SLOVENSKI STANDARD
oSIST prEN IEC 63341-3:2024

01-maj-2024

Železniške naprave - Sistemi gorivnih celic za vozna sredstva - 3. del: Metode za preskušanje zmogljivosti elektroenergetskih sistemov z gorivnimi celicami

Railway applications - Fuel cell systems for rolling stock - Part 3: Performance test methods for fuel cell power systems

Systèmes à pile à combustible pour matériel roulant - Partie 3: Méthodes d'essai des performances pour système à pile à combustible

Ta slovenski standard je istoveten z: **prEN IEC 63341-3:2024**

ICS:

27.070	Gorilne celice	Fuel cells
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

oSIST prEN IEC 63341-3:2024 **en**

105/1031/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2024-03-08	**2024-05-31**
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105/963/CD, 105/1007A/CC	

IEC TC 105 : FUEL CELL TECHNOLOGIES

SECRETARIAT:	SECRETARY:
Germany	Mr David Urmann
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 9	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
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TITLE:

Railway applications – Hydrogen and fuel cell systems for rolling stock – Part 3: Performance test methods for fuel cell power system

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS – HYDROGEN AND FUEL CELL SYSTEMS FOR ROLLING STOCK –

Part 3: Performance test methods for fuel cell power system

FOREWORD

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9) Attention is drawn to the possibility that some elements of this IEC publication may be the subject of patent rights. The IEC is not responsible for identifying any or all such patent rights.

International Standard IEC 63341-3 has been prepared by IEC Technical Committee 105: Fuel Cell Technologies and is an International Standard.

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

Draft	Report on voting
105/XX/FDIS	105/XX/RVD

Full information on the voting for approval of this International Standard can be found in the voting report indicated in the table above.

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

This document has been 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 types of documents developed by the IEC are described in more detail at http://www.iec.ch/standardsdev/publications.

TC105 decided to start work on generic fuel cell technologies covering different industrial sectors:

- IEC 62282-2: Fuel Cell Technologies:
    - IEC 62282-2-100: Fuel Cell Modules
    - IEC 62282-3-100: Stationary fuel cell power systems – Safety
    - IEC 62282-4-101: Fuel cell power systems for electrically powered industrial trucks - Safety

These standards are often generic and do not cover the specific requirements of railway applications.

The standard IEC 63341: Railway applications – Hydrogen and fuel cell systems for rolling stock is divided into several parts as described below:

- Part 1: Fuel cell power system
- Part 2: Hydrogen fuel system
- Part 3: Performance tests methods for fuel cell power system

In addition, TC 9 has developed the following standards for subsystems related to or having interfaces with 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, Railway applications – Power converters installed onboard rolling stock- Part 1: Characteristics and test methods
- IEC 60349, Electrical traction – rotating electrical machines for rail and road vehicles
- IEC 62928, Railway applications – rolling stock equipment – onboard lithium-ion traction batteries

The hierarchy of standards is shown in Figure 1.The standards listed in Figure 1 are not exhaustive.

