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Electrical energy storage (ESS) systems -
Part 5-4: Safety test methods and procedures for grid integrated EES systems - Lithium ion battery-based systems

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IEC 62933-5-4 has been prepared by IEC technical committee 120: Electrical Energy Storage (ESS) systems. It is an International Standard.

This International Standard is to be used in conjunction with IEC 62933-5-2:2025.

The text of this International Standard is based on the following documents:

Draft	Report on voting
120/448/FDIS	120/456/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62933 series, published under the general title *Electrical energy storage (EES) systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

The general safety requirements for EES systems are provided in IEC 62933-5-1. The safety requirements for battery energy storage systems (BESS) with subsystems utilizing electrochemical-based batteries are described in IEC 62933-5-2. In this document, among the safety provisions specified in IEC 62933-5-2, tests methods and procedures specific to the safety of BESS using lithium ion batteries in the subsystem are specified. This document is prepared for the following reasons:

a) To provide additional test methods and procedures specifically for lithium ion battery-based energy storage systems.

b) This document was developed based on the investigation results of BESS accidents that occurred over the world.

1 Scope

This part of IEC 62933 primarily describes the safety test methods and procedures for grid-connected energy storage systems where a lithium ion battery-based subsystem is used.

This document provides test methods and procedures to validate safety issues specifically related to the use of a lithium ion battery-based subsystem, primarily based on IEC 62933-5-1, which establishes criteria for ensuring the safe applications and use of electrical energy storage systems of any type or size, and IEC 62933-5-2, which further specifies safety provisions arising from the use of an electrochemical storage subsystems in EES systems.

All test methods and procedures are based on the requirements of IEC 62933-5-2. This document includes only the test methods specifically related to lithium ion battery-based BESS and is based on actual tests.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60079-29 (all parts), *Explosive atmospheres - Gas detectors*

IEC 60730-1, *Automatic electrical controls - Part 1: General requirements*

IEC 61000-4-18, *Electromagnetic compatibility (EMC) - Part 4-18: Testing and measurement techniques - Damped oscillatory wave immunity test*

IEC 61000-6-7, *Electromagnetic compatibility (EMC) - Part 6-7: Generic standards - Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*

IEC 62933-1, *Electrical energy storage (EES) systems - Part 1: Vocabulary*

IEC 62933-5-1, *Electrical energy storage (EES) systems - Part 5-1: Safety considerations for grid integrated EES systems - General specification*

IEC 62933-5-2:2025, *Electrical energy storage (EES) systems – Part 5-2: Safety requirements for grid-integrated EES systems – Electrochemical-based systems*

IEC 63056, *Secondary lithium cells and batteries for use in electrical energy storage systems - General requirements and methods of test*

CISPR 11, *Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement*

CISPR 16-1-2, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Coupling devices for conducted disturbance measurements*

Bibliography

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices*

IEC 60068-2-52, *Environmental testing - Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 61025, *Fault tree analysis (FTA)*

IEC 61427-2:2015, *Secondary cells and batteries for renewable energy storage – General requirements and methods of test - Part 2: On-grid applications*
IEC 61427-2:2015/AMD1:2024

IEC 62477-1, *Safety requirements for power electronic converter systems and equipment - Part 1: General requirements*

IEC 62619:2022, *Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications*

NFPA 69, *Standard on Explosion Prevention Systems*

UL 9540A, *Test Method for Evaluating Thermal Runaway Fir Propagation in Battery Energy Storage Systems*

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