

TECHNICAL SPECIFICATION

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



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CONTENTS

FOREWORD	7
INTRODUCTION	9
1 Scope	11
2 Normative references	11
3 Terms, definitions and symbols	11
3.1 Terms and definitions	11
3.2 Symbols	16
4 General safety considerations	18
5 Cell components	18
5.1 General	18
5.2 Membrane electrode assembly (MEA)	19
5.3 Gasket	19
5.4 Flow plate	19
5.5 Current collector	19
5.6 End plate (or clamping plate)	19
5.7 Clamping hardware	20
5.8 Temperature-control device	20
6 Cell assembly	20
6.1 Assembly procedure	20
6.2 Cell orientation and fluid flow configuration	20
6.3 Leak check	21
7 Test station setup	21
7.1 Minimum equipment requirements	21
7.2 Schematic diagram	21
7.3 Maximum variation in test station controls (inputs to test)	22
8 Measuring instruments	23
8.1 Instrument uncertainty	23
8.2 Measuring instruments and measuring methods	23
8.2.1 General	23
8.2.2 Voltage	23
8.2.3 Current	23
8.2.4 Internal resistance (IR)	23
8.2.5 Fuel and oxidant flow rates	24
8.2.6 Fuel and oxidant temperature	24
8.2.7 Cell temperature	24
8.2.8 Fuel and oxidant pressures	24
8.2.9 Fuel and oxidant humidity	24
8.2.10 Ambient conditions	25
9 Gas composition	25
9.1 Fuel composition	25
9.1.1 Hydrogen	25
9.1.2 Hydrogen containing gas	25
9.2 Oxidant composition	25
10 Test preparation	25
10.1 Standard test conditions	25
10.2 Ambient conditions	26

10.3	Data sampling rate.....	26
10.4	Repeatability and reproducibility	26
10.5	Number of test samples	26
10.6	Leak check of gas circuit with inert or test gas	26
10.7	Initial conditioning.....	26
10.8	Stable state check	27
10.9	Shutdown.....	27
10.10	Reconditioning.....	27
11	Diagnostic measurements.....	27
11.1	General.....	27
11.2	Polarization curve tests.....	28
11.2.1	Objective	28
11.2.2	Test methods.....	28
11.2.3	Data post-processing.....	29
11.3	Steady-state test.....	30
11.3.1	Objective	30
11.3.2	Test methods.....	30
11.3.3	Data post-processing.....	31
11.4	Hydrogen crossover test	31
11.4.1	Objective	31
11.4.2	Test method	31
11.4.3	Data post-processing.....	31
11.5	Short circuit measurement	32
11.5.1	Objective	32
11.5.2	Test method	32
11.5.3	Data post-processing.....	33
11.6	Internal resistance (IR) measurement	33
11.6.1	Objective	33
11.6.2	Test methods.....	33
11.6.3	Data post-processing.....	33
11.7	Electrochemically active surface area (ECSA) measurement.....	35
11.7.1	Objective	35
11.7.2	Test methods.....	35
11.7.3	Data post-processing.....	36
11.8	Electrochemical impedance spectroscopy (EIS)	38
11.8.1	Objective	38
11.8.2	Test method	38
11.8.3	Data post-processing.....	39
11.9	Oxygen reduction reaction (ORR) activity test.....	39
11.9.1	Objective	39
11.9.2	Test method	40
11.9.3	Data post-processing.....	40
11.10	Hydrogen gain test.....	42
11.10.1	Objective	42
11.10.2	Test method	42
11.10.3	Data post-processing.....	42
11.11	Oxygen gain test.....	42
11.11.1	Objective	42
11.11.2	Test method	42

11.11.3	Data post-processing	43
11.12	Gas stoichiometry effect tests	43
11.12.1	Objective	43
11.12.2	Test methods	43
11.13	Temperature effect test	43
11.13.1	Objective	43
11.13.2	Test method	43
11.13.3	Data post-processing	43
11.14	Pressure effect test	43
11.14.1	Objective	43
11.14.2	Test method	44
11.14.3	Data post-processing	44
11.15	Humidity effect tests	44
11.15.1	Objective	44
11.15.2	Test methods	44
11.15.3	Data post-processing	44
11.16	Limiting current test	44
11.16.1	Objective	44
11.16.2	Test method	44
11.16.3	Data post-processing	45
11.17	Overload test	45
11.17.1	Objective	45
11.17.2	Test method	45
11.17.3	Data post-processing	45
12	Durability measurements	45
12.1	General	45
12.2	Long-term operation test	46
12.2.1	Objective	46
12.2.2	Test method	46
12.2.3	Data post-processing	46
12.3	Start/stop cycling test	47
12.3.1	Objective	47
12.3.2	Test method	47
12.3.3	Data post-processing	47
12.4	Load cycling test	47
12.4.1	Objective	47
12.4.2	Test methods	47
12.4.3	Data post-processing	48
12.5	Sub-zero storage test	48
12.5.1	Objective	48
12.5.2	Test method	48
12.5.3	Data post-processing	48
12.6	Sub-zero start test	48
12.6.1	Objective	48
12.6.2	Test method	48
12.6.3	Data post-processing	49
12.7	Membrane swelling test (humidity cycle test)	49
12.7.1	Objective	49
12.7.2	Test method	49

