

STN	Dráhové aplikácie Vodíkové a palivové článkové systémy pre koľajové vozidlá Časť 1: Napájací systém palivových článkov	STN EN IEC 63341-1 34 1518
------------	---	--

Railway applications - Hydrogen and fuel cell systems for rolling stock - Part 1: Fuel cell power system

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 03/26

Obsahuje: EN IEC 63341-1:2025, IEC 63341-1:2025

142099



Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2026
Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD

EN IEC 63341-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2025

ICS 45.060.01; 27.070

English Version

**Railway applications - Hydrogen and fuel cell systems for rolling stock - Part 1: Fuel cell power system
(IEC 63341-1:2025)**

Applications ferroviaires - Systèmes à hydrogène et à pile à combustible pour le matériel roulant - Partie 1: Système à pile à combustible
(IEC 63341-1:2025)

Bahnanwendungen - Wasserstoff- und Brennstoffzellen-Energiesysteme für Bahnfahrzeuge - Teil 1: Brennstoffzellen-Energiesystem
(IEC 63341-1:2025)

This European Standard was approved by CENELEC on 2025-11-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 63341-1:2025 (E)**European foreword**

The text of document 9/3212/FDIS, future edition 1 of IEC 63341-1, prepared by TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63341-1:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-11-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2028-11-30

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 63341-1:2025 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60349-2	NOTE	Approved as EN 60349-2
IEC 60349-4	NOTE	Approved as EN 60349-4
IEC 60751	NOTE	Approved as EN IEC 60751
IEC 60812	NOTE	Approved as EN IEC 60812
IEC 61133	NOTE	Approved as EN IEC 61133
IEC 61287-1	NOTE	Approved as EN 61287-1
IEC 61377	NOTE	Approved as EN 61377
IEC 61508 (series)	NOTE	Approved as EN 61508 (series)
IEC 61881-3	NOTE	Approved as EN 61881-3
IEC 61882	NOTE	Approved as EN 61882
IEC 62864-1:2016	NOTE	Approved as EN 62864-1:2016 (not modified)
IEC 62928	NOTE	Approved as EN IEC 62928
IEC 62973-1:2018	NOTE	Approved as prEN IEC 62973-1:2025 (not modified) to be published
ISO 9223	NOTE	Approved as EN ISO 9223

EN IEC 63341-1:2025 (E)

ISO 9614-1 NOTE Approved as EN ISO 9614-1

ISO 9614-2 NOTE Approved as EN ISO 9614-2

EN IEC 63341-1:2025 (E)**Annex ZA**
(normative)**Normative references to international publications
with their corresponding European publications**

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-14	-	Rotating electrical machines - Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity	EN IEC 60034-14	-
IEC 60077-1	-	Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules	EN 60077-1	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
IEC 60571	-	Railway applications - Electronic equipment used on rolling stock	-	-
IEC 60617	-	Standard data element types with associated classification scheme for electric components - Part 4: IEC reference collection of standard data element types and component classes	-	-
IEC 61373	-	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	-
IEC 61709	-	Electric components - Reliability - Reference conditions of failure rates and stress models for conversion	EN 61709	-
IEC 61991	-	Railway applications - Rolling stock - Protective provisions against electrical hazards	-	-
IEC 62236-3-2	-	Railway applications - Electromagnetic compatibility -- Part 3-2: Rolling stock - Apparatus	-	-
IEC 62282-2-100	2020	Fuel cell technologies - Part 2-100: Fuel cell modules - Safety	EN IEC 62282-2-100	2020
IEC 62282-3-100	2019	Fuel cell technologies - Part 3-100: Stationary fuel cell power systems - Safety	EN IEC 62282-3-100	2020

EN IEC 63341-1:2025 (E)

