

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fuel cell technologies –
Part 4-102: Fuel cell power systems for electrically powered industrial trucks –
Performance test methods**

**Technologies des piles à combustible –
Partie 4-102: Systèmes à piles à combustible pour chariots de manutention
électriques – Méthodes d'essai des performances**



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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	9
3 Terms and definitions	9
4 Symbols	11
5 Standard conditions.....	13
6 Heating value base.....	13
7 Test preparation	13
7.1 General.....	13
7.2 Data acquisition plan	14
8 Test set-up	14
9 Instruments and measurement methods	15
9.1 General.....	15
9.2 Measurement instruments.....	15
9.3 Measurement points.....	16
9.4 Minimum required measurement systematic uncertainty.....	17
10 Test conditions	17
10.1 Laboratory conditions.....	17
10.2 Installation and operating conditions of the system	17
10.3 Indication of battery condition	17
10.4 Determination of state of charge of the battery.....	18
10.5 Quality of test fuel.....	18
10.5.1 Hydrogen.....	18
10.5.2 Methanol solution	18
11 Fuel consumption test.....	18
11.1 Hydrogen fuel consumption test.....	18
11.1.1 General	18
11.1.2 Test method	18
11.1.3 Calculation of results	19
11.2 Methanol fuel consumption test.....	21
11.2.1 General	21
11.2.2 Test method	21
11.2.3 Calculation of average methanol fuel power input.....	21
12 Electric power output test	22
12.1 General.....	22
12.2 Test method.....	22
12.3 Calculation of average electric power output.....	22
12.4 Computation of electric efficiency.....	22
13 Type tests on operational performance	23
13.1 Maximum power output test	23
13.1.1 General	23
13.1.2 Test method	23
13.1.3 Processing of data.....	23
13.2 Power cycling electric load test.....	23

13.2.1	General	23
13.2.2	Test method	23
13.2.3	Processing of data	23
13.3	Accessory load voltage spike test	24
13.3.1	General	24
13.3.2	Test method	24
13.3.3	Processing of data	24
14	Power stability under operation	24
14.1	General	24
14.2	Delivered power	24
14.3	Regenerated power	25
15	Type tests on environmental performance	25
15.1	General	25
15.2	Noise test	25
15.2.1	General	25
15.2.2	Test conditions	26
15.2.3	Test method	27
15.2.4	Processing of data	27
15.3	Exhaust gas test	27
15.3.1	General	27
15.3.2	Components to be measured	27
15.3.3	Test method	28
15.3.4	Processing of data	28
15.4	Discharge water test	30
15.4.1	General	30
15.4.2	Test method	30
16	Test reports	31
16.1	General	31
16.2	Title page	31
16.3	Table of contents	31
16.4	Summary report	31
16.5	Checklist for performance parameters	31
Annex A (informative)	Heating values for hydrogen and methanol at standard conditions	32
Annex B (informative)	Guidelines for the contents of detailed and full reports	33
B.1	General	33
B.2	Detailed report	33
B.3	Full report	33
Annex C (informative)	Checklist for performance criteria dealt with in this document	34
Bibliography		37
Figure 1	Fuel cell power systems for electrically powered industrial trucks	9
Figure 2	Example of a test set-up for hydrogen fuel	14
Figure 3	Example of a test set-up for methanol fuel	15
Figure 4	Energy flow for regenerated power and delivered power	24
Figure 5	Noise measurement points for fuel cell power systems	26

Table 1 – Symbols and their meanings for electric and thermal performance	11
Table 2 – Symbols and their meanings for environmental performance	12
Table 3 – Delivered power measurements	25
Table 4 – Regenerated power measurements	25
Table 5 – Correction values corresponding to the effect of background noise	27
Table A.1 – Heating values for hydrogen and methanol at standard conditions	32

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FUEL CELL TECHNOLOGIES –

**Part 4-102: Fuel cell power systems for electrically
powered industrial trucks – Performance test methods**

FOREWORD

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IEC 62282-4-102 has been prepared by IEC technical committee 105: Fuel cell technologies. It is an International Standard.

This second edition cancels and replaces the first 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) alignment of the Scope with the second edition of IEC 62282-4-101:2022;
- b) deletion of terms and definitions (previous entries 3.5, 3.10, and 3.15);
- c) addition of new terms in Clause 3: "delivered power" (3.13) and "regenerated power" (3.14);
- d) revision of symbols and their meanings in alignment with those of IEC 62282-3-201;
- e) replacement of "reference conditions" with "standard conditions" as seen in Clause 5;
- f) revision of the test method for the accessory load voltage spike test (13.3.2);

- g) addition of clarifications in Clause 14 (Power stability under operation);
- h) addition of a checklist for performance criteria dealt with in this document (Annex C).

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

Draft	Report on voting
105/947/FDIS	105/954/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.

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

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 electrically powered industrial trucks.

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). This document (IEC 62282-4-102) focuses on performance test methods for fuel cell power systems used to drive industrial electric trucks, which are being manufactured and used increasingly worldwide. This is because such applications are urgently needed 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 document.

Fuel cell systems used in electrically powered industrial trucks, such as forklift trucks, use both batteries and fuel cells, and so operate in several different modes. Similarly, forklift trucks operate in different modes. The purpose of this document is to evaluate the fuel cell system in the various combinations of fuel cell modes and forklift truck modes. This document breaks down these different modes and provides a framework for designing and evaluating a fuel cell system for use specifically in a forklift truck.

