

Australian/New Zealand Standard™

**Electrical installations — Safety of
battery systems for use with power
conversion equipment**



AS/NZS 5139:2019

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battery systems for use with power
conversion equipment**

Originated in Australia as AS 4086.2—1997.
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Preface

This Standard was prepared by Joint Standards Australia/Standards New Zealand Committee EL-042, Renewable Energy Power Supply Systems and Equipment, to supersede AS 4086.2—1997, *Secondary batteries for use with stand-alone systems, Part 2: Installation and maintenance*.

AS 4086.2—1997 will also remain current for three months after the date of publication of this Standard and after that period it will be superseded by AS/NZS 5139:2019. Regulatory authorities that reference this Standard in regulation may apply these requirements at a different time. Users of this Standard should consult with these authorities to confirm their requirements.

The objective of this Standard is to provide manufacturers, system integrators, designers and installers of battery energy storage systems with the requirements for the safety and installation of battery systems connected to power conversion equipment for the supply of a.c. and/or d.c. power.

This Standard necessarily deals with existing types of energy storage, but is not intended to discourage innovation or to exclude materials, equipment and methods that may be developed in the future.

Due to the innovative nature of many new energy storage technologies and the lack of detailed information on their risks and failures, it is necessary to state that the material contained in this Standard is based on the best information available at the time of its preparation. During the process of the development of this Standard, these technologies are evolving and it is expected that this document will require ongoing updating to truly ensure safe installation and operation of battery energy storage systems. Revisions may be made from time to time in view of such developments, and amendments to this edition will be made when necessary.

This Standard contains a substantial number of informative components so that the level of knowledge and understanding in this new field of technology and its application is increased and so that this information can act as a guide for interested parties.

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The terms “normative” and “informative” are used Standards to define the application of the appendix to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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Introduction

The installation of grid-connected energy storage systems, which include batteries, is a relatively new and growing market, and one in which there is a lack of definitive Standards.

Existing Standards for the design and installation of stationary battery systems were prepared for use with traditional lead-acid and nickel cadmium battery technology, and do not address recent production and application innovations and developments. These innovations include the following:

- (a) Newer battery technologies, including battery chemistry types other than lead-acid, such as lithium technologies (e.g. lithium ion, lithium iron phosphate), flow technologies (e.g. zinc bromine, vanadium redox flow), and hybrid ion technologies (e.g. aqueous). At this stage, this Standard has not considered all issues related to different technologies such as high temperature batteries (e.g. NaNiCl batteries or sodium sulfur batteries). For technologies not considered, a suitable risk assessment would need to be performed.
- (b) New developments in interconnection equipment (e.g. multiple-mode inverters), which can result in batteries being continually connected to the grid, and also include photovoltaic (PV) or other energy sources as an integrated system.
- (c) Cheaper cost structures resulting in battery systems being utilized more widely and in many more applications, such as becoming more prevalent in domestic and residential electrical installations.

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Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This Standard sets out general installation and safety requirements for battery energy storage systems (BESSs), where the battery system is installed in a location, such as a dedicated enclosure or room, and is connected with power conversion equipment (PCE) to supply electric power to other parts of an electrical installation.

This Standard sets out the requirements from the battery system up to but not including the PCE. This Standard also applies to pre-assembled integrated battery energy storage systems, which also include PCE(s).

This Standard outlines the potential hazards that are associated with battery energy storage systems and their associated battery systems and specifies installation methods that minimize risks posed by these hazards.

This Standard is applicable for the following battery systems:

- (a) Nominal voltage between 12 V d.c. and 1500 V d.c.
- (b) Connected to either single or multiple PCEs.
- (c) Using secondary or rechargeable cells.
- (d) With a rated capacity equal to or greater than 1 kWh and no more than 200 kWh, at —
 - (i) C10 rating, for lead acid batteries; or
 - (ii) 0.1C, for lithium technologies; or
 - (iii) manufacturer's specified energy capacity, for other technologies.

Where an installation includes multiple battery energy storage systems, this Standard applies to each individual battery energy storage system if —

- (A) the total energy storage capacity is equal to or greater than 1 kWh; and
- (B) each individual BESS is no more than 200 kWh.

This Standard does not apply to battery systems in the following electrical installation types:

- (1) Premises with critical power continuity requirements (e.g. acute care hospitals, substation support and black start).
- (2) Telecommunication applications.
- (3) Electric vehicles.
- (4) Portable equipment.
- (5) Uninterruptible power systems (UPS) that are in accordance with AS 62040.1.1 and AS 62040.1.2.
- (6) Transportable structures and vehicles that are in accordance with AS/NZS 3001.