IEC 62282-4-101	2022	Fuel cell technologies - Part 4-101: Fuel cell power systems for electrically powered industrial trucks - Safety	EN IEC 62282-4-101	2022
IEC 62497-1	-	Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment	-	-
IEC 62498-1	2010	Railway applications - Environmental conditions for equipment - Part 1: Equipment on board rolling stock	-	-
IEC 62635	-	Assessment of material recoverability rate of products	EN IEC 62635 ¹	-
IEC 63341-3	2025	Railway applications - Fuel cell systems for rolling stock - Part 3: Performance test methods for fuel cell power system	EN IEC 63341-3	— ²
IEC 61375-1	-	Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture	EN 61375-1	-
ISO 3744	-	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane	EN ISO 3744	-
ISO 3746	-	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane	EN ISO 3746	-
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	-
ISO 9227	-	Corrosion tests in artificial atmospheres - Salt spray tests	EN ISO 9227	-
ISO 14687	-	Hydrogen fuel quality - Product specification	-	-
ISO 21106	-	Railway applications - Recyclability and recoverability calculation method for rolling stock	-	-
ISO 23828	-	Fuel cell road vehicles - Energy consumption measurement - Vehicles fuelled with compressed hydrogen	-	-

¹ Under preparation. Stage at the time of publication: prEN IEC 62635:2025.

² Under preparation. Stage at the time of publication: FprEN IEC 63341-3:2025.



IEC 63341-1

Edition 1.0 2025-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Railway applications - Hydrogen and fuel cell systems for rolling stock -
Part 1: Fuel cell power system**

**Applications ferroviaires - Systèmes à hydrogène et à pile à combustible pour le
matériel roulant -
Partie 1: Système à pile à combustible**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
 3, rue de Varembe
 CH-1211 Geneva 20
 Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Warning! Make sure that you obtained this publication from an authorized distributor.

Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

IEC 63341-1:2025 © IEC 2025

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	9
2 Normative references	9
3 Terms, definitions and abbreviated terms	11
3.1 Terms and definitions	11
3.2 Abbreviated terms	22
4 Configuration of the fuel cell power system	22
4.1 Fuel cell power system definition	22
4.2 Subsystems of the fuel cell power system	23
4.3 FCPS power distribution	23
4.4 Typical state of a fuel cell power system	24
5 Environmental requirements	24
5.1 General	24
5.2 Specific use case	25
5.2.1 Rooftop installation	25
5.2.2 Tunnel	25
5.2.3 Performance limitation at low and high ambient temperature	26
5.2.4 Performance limitation at high altitude	26
6 Interface requirements	26
6.1 General	26
6.2 Fluidic interfaces	27
6.2.1 Fuel supply	27
6.2.2 Oxidant supply	27
6.2.3 Coolant	27
6.2.4 Air inlets	27
6.2.5 Exhaust	28
6.3 Electrical interfaces	28
6.3.1 General	28
6.3.2 Main power interface	28
6.3.3 Auxiliary supply and communication interfaces	29
7 Performance requirements	29
7.1 General	29
7.2 Fuel cell power system sizing	29
7.3 Load profile	30
7.4 Operational requirements	30
7.4.1 Normal mode requirements	30
7.4.2 Degraded mode requirements	30
7.5 Electric efficiency and hydrogen consumption calculations	30
7.6 Lifetime requirements	31
7.7 End-of-life performance	31
7.8 Voltage stability	32
8 Design requirements	32
8.1 General	32
8.2 FCPM requirements	32
8.3 FMS requirements	32

