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Part 5-4: Safety test methods and procedures for grid integrated EES systems - Lithium ion battery-based systems

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

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- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



120/332/CD

COMMITTEE DRAFT (CD)

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2023-08-11

CLOSING DATE FOR COMMENTS:
2023-11-03

SUPERSEDES DOCUMENTS:
120/193/NP, 120/200A/RVN

IEC TC 120 : ELECTRICAL ENERGY STORAGE (EES) SYSTEMS	
SECRETARIAT: Japan	SECRETARY: Mr Hideki HAYASHI
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 21,SC 21A,TC 22,SC 22F,TC 64,TC 77,TC 95,TC 99	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☒ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY	

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TITLE:

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

NOTE FROM TC/SC OFFICERS:

This CD was discussed and reviewed by WG5 experts.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

**Part 5-4: Safety test methods and procedures for grid integrated EES systems –
Lithium ion battery-based systems**

FOREWORD

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International Standard IEC 62933-5-4 has been prepared by subcommittee 120: Electrical energy storage(EES) systems.

a) This International Standard is to be used in conjunction with IEC 62933-5-2:2020.

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/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.

93 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
94 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
95 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
96 described in greater detail at <http://www.iec.ch/standardsdev/publications>.

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

- 100 • reconfirmed,
- 101 • withdrawn,
- 102 • replaced by a revised edition, or
- 103 • amended.

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105

106

INTRODUCTION

107 The general safety requirements for EES systems are listed in IEC 62933-5-1. The safety
108 requirements for EESS with subsystem utilizing electro-chemical based batteries are described
109 in IEC 62933-5-2. In this standard, among the safety provisions specified in IEC 62933-5-2,
110 tests methods and procedures related to safety specific to BESS using lithium ion battery in the
111 subsystem are specified. This document is prepared for the following reasons:

112 a) To provide with the additional test methods and procedures only for lithium ion battery-based
113 energy storage systems

114 b) This document was developed based on the investigation results of ESS accidents that
115 occurred in Korea, and can be used for safety verification in case of similar ESS accidents in
116 other areas.

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

Part 5-4: Safety test methods and procedures for grid integrated EES systems – Lithium ion battery-based systems

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 the test methods and procedures to validate the safety issues that specifically arise due to the use of a lithium ion battery-based subsystem basically based on IEC TS 62933-5-1 and IEC 62933-5-2.

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

IEC TS 62933-5-1:2017, Electrical energy storage (EES) systems – Part 5-1: Safety considerations for grid integrated EES systems – General specification

IEC 62933-5-2:2020, Electrical energy storage (EES) systems – Part 5-2: Safety considerations for grid integrated EES systems – Electrochemical-based systems

IEC 60079-7:2015, Explosive atmospheres – Part 7: Equipment protection by increased safety "e"

IEC 60079-7:2015/AMD1:2017

IEC 60079-13, Explosive atmospheres – Part 13: Equipment protection by pressurized room "p" and artificially ventilated room "v"

IEC 60079-29 (all parts), Explosive atmospheres – Gas detectors

IEC 60370, Test procedure for thermal endurance of insulating resins and varnishes for impregnation purposes - Electric breakdown methods

IEC 61000-1-2, Electromagnetic compatibility (EMC) – Part 1-2: General – Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena

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 62133-2, Amendment 1 - Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems

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

IEC 62620, Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62933-1, IEC TC 62933-5-1, IEC TC 62933-5-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp/ui>

3.1

state of charge

SOC

ratio between the available energy from an EES system and the actual energy capacity, typically expressed as a percentage

[SOURCE: IEC 62933-1:2018, 6.2.4]

3.2

Short-circuit

accidental or intentional conductive path between two or more conductive parts forcing the electric potential differences between these conductive parts to be equal to or close to zero

[SOURCE: IEC 195-04-11 and IEC 151-12-04]

3.3

AC short-circuit

accidental or intentional conductive path between two or more conductive parts of the grid and power conversion system(PCS) forcing the electric potential differences between these conductive parts to be equal to or close to zero

3.4

DC short-circuit

accidental or intentional conductive path between two or more conductive parts of the power conversion system(PCS) and electrochemical accumulation subsystem forcing the electric potential differences between these conductive parts to be equal to or close to zero

3.5

Switching element short-circuit

accidental or intentional conductive path between two or more conductive parts of the upper-arm and lower-arm of the power conversion system(PCS) switching element forcing the electric potential differences between these conductive parts to be equal to or close to zero

3.6

Earth fault

occurrence of an accidental conductive path between a live conductor and the earth

[SOURCE: IEC 195-04-14, modified]

3.7**AC earth fault**

occurrence of an accidental conductive path between a live conductor and the earth at a point between the grid and power conversion system(PCS)

3.8**DC earth fault**

occurrence of an accidental conductive path between a live conductor and the earth at a point between power conversion system(PCS) and electrochemical accumulation subsystem

3.9**Off-gas**

when the pressure increases due to internal overheating of the battery, flammable vapors and gases that exceed the designed pressure are released to the outside

3.10**Venting**

release of excessive internal pressure from a cell, module, battery pack, or battery system in a manner intended by design to preclude rupture or explosion

[SOURCE: IEC 62619:2022, 3.14]

3.11**Main circuit-breaker**

mechanical switching device, capable of breaking currents under specified abnormal circuit conditions such as those of short circuit for EESS(battery) protection

3.12**battery management system****BMS**

electronic system associated with a battery which has functions to control current in case of overcharge, overcurrent, overdischarge, and overheating and which monitors and/or manages the battery's state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and/or service life

[SOURCE: IEC 62619:2022, 3.12]

3.13**power management system****PMS**

A system that monitors the status information of PCS and protects BESS from abnormal conditions, and delivers information necessary for charge/discharge control to PCS

3.14**Hazardous fluids (Hazardous substance)**

Hazardous substance which can affect human health or the environment with an immediate or retarded effect or capable of posing an unacceptable risk to health, safety, property or to the environment

Note 1 to entry: May include other substances than those officially recognized as such in existing hazardous material classification systems, for example Global Harmonized System (GHS), Transport of Dangerous Goods (TDG).

[SOURCE:IEC 62933-1:2018, 7.3]

3.15**Rated current**

Current value determined under specified conditions and declared by the manufacturer

3.16**DC contactor**

an electrically controlled device designed to switch current on and off