 61000.3.7 for fluctuating loads
4. Methods for establishing flicker planning levels.

Sections 1 and 2 are to be read in conjunction with AS/NZS 61000.3.6; Sections 3 and 4 are to be read in conjunction with AS/NZS 61000.3.7. Within the text references to the Standard are in bold case enclosed in square brackets.

Appendices A, B, C, D, E and F relate to Section 1; G, H, I and J relate to Section 2; K and L relate to Section 3 and M relates to Section 4.

A questionnaire sent to power utilities to establish existing practices in Australia is reproduced as Appendix N.

CONTENTS

Page

Page

Power quality—Recommendations for the application of AS/NZS 61000.3.6 and AS/NZS 61000.3.7

SECTION 1 APPLICATION GUIDE TO AS/NZS 61000.3.6 FOR DISTORTING LOADS

1.1 SCOPE OF THE SECTION

AS/NZS 61000.3.6 (referred to subsequently in this Section as the Standard) specifies the conditions for the connection of harmonically distorting loads whose point of common connection (PCC) is in MV and HV power systems [1]*. These voltage levels are defined by the International Electrotechnical Commission and shown in Table 1.1 **[Clause 1, Footnote 2]** †.

TABLE 1.1

IEC STANDARD VOLTAGE LEVELS

Voltage level	Range (line-line)
LV (Low voltage)	$U_n \leq 1$ kV
MV (Medium voltage)	1 kV < U_n ≤ 35 kV
HV (High voltage)	35 kV < U_n ≤ 230 kV
EHV (Extra high voltage)	230 kV < U_n

This Section is intended for use by distribution company power quality engineers and installation engineers responsible for preparing connection agreements for MV/HV consumers. It is self-contained, with all equations and all necessary data from the Standard included. All procedures are illustrated with worked out examples (See Appendix A).

The Standard itself is based on IEC 61000.3.6:1996 Type 3 Technical Report, with slight modifications made by the Joint Standards Australia/Standards New Zealand Committee EL-034 'Power Quality' (formerly titled 'Electric Waveform Distortion'). IEC Type 3 documents are not as prescriptive as International Standards. AS/NZS 61000.3.6 contains several alternative methods for some allocation methods and this may create conflict between utilities and consumers if they use different methods to determine the consumer's harmonic allocation. Some techniques are presented incompletely with references to documents which are not readily available in Australia and this might handicap the infrequent user. Some of the assessment methods given are complex and time-consuming and it is not clear that this attention to detail is warranted in Australia yet.

This Section contains recommended practices chosen from the Standard. Preference was given to practices which were technically sound and allowed the maximum harmonic capability of the power system to be used with some margin for uncertainties.

* Numbers in square brackets refer to background documents detailed in Clause 1.9.1, References.

† References to AS/NZS 61000.3.6 are in bold case enclosed in square brackets.