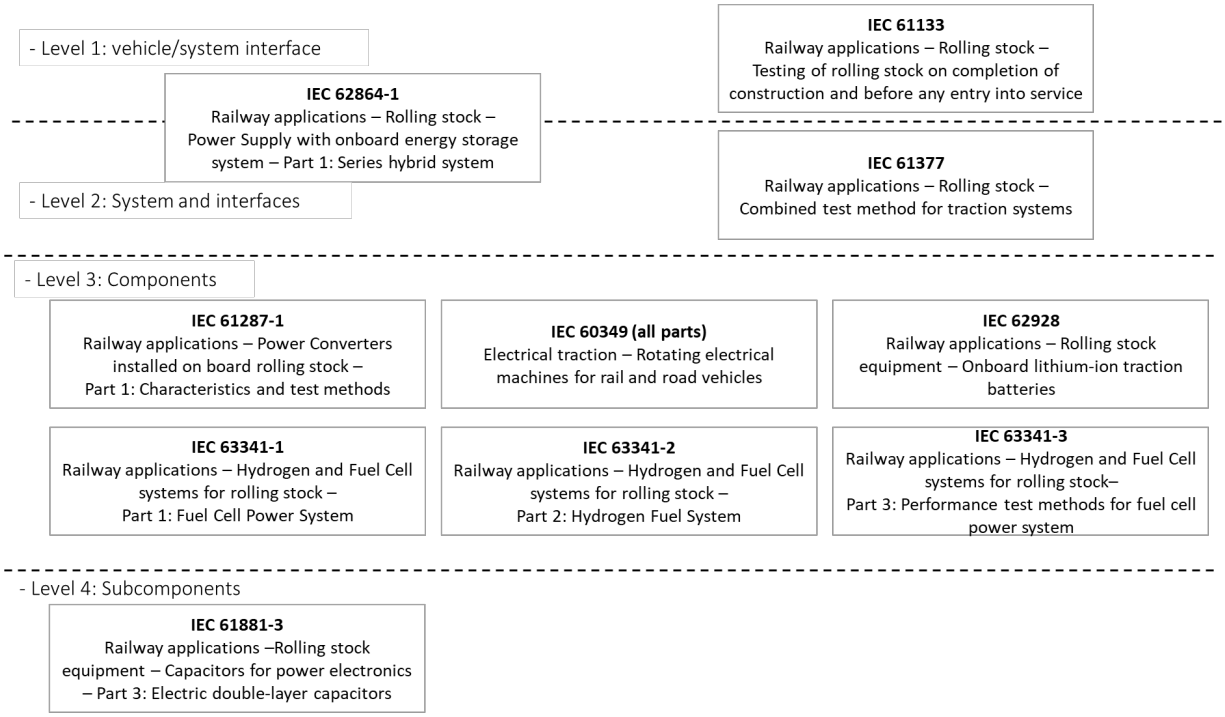

Figure 1 - Hierarchy of standards related to IEC 63341

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 that time, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The IEC 63341 series covers categories such as fuel cell power systems, hydrogen fuel systems, and performance test methods for fuel cell power system.

This part of IEC 63341 provides consistent and repeatable test methods for the electrical and environmental performance of fuel cell power systems for rolling stock. This document does not prescribe or identify categories of tests and does not set performance targets.

Fuel cells used in rolling stock, such as light rail vehicles, trams, streetcars, metros, commuter trains, regional trains, high speed trains, locomotives, etc., are hybrids and therefore operate in several different modes. Similarly, rolling stock operates in different modes. The purpose of this document is to evaluate the fuel cell system in the different combinations of fuel cell modes and rolling stock operating modes.

This part of IEC 63341 is expected to be used by manufacturers of fuel cell power systems used for rolling stock and/or those evaluating the performance of their systems.

Users of this document may select test items from those described in this document that are appropriate for their purposes. This document is not intended to preclude the use of other methods.

RAILWAY APPLICATIONS – HYDROGEN AND FUEL CELL SYSTEMS FOR ROLLING STOCK – Part 3: Performance tests methods for fuel cell power system

1 Scope

This document specifies the performance test methods for fuel cell power systems intended for use in electrically propelled rolling stock.

The scope of this document is limited to electrically powered rolling stock. Hydrogen rolling stock with an internal combustion engines are not included in the scope.

This document applies to hydrogen fuel cell power systems for electrically propelled rolling stock.

This document does not apply to reformer-equipped fuel cell power systems.

This document does not cover the hydrogen fuel systems that are permanently or separately attached to either the rolling stock or the fuel cell power system. These are covered by IEC 63341-2.

The basic system overview with the links between the main functions and the links to the external system is shown in Figure 4 of IEC64431-1.

All relevant standards are described in IEC 63341-1. Performance targets for fuel cell power systems are agreed between the user and the manufacturer.

