SLOVENSKI STANDARD
oSIST prEN IEC 62282-4-202:2023

01-januar-2023

Tehnologije gorivnih celic - 4-202. del: Elektroenergetski sistemi z gorivnimi celicami za brezpilotna letala - Metode za preskušanje zmogljivosti

Fuel cell technologies - Part 4-202: Fuel cell power system for unmanned aircrafts - Performance test methods

Ta slovenski standard je istoveten z: **prEN IEC 62282-4-202:2022**

ICS:

27.070	Gorilne celice	Fuel cells
49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general

oSIST prEN IEC 62282-4-202:2023 **en**

105/941/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62282-4-202 ED1**	
DATE OF CIRCULATION: **2022-11-04**	CLOSING DATE FOR VOTING: **2023-01-27**
SUPERSEDES DOCUMENTS: **105/811/CD, 105/831A/CC**	

IEC TC 105 : FUEL CELL TECHNOLOGIES

SECRETARIAT: Germany	SECRETARY: Mr David Urmann
OF INTEREST TO THE FOLLOWING COMMITTEES:	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:

Fuel cell technologies – Part 4-202: Fuel cell power system for unmanned aircrafts – Performance test methods

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

Title has been slightly adjusted, taking out 'systems'.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Fuel Cell Technologies –

Part 4-202: Fuel cell power system for unmanned aircrafts – Performance test methods

FOREWORD

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International Standard IEC 62282-4-202 has been prepared by IEC technical committee 105:

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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- withdrawn,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

The National Committees are requested to note that for this document the stability date is ....

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

This part of IEC 62282-4 provides consistent and repeatable test methods for the electric/thermal and environmental performance of fuel cell power systems for unmanned aircrafts.

The IEC 62282-4 series deals with categories such as safety, performance, and interchangeability of fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APUs). Among the categories mentioned above, this document (IEC 62282-4-202) focuses on fuel cell power systems for unmanned aircrafts because such an application is urgently demanded in the world.

This part of IEC 62282-4 describes type tests and their test methods only. No routine tests are required or identified, and no performance targets are set in this standard.

The purpose of this document is to evaluate the fuel cell system in the various combinations of fuel cell and unmanned aircrafts. This document will provide a framework for designing and evaluating a fuel cell system for use specifically in an unmanned aircraft.

This part of IEC 62282-4 is to be used by manufacturers of fuel cell power systems used for unmanned aircrafts and/or those who evaluate the performance of their systems for certification purposes.

Users of this document selectively execute test items that are suitable for their purposes from those described in this document. This document is not intended to exclude any other methods.

Scope

This document covers performance test methods of fuel cell power systems intended for being used to power unmanned aircrafts, including general requirements, start-up, shutdown, power output, continuous running time, electric efficiency, data transmission, warning and monitoring, environmental compatibility, etc.

The scope of the document is limited to electric powered unmanned aircrafts with a maximum take-off mass not exceeding 150 kg (i.e., level 5 or lower UAs).

The document applies to fuel cell power systems with a rated output voltage not exceeding 220 V DC for outdoor use.

The document applies only to compressed gaseous hydrogen-fuelled fuel cell power systems.

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

Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the cited edition applies. For undated references, the latest edition applies including any amendments.

IEV 60050-485: fuel cell technologies

IEC 62282-3-200:2015, Stationary fuel cell power system – Performance test methods

IEC 62282-3-201:2017, Stationary fuel cell power systems – Performance test methods for small fuel cell power systems

IEC 62282-4-102:2017, Fuel cell power systems for industrial electric trucks – Performance test methods

IEC 62282-6-200:2016, Micro fuel cell power systems – Performance test methods

IEC 60529:1989+AMD1:1999+AMD2:2013, Degrees of protection provided by enclosures (IP Code)

ISO 21384-4:2020 Unmanned aircraft systems — Part 4: Vocabulary

Terms and definitions

Following terms and definitions, and those listed in IEV 60050-485: fuel cell technologies, are applicable to this document. Some terms and definitions defined here are covered by IEV 60050-485 or elsewhere, but some details are added in order to suite for this document to avoid ambiguity.

3.1
unmanned aircraft (UA)
unmanned aerial vehicle (UAV)
remotely piloted aircraft (RPA)
An aircraft without a human pilot aboard with its flight being controlled either autonomously by onboard control systems or by the remote control of a pilot on the ground.

Note 1 to entry: ISO 21384-4:2020 Unmanned aircraft systems — Part 4: Vocabulary: aircraft which is designed to be operated remotely or autonomously.

3.2
fuel cell power system for UA
A fuel cell power system onboard an UA that provides electric power for propulsion and non-propulsion needs of the UA during its flight.

3.3
start-up time
The time duration from the moment a signal is sent out or an action is taken to start up the fuel cell power system to the moment the fuel cell power system enables to provide net electric power output.

Note 1 to entry: IEV 60050-485: fuel cell technologies: duration required for transitioning from cold or storage state to net electric power output.

3.4
shutdown time
The time duration from the moment a signal is sent out or an action is taken to shut down the fuel cell power system to the moment the fuel cell power system enters the shutdown state.

Note 1 to entry: IEV 60050-485: fuel cell technologies: duration between the instant when the load is removed and the instant when the shutdown is completed.

3.5
rated power output
The maximum continuous DC power output of the fuel cell power system when operated under the normal condition specified by the fuel cell power system manufacturer.

Note 1 to entry: A continuous running duration of the fuel cell power system at rated power output may be agreed upon by the related parties.

3.6
peak power output
The maximum DC power output of the fuel cell power system that can last for a short time.

Note 1 to entry: It is recommended that the time duration should be more than 2 minutes.

Note 2 to entry: The time duration can also be agreed upon by the related parties based on actual situations.

3.7
output voltage range
Under the normal operational condition specified by the fuel cell power system manufacturer, the range from the lowest output voltage to the highest output voltage of the fuel cell power system in the entire process from start-up, to operation, to shutdown.

Note 1 to entry: It is important that the DC output voltage of the fuel cell power system is always within the input voltage range of the DC/DC or DC/AC converter or the Electronic Speed Controller (ESC) used on the UA by the UA manufacturer.

3.8
continuous running duration
Under the normal operational condition specified by the fuel cell power system manufacturer, the time duration the fuel cell power system can last at the rated power output with its output voltage within the output voltage range described in 3.7.

Note 1 to entry: The DC/DC or DC/AC converter or the electronic speed controller used on the UA may either be damaged or not function effectively when the output DC voltage from the fuel cell power system is out of the input voltage range of the DC/DC or DC/AC converter or the electronic speed controller.

3.9
H_2 management subsystem
Combination of all the parts, apparatus, devices, pipes, connectors and controls that is responsible for sending hydrogen from the H_2 storage vessel to the fuel cell module.

Note 1 to entry: The fuel management subsystem may include all or part of the followings: stop valve, filter, electromagnetic valve, pressure regulator, fusible valve, excess flow valve, pressure release valve, unidirectional valve, ejector, recirculation pump, pressure sensor, temperature sensor, pressure gage, flow meter, controls.

Note 2 to entry: The hydrogen storage vessel is not included in the H_2 management subsystem. Parts that accompany the hydrogen storage vessel to be supplied to the fuel cell power system manufacturer can be considered not the responsibility of the fuel cell power system manufacturer.

3.10
H_2 leakage rate
The ratio of the amount of hydrogen leaking out of the fuel cell power system to the amount of hydrogen theoretically required by the fuel cell power system at the rated power output.

3.11
power management subsystem
A device or system that manages the DC power from both the fuel cell module and the energy storage subsystem, sends unregulated main DC power to the UA's propulsion system, and sends either regulated or unregulated minor DC or AC power to the power consuming devices within the fuel cell power system for the internal power need.

Requirements for fuel cell power system for UAs

4.1 System configuration

Figure 1 illustrates the general fuel cell power system configuration subject to this document, and shows the system boundary and physical items entering and leaving the system.

The fuel cell power system may contain part or all of the subsystems.

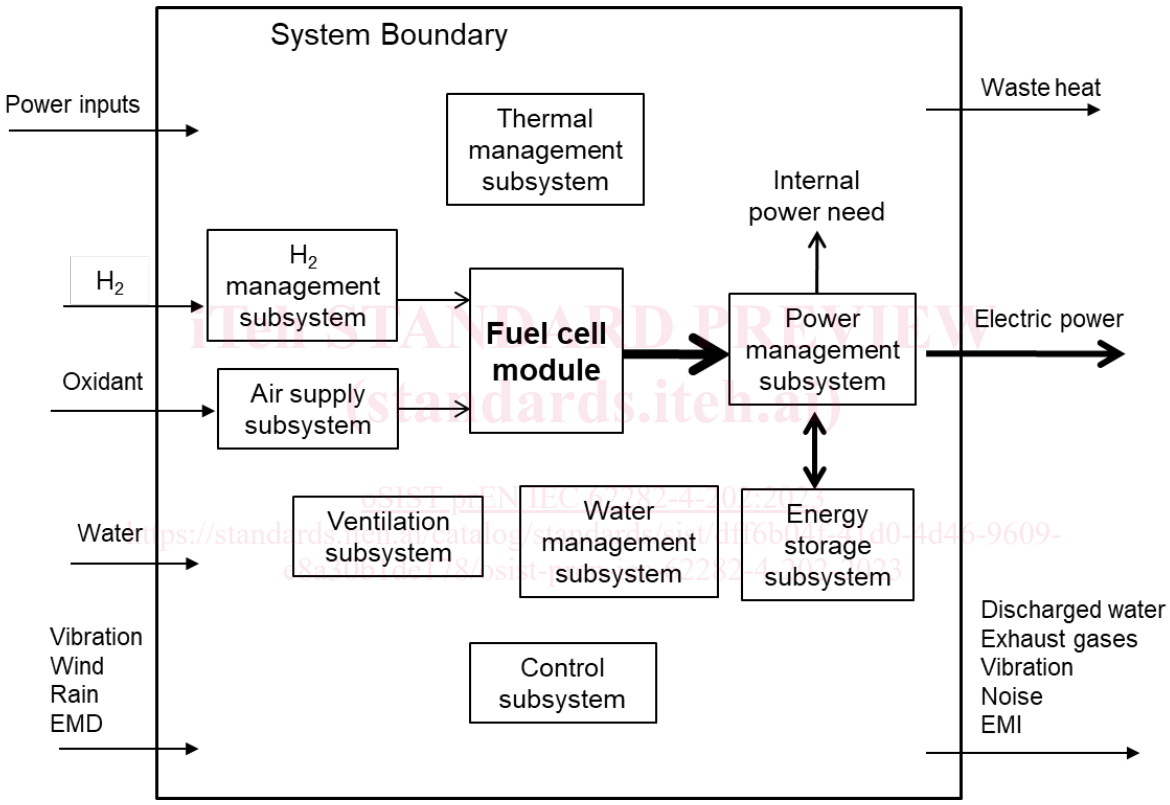

Figure 1 – General configuration of a fuel cell power system for UAs

The power management subsystem provides unregulated DC power to the DC/DC or DC/AC converter or the electronic speed controller provided by the UA manufacturer. In other word, any device that is needed to regulate the main DC power from the fuel cell power system to propel the UA is not part of the fuel cell power system in this document. However, the power management subsystem provides unregulated or regulated DC or AC power for the internal power need of the fuel cell power system.

4.2 Appearance and structure

1) The appearance of the fuel cell power system shall show no signs of mechanical damage, cracks, dents, rust, and obvious deformation.

2) There shall have no sharp edges and corners that can cause injury to human beings.

3) During the normal operation of the fuel cell power system, parts, modules, subsystems, and connections within the system shall be sturdy and reliable, without loss of stability, deformation, breaking and abrasion.