IEC 63341-1:2025 © IEC 2025

8.3.1	Design requirement	32
8.3.2	Functional requirement	34
8.4	OMS requirements	34
8.4.1	General	34
8.4.2	Non-metallic piping	34
8.4.3	Overpressure	34
8.4.4	Oxidant quality and filtering device	34
8.5	TMS requirements	35
8.5.1	Design requirements	35
8.5.2	Functional requirements	36
8.6	ExMS requirements	37
8.6.1	Hydrogen release	37
8.6.2	Waste water	37
8.7	EPMS requirements	37
8.7.1	General	37
8.7.2	Cabling	37
8.7.3	Ripple current	37
8.7.4	Electric power input	38
8.7.5	Auxiliary motors	38
8.7.6	Light maintenance operation	38
8.8	MCS requirements	38
8.8.1	Hardware	38
8.8.2	Software	38
8.9	Mechanical requirements	39
8.9.1	Mechanical integration	39
8.9.2	Mechanical design	39
8.9.3	Bolted assemblies	39
8.9.4	Degree of protection	40
8.9.5	Shock and vibration	40
8.10	Recyclability requirements	40
8.11	Documentation	40
8.12	Other	41
8.12.1	Noise emission requirements	41
8.12.2	EMC requirements	42
9	Safety, reliability and protection requirements	42
9.1	Reliability	42
9.2	Safety	42
9.2.1	Safety analysis	42
9.2.2	Hazard identification	43
9.2.3	Prevention for maintenance operation and storage	43
9.2.4	Hydrogen risk management	44
9.2.5	Fire, smoke, flammability	45
9.2.6	Electrical shock	45
9.2.7	Software	45
10	Marking and labelling	46
10.1	Safety signs	46
10.1.1	FCPS enclosure	46
10.1.2	Other places inside the FCPS enclosure	46
10.2	Nameplate	46

IEC 63341-1:2025 © IEC 2025

10.2.1	FCPS enclosure	46
10.2.2	Nameplates on sub-assemblies inside the box	47
11	Installation and maintenance	47
11.1	General.....	47
11.2	Installation	47
11.3	Maintenance	47
11.3.1	General	47
11.3.2	Maintenance accessibility	47
11.3.3	Technical documentation	47
12	FCPS storage and transportation conditions	49
12.1	General.....	49
12.2	Transportation	49
12.3	Storage.....	49
13	Testing	49
13.1	General.....	49
13.2	Parameter measurements	49
13.3	Parameter measurement tolerances.....	49
13.4	Reference conditions of tests	50
13.4.1	Installation and operating conditions of the system	50
13.4.2	Quality of hydrogen	50
13.4.3	Quality of power input.....	50
13.5	Type test.....	50
13.5.1	General	50
13.5.2	Visual checks	50
13.5.3	Mass	50
13.5.4	Communication network test.....	50
13.5.5	Dielectric voltage strength test.....	51
13.5.6	Insulation impedance (optional)	51
13.5.7	Sub-equipment functional tests (optional)	51
13.5.8	Operating test for stabilized operations.....	51
13.5.9	Operating test for dynamic operations	51
13.5.10	Polarization curve test	51
13.5.11	Load profile test.....	51
13.5.12	Hydrogen leakage test.....	52
13.5.13	Ultimate strength pressure test	52
13.5.14	Flammable concentration test.....	52
13.5.15	Thermal rising test.....	52
13.5.16	Endurance test (optional).....	52
13.5.17	Safety test in abnormal conditions	53
13.5.18	Hydrogen emissions	53
13.5.19	Environmental tests	53
13.5.20	Acoustic noise emissions.....	54
13.5.21	EMC test	55
13.5.22	Type tests at component level (optional).....	55
13.6	Routine test	55
13.6.1	Visual checks	55
13.6.2	Communication network test.....	55
13.6.3	Dielectric test	55
13.6.4	Insulation impedance test (optional)	55

IEC 63341-1:2025 © IEC 2025

13.6.5	Normal operation test	55
13.6.6	Hydrogen leakage test	56
13.6.7	Overpressure test	56
Annex A (informative)	Datasheet template	57
Annex B (informative)	Local laws, regulations and standards applicable	60
B.1	Europe	60
B.2	Japan	61
B.3	China	61
Bibliography	62
Figure 1	– Hierarchy of standards related to IEC 63341	8
Figure 2	– Example of the main block diagrams for a fuel cell power system for railway applications	23
Figure 3	– FCPS power distribution.....	24
Figure 4	– Typical state diagram for the FCPS.....	24
Table A.1	– Datasheet template proposal.....	57

IEC 63341-1:2025 © IEC 2025

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Railway applications -
Hydrogen and fuel cell systems for rolling stock -
Part 1: Fuel cell power system**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63341-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

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

Draft	Report on voting
9/3212/FDIS	9/3254/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.

IEC 63341-1:2025 © IEC 2025

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 63341 series, published under the general title *Railway applications – Hydrogen and fuel cell systems for rolling stock*, 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.

