IEC TS 62282-7-1

Edition 3.0 2025-10

TECHNICAL SPECIFICATION

Fuel cell technologies -
Part 7-1: Test methods - Single cell performance tests for polymer electrolyte fuel cells (PEFC)

ICS 27.070

ISBN 978-2-8327-0646-6

IEC TS 62282-7-1:2025-10(en)

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Fuel cell technologies - Part 7-1: Test methods - Single cell performance tests for polymer electrolyte fuel cells (PEFC)

FOREWORD

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IEC TS 62282-7-1 has been prepared by IEC technical committee 105: Fuel cell technologies. It is a Technical Specification.

This third edition cancels and replaces the second edition published in 2017. This edition constitutes a technical revision.

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

a) the harmonization with the “EU Harmonised Test Protocols for PEMFC-MEA Testing in Single Cell Configuration for Automotive Applications” published by Joint Research Centre (JRC) of European Commission;
b) restructuring of the format: move the applied performance test methods in Annex H (Edition 2) to the main body and restructure the clause of testing and measurements;
c) add new example single cell designs to Annex A and Annex B.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
105/1120/DTS	105/1138/RVDTS

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 Technical Specification 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.

A list of all parts of the IEC 62282 series, published under the general title *Fuel cell technologies*, 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– withdrawn, or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

This part of IEC 62282 describes standard single-cell test methods for polymer electrolyte fuel cells (PEFCs). This document has been mainly based on the research and development of PEFCs [1], [2], [3], [4], [5], [6], [7], [8], [9], and provides consistent and repeatable methods to test the performance of single cells. This document should be used by component manufacturers or stack manufacturers who assemble components in order to evaluate the performance of cell components, including membrane electrode assemblies (MEAs) and flow plates. This document is also available for fuel suppliers to determine the maximum allowable impurities in fuels.

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

Although this document is for proton exchange membrane fuel cells (PEMFCs) as stated in the scope, users can use this document as a reference to other types of electrolyte membrane fuel cells because they have a certain similarity to PEMFC in test items and test methods.

Further reading

IEC 60688, *Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals*

IEC 61882, *Hazard and operability studies (HAZOP studies) - Application Guide*

IEC 60051-2, *Direct acting indicating analogue electrical measuring instruments and their accessories - Part 2: Special requirements for ammeters and voltmeters*

ISO 5167-1:2022, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements*

ISO 5167-2:2022, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

ISO 5167-3:2022, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 3: Nozzles and Venturi nozzles*

ISO 5167-4:2022, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 4: Venturi tubes*

Other publications

Taylor, B. N., and Kuyatt, C. E., 1994, "*Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*," National Institute of Standards and Technology, NIST Technical Note 1297

Fuel Cell Handbook (7th Ed.), *EG&G Technical Services*, US DOE Report, 2004

FCTESTNET Fuel Cells Glossary, EUR22295 EN (June 2006)

G. Tsotridis, A. Pilenga, G. De Marco, T. Malkow, *EU harmonised test protocols for PEMFC MEA testing in single cell configuration for automotive applications*; JRC Science for Policy report, 2015; EUR 27632 EN; doi 10.2790/5465

T. Bednarek, G. Tsotridis, *Development of reference hardware for a harmonised testing of PEM single fuel cells*, EUR 30592 EN, Publication Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-30231-5 (online), doi:10.2760/83818, JRC123219

1 Scope

This document covers cell assemblies, test station setup, measuring instruments and measuring methods, performance test methods, and test reports for PEFC single cells.

This document is used for evaluating:

a) the performance and durability of membrane electrode assemblies (MEAs) for PEFCs in a single cell configuration;

b) materials or structures of PEFCs in a single cell configuration; or,

c) the influence of impurities in fuel and/or in air on the fuel cell performance and durability.

This document is for proton exchange membrane fuel cells (PEMFC) basically having flow field configurations and using hydrogen or hydrogen containing gas as fuel. It excludes from the scope fuel cells based on anion exchange membranes, bipolar membranes, and phosphoric acid doped polybenzimidazole membranes.

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.

ISO 14687, *Hydrogen fuel quality - Product specification*

IEC 60050-485:2020, *International Electrotechnical Vocabulary (IEV) - Part 485: Fuel cell technologies (available at http://www.electropedia.org)*