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 60050-485:2020, International Electrotechnical Vocabulary (IEV) - Part 485: Fuel cell technologies

IEC 60050-551:1998, International Electrotechnical Vocabulary - Part 551: Power electronics

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

IEC 61287-1，Railway applications-Power converters installed on board rolling stockPart 1: Characteristics and test methods

IEC 62236-3-1, Railway applications - Electromagnetic compatibility-Part 3-1: Rolling stock - Train and complete vehicle

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

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

IEC 62928:2017, Railway applications - Rolling stock - Onboard lithium-ion traction batterie

IEC 62973-1:2018, Railway applications – Rolling stock – Batteries for auxiliary power supply systems – Part 1: General requirement

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 9614-1, Acoustics; determination of sound power levels of noise sources using sound intensity; part 1: measurement at discrete points

ISO 9614-2, Acoustics; determination of sound power levels of noise sources using sound intensity; part 2: Measurement by scanning

3 Terms, definitions and abbreviated term

3.1 Terms and definition

For the purpose of this document, the following terms and definitions apply.

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

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

3.1.1
fuel cell power system
FCPS
generator system that uses one or more fuel cell modules to generate electric power and heat

Note 1 to entry: This system typically includes the following subsystems: fuel cell power module, oxidant management system, fuel management system, thermal management system, exhaust management system, electrical and power management system, and their monitoring & control system.

[SOURCE: IEC 60050-485:2020, 485-09-01, modified – “fuel cell modules” has been replaced with “fuel cell power modules”; “the note 1 to entry” has been added.]

3.1.2
fuel cell stack
FCS
equipment assembly of two or more cells, separators, cooling plates, manifolds and a support structure that electrochemically converts, typically, hydrogen rich gas and air reactants to electrical power, heat and other reactant bi-products

[SOURCE: IEC 60050-485:2020, 485-06-01, modified – “equipment”, “two or more”, “bi” have been added; “supporting” has been replaced with “support”; “hydrogen-rich” has been replaced with “hydrogen rich”; “DC” has been replaced with “electrical”; “reaction” has been replaced with “reactant”.]

3.1.3
fuel cell power module
fuel cell module
FCPM
assembly incorporating one or more fuel cell stacks and other main and, if applicable, additional components, which are intended to be integrated into a power system

Note 1 to entry: A fuel cell module can contain the following equipment: its control system and in option, the cell voltage monitoring device, the fuel recirculation device, the humidification device for reactants, sensors, valves and actuators. This subsystem is a part of the fuel cell power system.

[SOURCE: IEC 60050-485:2020, 485-09-03, modified – “fuel cell power module” has been added as the preferred term and the term “fuel cell module” has become synonymous; “other main and” has been added; “that” has been replaced with “which”; “or a vehicle” has been removed; “note 1 to entry” has been modified.]

3.1.4
oxidant management system
OMS
system including filtering and pressuring equipments (and in option humidifying equipments), sensors and valves, able to manage the incoming oxidant such as air from the environment (as an example) to supply the FCPM (or fuel cell stack)

Note 1 to entry: This subsystem is a part of the fuel cell power system.

3.1.5
thermal management system
TMS
thermal loop including pump, heat exchanger, fan, heater, sensors and valves, (and in option ion removal device…) able to manage the temperature of the fuel cell power system and coolant for cooling purpose and heating purpose

Note 1 to entry: This subsystem is a part of the fuel cell power system.

3.1.6
exhaust management system
ExMS
fluidic circuit able to manage the gas exhaust from the fuel cell power system to the environment

Note 1 to entry: This subsystem is a part of the fuel cell power system.

3.1.7
(electronic) (power) converter
an operative unit for electronic power conversion, comprising one or more electronic valve devices, transformers and filters if necessary and auxiliaries if any

Note 1 to entry: It can be DC/DC converter (insulated type) or chopper (non insulated type) for FCPS output.

[SOURCE: IEC 60050-551:1998, 551-12-01, modified – “note 1 to entry” has been modified.]