IEC 63341-1:2025 © IEC 2025

INTRODUCTION

This document considers general requirements for all fuel cell power systems installed onboard rolling stock for railway applications.

IEC TC 105 is developing the IEC 62282 series, covering generic fuel cell technologies in different industrial sectors:

- IEC 62282-2 series on fuel cell modules;
- IEC 62282-3 series on stationary fuel cell power systems;
- IEC 62282-4 series on fuel cell power systems for propulsion and auxiliary power units

These documents are often generic and do not cover the specific requirements for railway applications.

Therefore, this document has been developed to specify the requirements for railway applications.

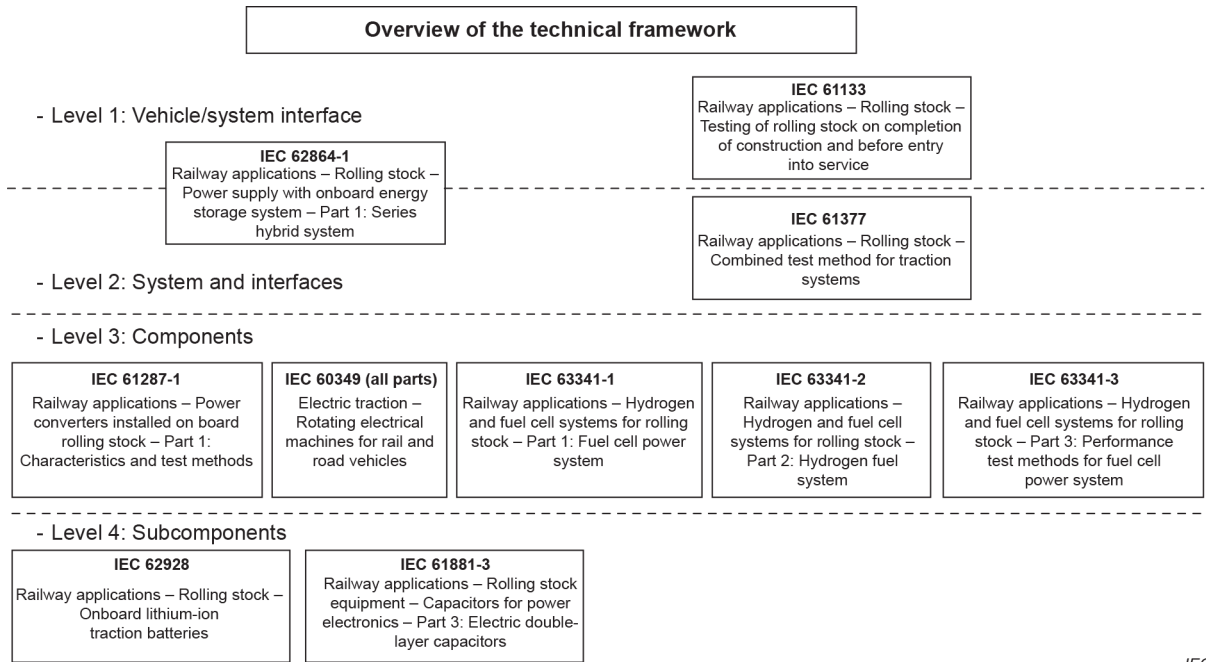
This document is linked to IEC 63341-3, which specifies the performance test method to validate the fuel cell power system performance.

This document with the other parts is used in conjunction with other related IEC standards for auxiliary equipment used for railway rolling stock applications. In addition, IEC TC 9 has developed the following standards for the subsystems, which are related or have interfaces to the fuel cell power system:

- IEC 62864-1:2016, *Railway applications - Rolling stock - Power supply with onboard energy storage system - Part 1: Series hybrid system*
- IEC 61287-1, *Railway applications - Power converters installed on board rolling stock - Part 1: Characteristics and test methods*
- IEC 60349 (all parts), *Electric traction - Rotating electrical machines for rail and road vehicles*
- IEC 62928, *Railway applications - Rolling stock - Onboard lithium-ion traction batteries*

IEC 62864-1:2016 specifies the general requirements for the onboard energy storage system as a system level. The hierarchy of standards is shown in Figure 1. The list is not exhaustive.

