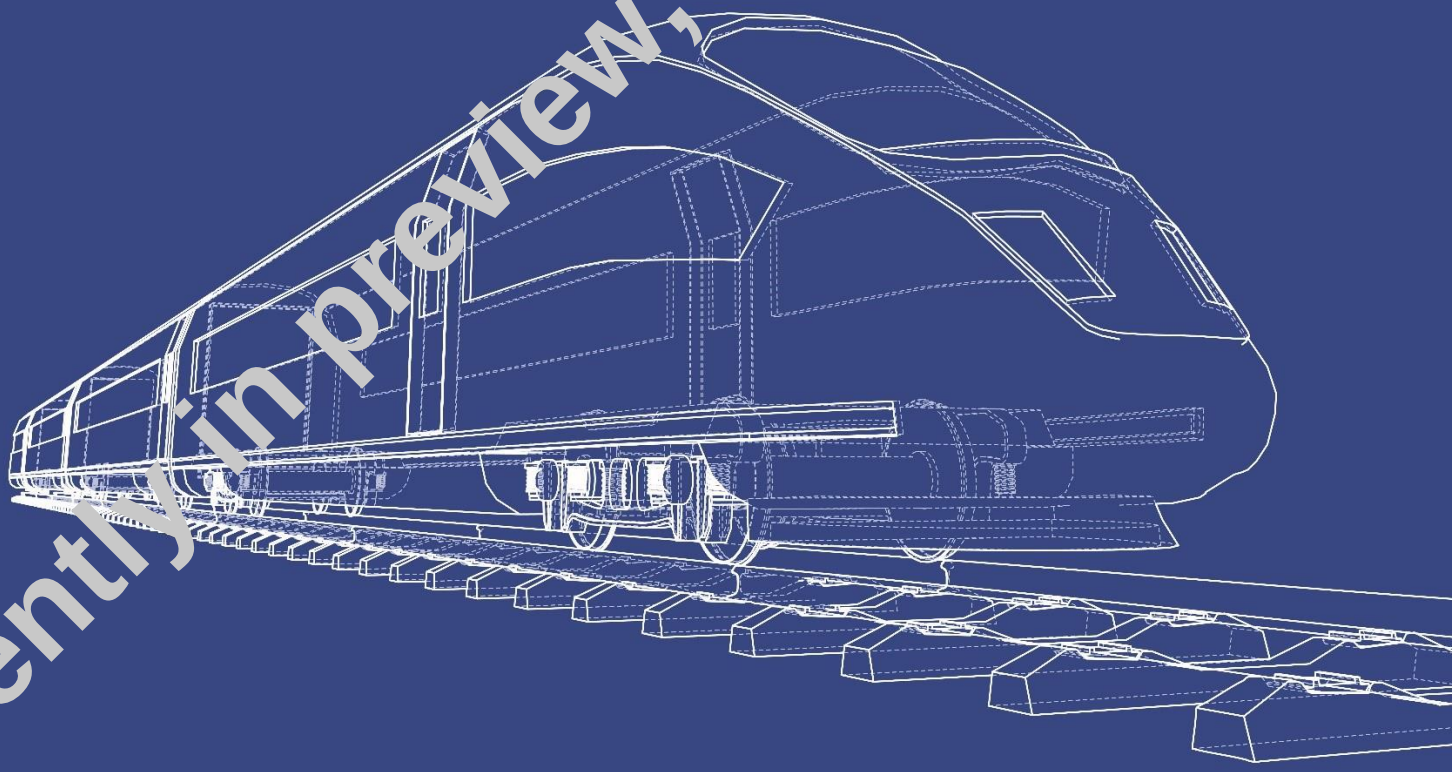
AS 7486:2022

Australian STANDARD®

Railway energy storage: Rolling stock onboard electrical energy storage

RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

Rolling Stock Standard



This Australian Standard® AS 7486 Railway energy storage: Rolling stock onboard electrical energy storage was prepared by a Rail Industry Safety and Standards Board (RISSB) Development Group consisting of representatives from the following organisations:

AECOM	Aurizon	BHP
Caterpillar Inc	Central Queensland University	Metro Trains Melbourne
Public Transport Authority WA	Department of Transport (Vic)	Queensland Rail
Rail Projects Victoria	TfNSW	

The Standard was approved by the Development Group and the Rolling Stock Standing Committee in June, 2022. On June 30, 2022 the RISSB Board approved the Standard for release.

This standard was issued for public consultation and was independently validated before being approved.

Development of the Standard was undertaken in accordance with RISSB's accredited process. As part of the approval process, the Standing Committee verified that proper process was followed in developing the Standard

RISSB wishes to acknowledge the positive contribution of subject matter experts in the development of this Standard. Their efforts ranged from membership of the Development Group through to individuals providing comment on a draft of the Standard during the open review.

I commend this Standard to the Australasian rail industry as it represents industry good practice and has been developed through a rigorous process.

Deb Spring
Chief Executive Officer
Rail Industry Safety and Standards Board

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Document details

First published as: AS 7486:2022 Railway energy storage: Rolling stock onboard electrical energy storage

ISBN 978-1-76113-879-9

Document history

Publication Version	Effective Date	Reason for and Extent of Change(s)
2022	June 30, 2022	First published

Approval

Name	Date
Rail Industry Safety and Standards Board	30/06/2022

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This Standard was prepared by the Rail Industry Safety and Standards Board (RISSB) Development Group AS 7486 Railway energy storage: Rolling stock onboard electrical energy storage. Membership of this Development Group consisted of representatives from the organisations listed on the inside cover of this document

Compliance

There are four types of provisions contained within Australian Standards developed by RISSB:

1. Requirements.
2. Recommendations.
3. Permissions.
4. Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term 'shall'.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred. Recommendations are identified within the text by the term 'should'.

Recommendations recognise that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term 'may'.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term 'must'.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities, or interfacing organisations where the risk may be shared.

RISSB Standards address known hazards / hazardous events within the railway industry. Where applicable to this Standard, these are listed in Appendix A: Australian Rail Risk Model (ARRM).

Contents

Appendix contents

Introduction

This standard supports Australian rolling stock operators (RSO) to specify and utilize onboard batteries and electric double-layer capacitors (EDLC) used mainly for traction purposes (propulsion and braking) so that they are used safely, effectively, and reliably in the Australian context and networks, throughout the life of the energy storage system (ESS). This document provides a basis for RSOs, vehicle manufacturers, and ESS manufacturers to understand and communicate the requirements on ESS.

This is done through guiding the understanding of:

(a) the ESS's contribution to rolling stock performance goals;

(b) the ESS's interface with onboard and offboard systems;

(c) the rolling stock operational context;

(d) international and national standards related to rolling stock with onboard ESS.

Adherence to this RISSB standard does not ensure compliance with the national law, national guidelines, standards, and codes of practice. However, this standard supports the duties under the Rail Safety National Law by articulating potential hazards arising from the ESS in the operational context.

Design principles are presented to support the elimination or mitigation of safety risk to be safe, so far as is reasonably practicable (SFAIRP). Where applicable, this standard also directs the reader to existing standards that can provide specific requirements and information.

This standard builds on existing national and international standards by providing additional guidance and requirements for ESS. The main existing international standards relevant to onboard ESS using batteries are IEC 62864-1, IEC 61881-3, and IEC 62928. Performance based requirements, recommendations, and guidance will not replicate existing published requirements and recommendations.

Note that IEC 62864-1 presents the relationship between the standards in terms of levels of systems and subsystems.

(a) Level 1 is the vehicle/system interface.

(b) Level 2 is system and interfaces.

(c) Level 3 is components.

(d) Level 4 is subcomponents.

The following provides a summary of the content of these standards and the additional guidance and recommendations that will be provided in this standard:

(a) IEC 62864-1 for power supply with onboard energy storage system covers basic system electrical configuration, tests to verify and some guidelines for manufacturing and evaluating. It is defined as Level 1/2, or across the vehicle/system interface and system levels. This standard will build on IEC 62864-1, by providing further guidance that considers the Australian rail operational context to inform:

i. the performance requirements, design guidance throughout the ESS lifecycle; and

ii. the identification and mitigation of relevant safety hazards.

(b) IEC 61881-3 for electric double-layer capacitors (EDLC) is at the component level (Level 4) within the IEC standard structure. It focusses on the quality requirements and testing of EDLCs. It provides guidance to support their design, selection and use, including their installation and operation. This standard will build on IEC 61881-3 by providing further guidance that considers the Australian rail operational context to inform:

i. the performance requirements and design guidance throughout the ESS lifecycle;

ii. the identification and mitigation of relevant safety hazards.

(c) IEC 62928 for lithium-ion batteries is at the component level (Level 4) within the IEC standard structure and discusses the design, operation, parameters, safety recommendations, data exchange, routine and type tests as well as marking and designation. It includes broad coverage of operational conditions as well as some guidance in using the operational pattern for sizing. This standard will build on IEC 62928 by providing further safety guidance related to the Australian rail operational context.

1 Scope and general

1.1 Scope

The scope of this standard is the system functional and safety requirements for ESS which use batteries and EDLCs on new and modified rolling stock in Australia. It focusses on hazards associated with lithium-ion batteries and EDLCs and their implementation, however safety and design guidance is equally relevant to other battery technologies including solid state and metal air batteries.

1.2 Out of scope

The following are out of scope:

(a) Wayside energy storage.

(b) Energy storage technologies other than batteries or EDLCs.

(c) Any requirements and recommendations on other systems that are not explicitly related to supporting the ESS function and safety. Systems that interface with the ESS are discussed in Section 2.

1.3 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:

- AS 7501, *Rolling stock compliance certification*
- AS 7507, *Rolling stock outlines*
- AS 7509, *Rolling stock – Dynamic Behaviour*
- AS 7519 (all parts), *Railway Rolling Stock – Bogie Structural Requirements*
- AS 7520 (all parts), *Australian Railway Rolling Stock – Body Structural Requirements*
- AS 7521, *Interior Crashworthiness*
- AS 7529 (all parts), *Australian Railway Rolling Stock – Fire Safety*
- AS 7530, *Electrical systems*
- AS 7540, *Rail Systems Interoperability*
- AS 7723, *Railway infrastructure: Clearances*
- AS 7770, *Rail Cyber Security*
- AS 7722, *EMC Management*
- IEC 61881-3, *Railway Applications – Rolling Stock Equipment – Capacitors for power electronics*
- IEC 62864-1, *Railway Applications – Rolling Stock – Power supply with onboard energy storage system – Part 1: Series Hybrid System:* Specifies general requirements for the onboard energy storage system at a system level.
- IEC 62928, *Railway Applications – Rolling Stock – Onboard lithium-ion traction batteries:* States the requirements for railway traction applications.