IEC 62282-4-101

Edition 2.0 2022-08
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Fuel cell technologies –
Part 4-101: ~~Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Safety of electrically powered industrial trucks~~
Fuel cell power systems for electrically powered industrial trucks – Safety

IEC 62282-4-101:2022-08 RLV(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.070

ISBN 978-2-8322-5589-6

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62282-4-101:2014. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62282-4-101 has been prepared by IEC technical committee 105: Fuel cell technologies.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

a) revision of the title of this document;
b) revision of reference standards;
c) addition of new subclauses (4.3, 4.14.5, 4.15.3, 4.15.4, 4.16, 5.6, and 5.23);
d) previous 4.15 was revised as “4.16 Risk assessment and risk reduction”;
e) revision of 4.6 3), access to the manual shutoff valve;
f) revision of requirements for battery terminals that are threaded (4.14.10.1);
g) revision of requirements for double layer capacitors (4.14.10.2);
h) revision of external leakage test (5.5) and ultimate strength test (5.7);
i) revision of temperature limits on capacitors depending on the temperature rating of the material (Table 3);
j) revision of markings that are not relevant (Clause 7);
k) added “Significant hazards, hazardous situations and events dealt with in this document” as a new informative annex (Annex B).

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

Draft	Report on voting
105/912/FDIS	105/922/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/standardsdev/publications.

A list of all parts of 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

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 (APU). Among the categories mentioned above, this document, IEC 62282-4-101, focuses on safety of electrically powered industrial ~~electric~~ trucks with fuel cell power systems because such applications are urgently demanded in the world. Future documents in this part of IEC 62282-4 will deal with other applications related to onboard vehicles other than road vehicles and auxiliary power units (APU).

FUEL CELL TECHNOLOGIES –

Part 4-101: ~~Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Safety of electrically powered industrial trucks~~ Fuel cell power systems for electrically powered industrial trucks – Safety

1 Scope

This document deals with safety of fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU).

This part of IEC 62282 covers safety requirements for fuel cell power systems intended to be used in electrically powered industrial trucks as defined in ISO 5053-1, except for:

– rough-terrain trucks;
– non-stacking low-lift straddle carriers;
– stacking high-lift straddle carriers;
– rough-terrain variable-reach trucks;
– slewing rough-terrain variable-reach trucks;
– variable-reach container handlers;
– pedestrian propelled trucks.

~~This standard is limited to electrically powered industrial trucks and is applicable to material-handling equipment, e.g. forklifts.~~

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;
– methanol.

This document covers the fuel cell power system as defined in 3.8 and Figure 1.

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

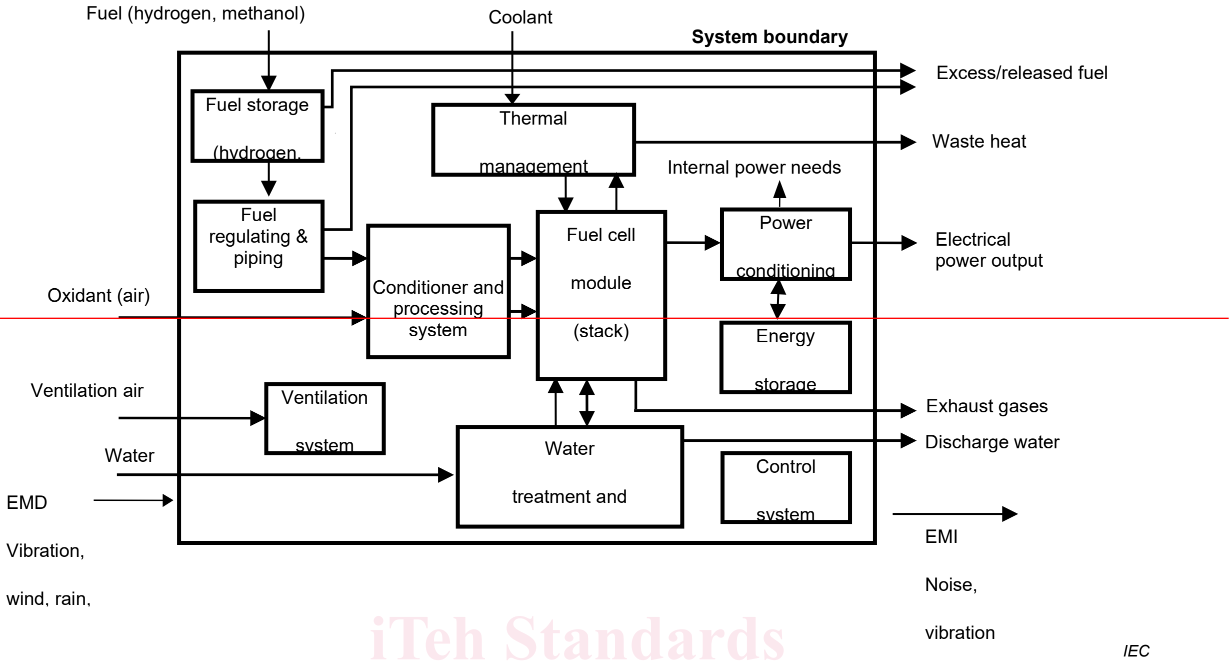
This document covers fuel cell power systems whose fuel source container is permanently attached to either the industrial truck or the fuel cell power system.