This part of IEC 62282-4 is intended to be used by either manufacturers of fuel cell power systems used for electrically powered industrial trucks or those who evaluate the performance of the systems used in them for certification purposes or both.

Users of this document can select and perform the tests they need from those described. This document is not intended to exclude any other tests.

FUEL CELL TECHNOLOGIES –

Part 4-102: Fuel cell power systems for electrically powered industrial trucks – Performance test methods

1 Scope

This part of IEC 62282 specifies the performance test methods of fuel cell power systems for propulsion and auxiliary power units (APU). This document covers fuel cell power systems for propulsion other than those for road vehicles.

This document covers the performance test methods of fuel cell power systems intended to be used for electrically powered industrial trucks as defined in ISO 5053-1, except for:

- rough-terrain trucks;
- non-stacking low-lift straddle carrier;
- stacking high-lift straddle carrier;
- rough-terrain variable-reach truck;
- slewing rough-terrain variable-reach truck;
- variable-reach container handler;
- pedestrian propelled trucks.

This document applies to gaseous hydrogen-fuelled fuel cell power systems and direct methanol fuel cell power systems for electrically powered industrial trucks. The following fuels are considered within the scope of this document:

- gaseous hydrogen, and
- methanol.

This document covers the fuel cell power system as defined in 3.7 and Figure 1.

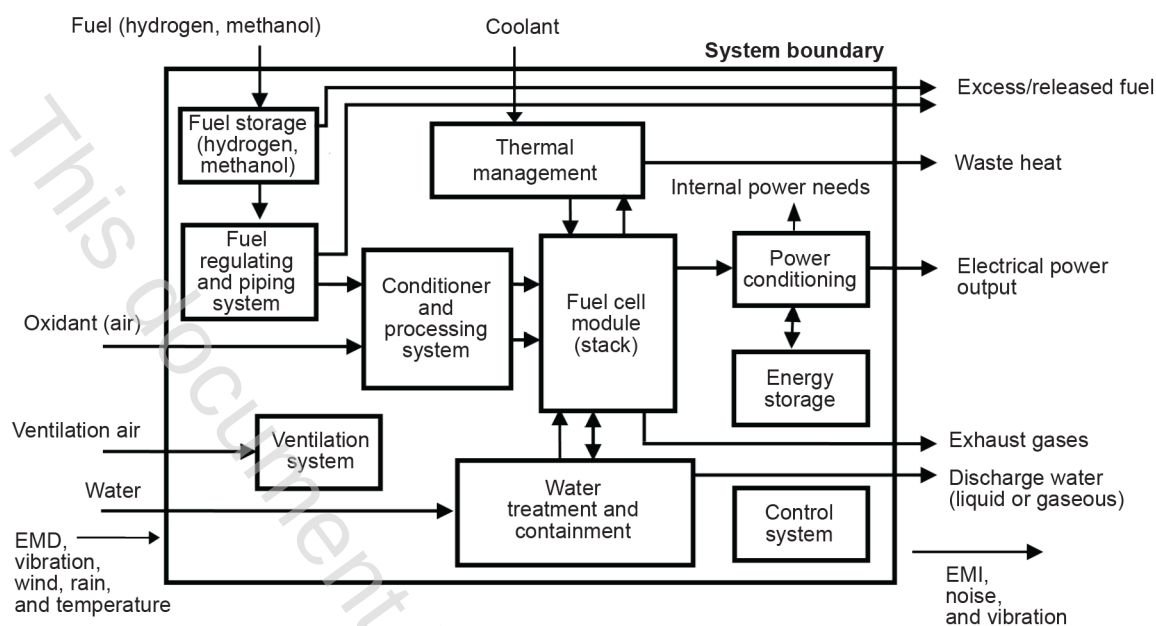
This document applies to DC type fuel cell power systems, with a rated output voltage not exceeding DC 150 V for indoor and outdoor use.

This document covers fuel cell power systems whose fuel source container is permanently attached to either the industrial truck or the fuel cell power system.

All systems with integrated energy storage systems are covered by this document. This includes systems such as batteries for internal recharges or recharged from an external source.

The following are not included in the scope of this document:

- detachable type fuel source containers;
- hybrid trucks that include an internal combustion engine;
- reformer-equipped fuel cell power systems;
- fuel cell power systems intended for operation in potentially explosive atmospheres;
- fuel storage systems using liquid hydrogen.



IEC

Key

EMD electromagnetic disturbance

EMI electromagnetic interference

NOTE A fuel cell power system can contain all or some of the above components.

Figure 1 – Fuel cell power systems for electrically powered industrial trucks**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 62282-6-300:2012, *Fuel cell technologies – Part 6-300: Micro fuel cell power systems – Fuel cartridge interchangeability*

ISO 6798-1, *Reciprocating internal combustion engines – Measurement of sound power level using sound pressure – Part 1: Engineering method*

ISO 6798-2, *Reciprocating internal combustion engines – Measurement of sound power level using sound pressure – Part 2: Survey method*

ISO 14687, *Hydrogen fuel quality – Product specification*

3 Terms and definitions

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

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

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