3.1.8
gross power<for fuel cell power system>
DC outlet power of operational fuel cell stack(s) in the fuel cell power system

Note 1 to entry: **Error! Reference source not found.** shows typical power distribution of a fuel cell power system. This figure applies to definitions 3.1.8 to 3.1.13.

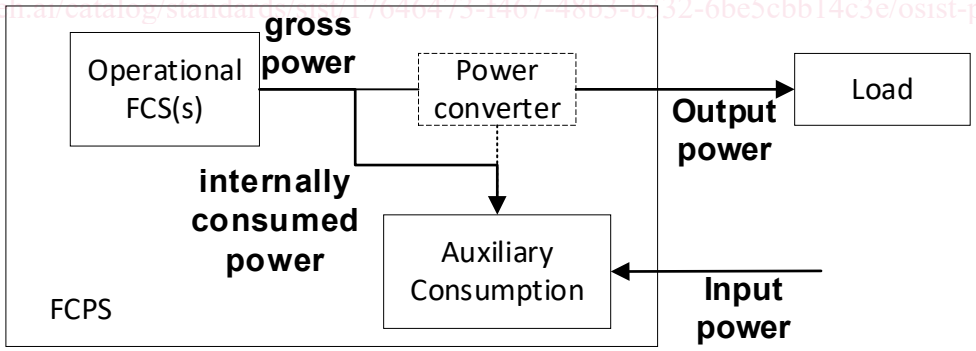

Figure 2 - Example of electric power distribution of FCPS

Note 2 to entry: Power converter in dashed frame is optional. ,A dashed line indicated the loss of power converter is optional and part of the internally consumed power.

[SOURCE: IEC 60050-485:2020, 485-14-01, modified – “a fuel cell stack” has been replaced with“total fuel cell stack(s) in the fuel cell power system”; “note 1 to entry” has been modified; “note 2 to entry” has been added.]

3.1.9

output power<for fuel cell power system>

power generated by the fuel cell power system and available for external use

Note 1 to entry: Output power=gross Power-internal Consumed Power.

3.1.10

input power<for fuel cell power system>

power not internally supplied by the fuel cell power system, needed for the fuel cell power system operation, and consumed by the auxiliaries

Note 1 to entry: The consumption of the auxiliaries is partially or all provided by the FCPS input power.

3.1.11

net power <for fuel cell power system>

net electric power

remaining power generated by the fuel cell power system usable in totality for external use

Note 1 to entry: net powe r= output power - input power

Note 2 to entry: Correction methods of different electrical system configurations are shown in the annex A.

[SOURCE: IEC 60050-485:2020, 485-14-03 for net electric power, modified – “remaining” has been added; “available” has been replaced with “usable and available”; “note 1 to entry” has been modified.]

3.1.12

auxiliary consumption

power consumed by all the fuel cell power system auxiliaries necessary for the fuel cell power system operation, which is the sum of the FCPS input power and the internally consumed power

Note 1 to entry: Auxiliary consumption=gross power-output power+input power.

3.1.13

internally consumed power

Power consumed internally by the fuel cell power system auxiliaries

Note 1 to entry: Internally consumed power=gross power-output power.

Note 2 to entry: Internally consumed power could be 0.

3.1.14

minimum power<for fuel cell power system>

minimum output power at which the fuel cell power system is able to operate (for transient operation)

Note 1 to entry: If the operation with minimum power is limited in time, the maximum duration shall be specified by the manufacturer.

3.1.15

idle power<for fuel cell power system>

minimum output power at which the fuel cell power system can operate continuously in a stable manner

Note 1 to entry: Idle Power can be identical or higher than minimum power.

3.1.16

rated power<for fuel cell power system>

maximum continuous output power that the fuel cell power system is designed to generate, established for a specific set of operating conditions specified by the manufacturer

[SOURCE: IEC 60050-485:2020, 485-14-04, modified – ”electric power output” has been replaced by” output power”; ”achieve under normal” has been replaced by “generate, established for a specific set of”.]