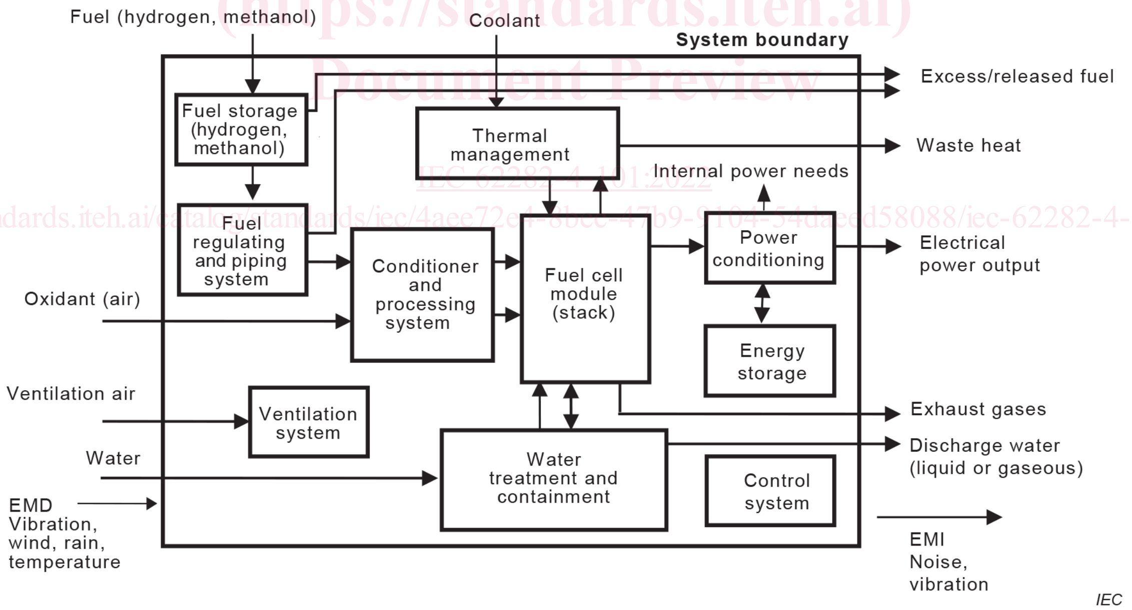
In accordance with IEC Guide 116, significant hazards, hazardous situations and events dealt with in this document are shown in Annex B.

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.





Key

EMD electromagnetic disturbance

EMI electromagnetic interference

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

Figure 1 – Fuel cell power systems for 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 60050-485, *International Electrotechnical Vocabulary (IEV) – Part 485: Fuel cell technologies*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

IEC 60079-29-4, *Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60227-3, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring*

IEC 60227-5, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60335-2-41, *Household and similar electrical appliances – Safety – Part 2-41: Particular requirements for pumps*

IEC 60335-2-80, *Household and similar electrical appliances – Safety – Part 2-80: Particular requirements for fans*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric* shock
IEC 60364-4-41:2005/AMD1:2017

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60584-1, *Thermocouples – Part 1: ~~Reference tables~~ EMF specifications and tolerances*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695 (all parts), *Fire hazard testing*

IEC 60695-1-30, *Fire hazard testing – Part 1-30: Guidance for assessing the fire hazard of electrotechnical products – Preselection testing process – General guidelines*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60695-11-4, *Fire hazard testing – Part 11-4: Test flames – 50 W flame – Apparatus and confirmational test method*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60730-1:2013, *Automatic electrical controls ~~for household and similar use~~ – Part 1: General requirements*
IEC 60730-1:2013/AMD1:2015
IEC 60730-1:2013/AMD2:2020

~~IEC 60730-2-17, *Automatic electrical controls for household and similar use – Part 2-17: Particular requirements for electrically operated gas valves, including mechanical requirements*~~

IEC 60812, *Failure modes and effects analysis (FMEA and FMECA)*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*
IEC 60950-1:2005/AMD1:2009
IEC 60950-1:2005/AMD2:2013

IEC 61025, *Fault tree analysis (FTA)*

IEC 61204-7, *Low-voltage switch mode power supplies~~, d.c. output~~ – Part 7: Safety requirements*

IEC TS 61430, *Secondary cells and batteries – Test methods for checking the performance of devices designed for reducing explosion hazards – Lead-acid starter batteries*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61558-1, *Safety ~~os power transformers, power supplies, reactors and similar products~~ of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

~~IEC 62103, *Electronic equipment for use in power installations*~~

IEC 62477-1, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC 62133-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 1: Nickel systems*

IEC 62282-2-100, *Fuel cell technologies – Part 2-100: Fuel cell modules – Safety*

IEC 62391-1, *Fixed electric double-layer capacitors for use in electric and electronic equipment – Part 1: Generic specification*

IEC 62391-2, *Fixed electric double-layer capacitors for use in electronic equipment – Part 2: Sectional specfication – Electric double layer capacitors for power application*