AS 61000.3.100—2011
(Incorporating Amendment No. 1)

AS 61000.3.100—2011

Electromagnetic compatibility (EMC)

Part 3.100: Limits—Steady state voltage limits in public electricity systems

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- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Australian Information Industry Association
- Bureau of Steel Manufacturers of Australia
- Consumer Electronic Suppliers Association
- Consumers Federation of Australia
- Electrical Regulatory Authorities Council
- Energy Networks Association
- Engineers Australia
- Lighting Council of Australia
- National Measurement Institute
- Telstra Corporation
- University of Wollongong

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EL-034, Power Quality. After consultation with stakeholders in both countries Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard incorporates Amendment No. 1 (March 2016). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of this Standard is to—

(a) define and describe the limits of the steady state supply voltage variation in public electricity systems at the customer connection points;

(b) provide a consistent methodology for the assessment of steady state voltage parameters using power quality monitors; and

(c) provide recommended threshold voltage levels for the detection of voltage dips and voltage swells that are consistent with the prescribed steady state voltage limits.

This Standard is structured so that all requirements are in the main section of the Standard and all recommendations and illustrative examples are in the Appendices.

This Standard is intended to be adopted by International Electrotechnical Commission (IEC) as an International Standard. Therefore the Standard number has been allocated in alignment with the IEC 61000-3 *Electromagnetic compatibility (EMC)—Limits* series Standards.

The term ‘informative’ has been used in this Standard to define the application of the appendices to which it applies. An ‘informative’ appendix is only for information and guidance.

In selecting the parameters which serve to protect electricity customers from wide variations of steady state voltage, special consideration was given to IEC 60038 and AS 60038, *Standard voltages*. All the 230 V steady state voltage limits used in this Standard have been selected to be within the range specified within IEC 60038 and having due regard to AS 60038 for Australian conditions. The strategy used in selecting the steady state voltage ranges has been based on the following:

(i) The 230 V ±10% specified in IEC 60038 is a generic all inclusive range that broadly and simultaneously covers the historic ranges 240 V ±6% and 220 V ±6%. A 230 V ±6% range also sits within the wider 230 V ±10% range. IEC 60038 specifies what a 230 V nominal voltage means but does not specify the power quality measurement requirements.

(ii) A 230 V ±10% (total 20%) range of steady state voltage at the customer connection point is too wide for all existing customer equipment to operate effectively and efficiently. While many items of customer equipment operate effectively and efficiently over the wide steady state voltage range, some items of customer equipment are sensitive to steady state voltage levels including:

  (A) Incandescent lighting.

  (B) Discharge lighting incorporating fixed impedance ballasts (as distinct from electronic ballasts).

(C) Resistive devices that are required to provide instantaneous heating including electric toasters, electric radiators, instantaneous electric water heaters, clothes dryers, hair dryers and many electric cooking appliances.

(D) Electric motors (non-variable speed drive types).

(iii) A total supply steady state voltage range of 16% and a preferred sub-range of 8% is considered appropriate and achievable by network service providers and is in line with keeping distribution network losses at reasonable levels. This range is consistent with AS 60038.

(iv) The preferred 8% sub-range encourages network service providers to provide steady voltage that is closer to the 230 V nominal level where manufacturers tend to optimize the performance of their equipment to meet 'Mandatory Energy Performance Standards' test requirements. The preferred 8% sub-range also is aimed to cater for short duration voltage rise effects of distributed embedded generation, especially small scale photovoltaics.

(v) Recommended voltage swell measurement thresholds have generally been set at 4% above $V_{99\%}$ levels and recommended voltage dip measurement thresholds have been set at 4% below $V_{1\%}$ levels. While voltage swell and dip thresholds have been recommended in this Standard, possible future limits on the frequency of such occurrences remains a subject for further research.

This Standard has set limits on $V_{1\%}$ and $V_{99\%}$ percentile values in preference to $V_{0\%}$ and $V_{100\%}$ values due to the following reasons:

(1) To filter out erroneous and non-representative steady state measurements that sometimes occur during the power quality monitoring process. These sometimes occur when instruments are connected/disconnected and during short duration network disturbances.

(2) To accommodate the impacts of short duration power system switching events.

(3) To alert equipment manufacturers that steady state voltages can and will move outside the $V_{1\%}$ to $V_{99\%}$ range.

(4) To provide consistency with many other power quality standards where limits are defined in terms of statistical quantities.

(5) To provide greater consistency and reproducibility when repeat measurement surveys are completed.