IEC 63341-1:2025 © IEC 2025



IEC

Figure 1 – Hierarchy of standards related to IEC 63341

IEC 63341-1:2025 © IEC 2025

1 Scope

This part of IEC 63341 applies to fuel cell power systems installed onboard rolling stock for railway applications (e.g. light rail vehicles, tramways, streetcars, metros, commuter trains, regional trains, high speed trains, locomotives). Fuel cell power systems specified in this document are used for the traction power and the auxiliary supply of railway vehicles such as hybrid vehicles, and in case of use as an auxiliary onboard power source.

This document applies to the fuel cell technology called proton exchange membrane fuel cell (PEMFC), with the use of hydrogen as fuel source and the use of air as oxidant source.¹

This document does not apply for hydrogen fuel system which is specified in IEC 63341-2, as HFS is not within the scope of this document.

This document does not apply for power conversion equipment which is specified in IEC 61287-1 and is not within the scope this document.

This document specifies:

- the scope of supply and the description of the interfaces (fluidic, electrical, thermal and mechanical) of the fuel cell power system;
- the description of the environmental conditions;
- the specification and description of all the requirements to ensure the fuel cell power system conformance with a railway application;
- the process to validate the fuel cell power system sizing required for a specific load profile;
- the safety, reliability and protection requirements to design the fuel cell power system for a railway application;
- the marking and labelling requirements;
- the requirements related to storage, transportation, installation and maintenance;
- the tests (type, routine and investigation) required to validate the fuel cell power system.

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 60034-14, *Rotating electrical machines - Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity*

IEC 60077-1, *Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

¹ PEM fuel cells are typically limited to less than 120 °C due to stability of the membrane and evaporation of water. More practically, they are limited to 85 °C to 90 °C in high or peak temperature application to limit the electrochemical degradations and preserve their lifetime.

Because of the thin membrane, and low resistance losses, PEM fuel cells tend to deliver high power density and offer the advantages of low mass and volume, compared to other fuel cell types. The low temperature operation also allows them to start quickly (less warm-up time) and to start from freeze condition, which makes them particularly well suited for transportation applications.

IEC 63341-1:2025 © IEC 2025

IEC 60571, *Railway applications - Electronic equipment used on rolling stock*

IEC 60617, *Graphical symbols for diagrams*, available at <http://std.iec.ch/iec60617>

IEC 61373, *Railway applications - Rolling stock equipment - Shock and vibration tests*

IEC 61709, *Electric components - Reliability - Reference conditions of failure rates and stress models for conversion*

IEC 61991, *Railway applications - Rolling stock - Protective provisions against electrical hazards*

IEC 62236-3-2, *Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus*

IEC 62282-2-100:2020, *Fuel cell technologies - Part 2-100: Fuel cell modules - Safety*

IEC 62282-3-100:2019, *Fuel cell technologies - Part 3-100: Stationary fuel cell power systems - Safety*

IEC 62282-4-101:2022, *Fuel cell technologies - Part 4-101: Fuel cell power systems for electrically powered industrial trucks - Safety*

IEC 62497-1, *Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*

IEC 62498-1:2010, *Railway applications - Environmental conditions for equipment - Part 1: Equipment on board rolling stock*

IEC 62635, *Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment*

IEC 63341-3:2025, *Railway applications - Hydrogen and fuel cell systems for rolling stock - Part 3: Performance test methods for fuel cell power system*

IEC 61375-1, *Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture*

ISO 3744, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane*

ISO 3746, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane*

ISO 7010, *Graphical symbols - Safety colours and safety signs - Registered safety signs*, available at <https://www.iso.org/obp>

ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests*

ISO 14687, *Hydrogen fuel quality - Product specification*

ISO 21106, *Railway applications - Recyclability and recoverability calculation method for rolling stock*

IEC 63341-1:2025 © IEC 2025

ISO 23828, *Fuel cell road vehicles - Energy consumption measurement - Vehicles fuelled with compressed hydrogen*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN