IEC 62278-2

Edition 1.0 2025-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Railway applications - Specification and demonstration of reliability, availability, maintainability and safety (RAMS) - Part 2: Systems approach to safety

Applications ferroviaires - Spécification et démonstration de la fiabilité, de la disponibilité, de la maintenabilité et de la sécurité (FDMS) - Partie 2: Approche systématique pour la sécurité

ICS 45.060.01

ISBN 978-2-8327-0584-1

IEC 62278-2:2025-07(en-fr)

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CONTENTS

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Railway applications - Specification and demonstration of reliability, availability, maintainability and safety (RAMS) - Part 2: Systems approach to safety

FOREWORD

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IEC 62278-2 has been prepared by IEC technical committee 9: Electric systems and equipment for railways. It is an International Standard.

This first edition, together with IEC 62278-1, cancels and replaces IEC 62278:2002. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) creation of this new Part 2 providing, for the first time, safety-related guidance and methods that support the safety management process provided in IEC 62278-1:2025.

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

Draft	Report on voting
9/3208/FDIS	9/3235/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.

The IEC 62278 series forms part of the railway sector specific application of IEC 61508. IEC 62278, IEC 62279 and IEC 62425 comprise the railway sector equivalent of the IEC 61508 series so far as railway communication, signalling and processing systems are concerned. When compliance with these documents has been demonstrated, further evaluation of compliance with the IEC 61508 series is not foreseen.

A list of all parts in the IEC 62278 series, published under the general title *Railway applications - Specification and demonstration of reliability, availability, maintainability and safety (RAMS)*, 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

IEC 62278:2002 was aimed at introducing the application of a systematic RAMS management process in the railway sector. Through the application of IEC 62278:2002 and the experiences gained over the last years, the need for revision and restructuring became apparent with a need to deliver a systematic and coherent approach to RAMS applicable to all the railway application fields including signalling, rolling stock and fixed installations.

This document provides railway duty holders and the railway suppliers with a process which will enable the implementation of a consistent approach to the management of reliability, availability, maintainability and safety, denoted by the acronym RAMS.

Processes for the specification and demonstration of RAMS requirements are cornerstones of this document. This document promotes a common understanding and approach to the management of RAMS.

The IEC 62278 series is derived from the European Standard series EN 50126:2017, consisting of EN 50126-1:2017 and EN 50126-2:2017.

With regard to safety, IEC 62278-1 provides a safety management process which is supported by guidance and methods described in this document.

IEC 62278-1 and IEC 62278-2 are independent from the technology used. As far as safety is concerned, IEC 62278 takes the perspective of safety with a functional approach.

The application of this document can be adapted to the specific requirements for the system under consideration.

This document can be applied systematically by the railway duty holders and railway suppliers, throughout all phases of the life cycle of a railway application, to develop railway-specific RAMS requirements and to achieve compliance with these requirements. The system level approach developed by this document facilitates assessment of the RAMS interactions between elements of railway applications even if they are of complex nature.

This document promotes co-operation between the stakeholders of railways in the achievement of an optimal combination of RAMS and cost for railway applications.

The process defined by this document assumes that railway duty holders and railway suppliers have business-level policies addressing quality, performance and safety. The approach defined in this document is consistent with the application of quality management requirements contained within ISO 9001.

1 Scope

This document considers the safety-related generic aspects of the RAMS life cycle and defines methods and tools which are independent of the actual technology of the systems and subsystems.

This document provides:

a) methods for the understanding of the systems approach to safety which is a key concept of IEC 62278;

b) methods to derive the safety requirements and their safety integrity requirements for the system and to apportion them to the subsystems;

c) methods to derive the safety integrity levels (SIL) for the safety-related electronic functions;

d) guidance and methods for the following areas:

   1) safety process;

   2) safety demonstration and acceptance;

   3) organization and independence of roles;

   4) risk assessment;

   5) specification of safety requirements;

   6) apportionment of functional safety requirements;

   7) design and implementation;

e) the user of this document with the methods to assure safety with respect to the system under consideration and its interactions;

f) guidance about the definition of the system under consideration, including identification of the interfaces and the interactions of this system with its subsystems or other systems, in order to conduct the risk analysis.

This document does not specify:

g) RAMS targets, quantities, requirements or solutions for specific railway applications;

h) rules or processes pertaining to the certification of railway products against the requirements of this document;

i) an approval process by the safety authority.

This document is applicable:

j) to the specification and demonstration of RAMS for all railway applications and at all levels of such an application, as appropriate, from complete railway systems to major systems and to individual and combined subsystems and components within these major systems, including those containing software; in particular:

   1) to new systems;

   2) to new systems integrated into existing systems already accepted, but only to the extent and insofar as the new system with the new functionality is being integrated. It is otherwise not applicable to any unmodified aspects of the existing system;

   3) as far as reasonably practicable, to modifications and extensions of existing systems already accepted, but only to the extent and insofar as existing systems are being modified. It is otherwise not applicable to any unmodified aspect of the existing system;

k) at all relevant phases of the life cycle of an application;

l) for use by railway duty holders and the railway suppliers.

This document is not applicable to:

m) any unmodified aspect of the existing system;

n) existing systems which remain unmodified, including those systems already compliant with IEC 62278:2002.

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 62278-1:2025, *Railway applications - Specification and demonstration of reliability, availability, maintainability and safety (RAMS) - Part 1: Generic RAMS process*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62278-1 apply.

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

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

4 Abbreviated terms

ALARP	as low as reasonably practicable
CBA	cost benefit analysis
CCF	common cause failure analysis
CoP	code of practice
DRA	differential risk aversion
ERE	explicit risk estimation
EMC	electromagnetic compatibility
ETA	event tree analysis
FMECA	failure mode, effects and criticality analysis
FTA	fault tree analysis
GA	generic application
GASC	generic application safety case
GP	generic product
GPSC	generic product safety case
GAME	globalement au moins equivalent (globally at least equivalent)
HAZOP	hazard and operability study
IM	infrastructure manager
LRU	line replaceable unit
MDT	mean down time
MEM	minimum endogenous mortality
RAMS	reliability, availability, maintainability and safety
RAP	risk acceptance principle
RBD	reliability block diagram