12.7.3	Data post-processing	49
12.8	Potential cycle test.....	49
12.8.1	Objective	49
12.8.2	Test methods.....	49
12.8.3	Data post-processing.....	50
12.9	Open circuit voltage (OCV) test.....	50
12.9.1	Objective	50
12.9.2	Test method	50
12.9.3	Data post-processing.....	50
13	Impurity influence measurements	50
13.1	General.....	50
13.2	Influence at rated current density	51
13.2.1	Objective	51
13.2.2	Test method	51
13.2.3	Data post-processing.....	51
13.3	Influence on polarization curves.....	51
13.3.1	Objective	51
13.3.2	Test method	52
13.3.3	Data post-processing.....	52
13.4	Long-term impurity influence test	52
13.4.1	Objective	52
13.4.2	Test method	52
13.4.3	Data post-processing.....	52
13.5	Oxygen concentration test	52
13.5.1	Objective	52
13.5.2	Test method	53
13.5.3	Data post-processing.....	53
14	Test report.....	53
14.1	General.....	53
14.2	Report items	53
14.3	Test data description	53
14.4	Description of measurement conditions.....	53
14.5	Test cell parameter description	54
Annex A (informative)	Flow plates.....	55
Annex B (informative)	Cell component alignment	63
Annex C (informative)	Stressor tests.....	65
Annex D (informative)	Leak test.....	67
D.1	Purpose	67
D.2	Test procedures.....	67
Annex E (informative)	Initial conditioning	69
Annex F (informative)	Shutdown	70
Annex G (informative)	Reconditioning protocols.....	71
Annex H (informative)	Polarization curve test supplement.....	72
Annex I (informative)	Test report for polarization curve tests.....	74
I.1	General.....	74
I.2	General information	74
I.2.1	General information on the test report	74

I.2.2	General information concerning the test	74
I.3	Introductory remarks	74
I.4	Objective and scope of the test	74
I.5	Description of cell components	75
I.6	Background	76
I.7	Description of the test setup	76
I.8	Description of operating conditions, inputs and outputs	76
I.9	Test procedure and results	78
I.9.1	Description of start up and conditioning	78
I.9.2	Description of shutdown (when relevant)	78
I.9.3	Description of measurement and results	78
I.9.4	Deviation from test procedures	79
I.10	Data post-processing	79
I.11	Conclusion and acceptance criteria	79
Annex J (informative)	Polarization curves in helox	80
Annex K (informative)	Test report for sub-zero start test	81
Annex L (informative)	Start/stop cycling test supplement	82
Annex M (informative)	Load cycling test supplement	83
Annex N (informative)	Test conditions	85
N.1	Oxygen reduction reaction (ORR) activity test	85
N.2	Membrane swelling test (humidity cycle test)	85
N.3	OCV test	85
Annex O (informative)	Potential cycling test conditions	86
Annex P (informative)	Polarization curve analysis	88
Annex Q (informative)	The expression of the stoichiometry	90
Bibliography		91
Figure 1 –	Test station schematic diagram for single cell testing	22
Figure 2 –	Typical testing flowchart	26
Figure 3 –	Hydrogen crossover test	32
Figure 4 –	Measurement of ΔV_{CI}	34
Figure 5 –	Determination of adsorption/desorption charge (q_h)	37
Figure 6 –	Determination of CO oxidation charge (q_{CO})	38
Figure 7 –	Typical diagram of a complex impedance plot	39
Figure 8 –	ORR activity test procedure	40
Figure 9 –	Example of Tafel plot	41
Figure A.1 –	Single-serpentine flow channel for an active area of 25 (5 × 5) cm ²	57
Figure A.2 –	Double-serpentine flow channel for an active area of 25 (5 × 5) cm ²	57
Figure A.3 –	Quintuple-serpentine flow channel for an active area of 1 (1 × 1) cm ²	58
Figure A.4 –	Parallel flow channel for an active area of 1 (1 × 1) cm ²	58
Figure A.5 –	Parallel flow channel for an active area of 3 (1 × 3) cm ²	59
Figure A.6 –	Design for flow plate (triple-serpentine flow channel)	59
Figure A.7 –	Parallel flow channel for Type 2 cell	60
Figure A.8 –	MEA alignment for Type 2 cell	61

Figure A.9 – Parallel flow channel for Type 3 cell.....	62
Figure B.1 – Single cell assembly (Type 1)	63
Figure B.2 – Single cell assembly (Type 2)	63
Figure B.3 – Single cell assembly (Type 3)	64
Figure J.1 – Illustration of losses identified by comparison of polarization curves in oxygen, helox and air.....	80
Figure M.1 – Dynamic load cycling profile	83
Figure M.2 – Second dynamic load cycling profile	83
Figure M.3 – Dynamic load cycling based on road vehicle driving	84
Figure O.1 – Potential cycle test (start up shutdown)	86
Figure O.2 – Potential cycle test (load cycle durability)	87
Table 1 – Symbols	16
Table C.1 – Stress tests based on operating conditions	66
Table H.1 – Current density increments if maximum current density is known	72
Table H.2 – Current density increments if maximum current density is not specified by the manufactures	72
Table I.1 – Test input parameters	76
Table I.2 – Test output parameters	77
Table I.3 – Cell performance during start up and conditioning	78
Table I.4 – Cell performance during test	78
Table K.1 – Energy consumption, gas consumption and heat balance data during sub-zero start up	81
Table K.2 – Cell characteristics comparison before and after sub-zero testing	81

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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>)*