



**NSAI**  
Standards

Irish Standard  
I.S. EN 62282-3-100:2012

# Fuel cell technologies -- Part 3-100: Stationary fuel cell power systems - Safety (IEC 62282-3-100:2012 (EQV))

## I.S. EN 62282-3-100:2012

*Incorporating amendments/corrigenda issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

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EUROPEAN STANDARD

**EN 62282-3-100**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2012

ICS 27.070

Supersedes EN 62282-3-1:2007

English version

**Fuel cell technologies -  
Part 3-100: Stationary fuel cell power systems -  
Safety  
(IEC 62282-3-100:2012)**

Technologies des piles à combustible -  
Partie 3-100: Systèmes à piles à  
combustible stationnaires -  
Sécurité  
(CEI 62282-3-100:2012)

Brennstoffzellentechnologien -  
Teil 3-100: Stationäre Brennstoffzellen-  
Energiesysteme -  
Sicherheit  
(IEC 62282-3-100:2012)

This European Standard was approved by CENELEC on 2012-03-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

**I.S. EN 62282-3-100:2012**

EN 62282-3-100:2012

- 2 -

**Foreword**

The text of document (105/371/FDIS), future edition 1 of IEC 62282-3-100, prepared by IEC/TC 105 "Fuel cell technologies" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62282-3-100:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-12-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-03-22

This document supersedes EN 62282-3-1:2007.

EN 62282-3-100:2012 includes the following significant technical changes with respect to EN 62282-3-1:2007:

- a) general reorganization of the safety requirements;
- b) major changes for addressing electrical safety requirements for internal components;
- c) clarifications for numerous requirements and tests, particularly the pressure leakage and strength tests;
- d) expanded wind tests;
- e) additional tests for condensate discharge and ventilation leakage.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

**Endorsement notice**

The text of the International Standard IEC 62282-3-100:2012 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60079-20-1	NOTE	Harmonized as EN 60079-20-1.
IEC 60812	NOTE	Harmonized as EN 60812.
IEC 61025	NOTE	Harmonized as EN 61025.
IEC 61511-1	NOTE	Harmonized as EN 61511-1.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	-	-
IEC 60079-2	-	Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"	EN 60079-2	-
IEC 60079-10	Series	Explosive atmospheres - Part 10: Classification of areas	EN 60079-10	Series
IEC 60079-29-1	-	Explosive atmospheres - Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases	EN 60079-29-1	-
IEC 60079-30-1	-	Explosive atmospheres - Part 30-1: Electrical resistance trace heating - General and testing requirements	EN 60079-30-1	-
IEC 60204-1	-	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	EN 60204-1	-
IEC 60335-1 (mod) + corr. July + corr. April	2010 2010 2011	Household and similar electrical appliances - Safety - Part 1: General requirements	EN 60335-1	2012
IEC 60335-2-51	-	Household and similar electrical appliances - Safety - Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations	EN 60335-2-51	-
IEC 60417	Data-base	Graphical symbols for use on equipment	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60730-1	-	Automatic electrical controls for household and similar use - Part 1: General requirements	EN 60730-1	-
IEC 60730-2-5	-	Automatic electrical controls for household and similar use - Part 2-5: Particular requirements for automatic electrical burner control systems	EN 60730-2-5	-
IEC 60730-2-6	-	Automatic electrical controls for household and similar use - Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements	EN 60730-2-6	-

**I.S. EN 62282-3-100:2012**

EN 62282-3-100:2012

- 4 -

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60730-2-9	-	Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls	EN 60730-2-9	-
IEC 60950-1	-	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	-
IEC 61000-3-2	-	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current $\leq$ 16 A per phase)	EN 61000-3-2	-
IEC 61000-3-3	-	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq$ 16 A per phase and not subject to conditional connection	EN 61000-3-3	-
IEC/TS 61000-3-4	-	Electromagnetic compatibility (EMC) - Part 3-4: Limits - Limitation of emission of harmonic currents in low-voltage power supply systems for equipment with rated current greater than 16 A	-	-
IEC/TS 61000-3-5	-	Electromagnetic compatibility (EMC) - Part 3-5: Limits - Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75 A	-	-
IEC 61000-3-11	-	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current $\leq$ 75 A and subject to conditional connection	EN 61000-3-11	-
IEC 61000-6-1	-	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	EN 61000-6-1	-
IEC 61000-6-2	-	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2	-
IEC 61000-6-3	-	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	EN 61000-6-3	-
IEC 61000-6-4	-	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	EN 61000-6-4	-
IEC 61508	Series	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	Series
IEC 62040-1	-	Uninterruptible Power Systems (UPS) - Part 1: General and safety requirements for UPS	EN 62040-1	-

**I.S. EN 62282-3-100:2012**

- 5 -

EN 62282-3-100:2012

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62061	-	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	EN 62061	-
IEC/TS 62282-1	-	Fuel cell technologies - Part 1: Terminology	-	-
IEC 62282-3-200	-	Fuel cell technologies - Part 3-200: Stationary fuel cell power systems - Performance test methods	EN 62282-3-200	-
ISO 3864-2	-	Graphical symbols - Safety colours and safety - signs - Part 2: Design principles for product safety labels	-	-
ISO 4413	-	Hydraulic fluid power - General rules relating to systems	EN ISO 4413	-
ISO 4414	-	Pneumatic fluid power - General rules relating to systems	EN ISO 4414	-
ISO 5388	-	Stationary air compressors - Safety rules and code of practice	-	-
ISO 7000	-	Graphical symbols for use on equipment - Index and synopsis	-	-
ISO 10439	-	Petroleum, chemical and gas service industries - Centrifugal compressors	EN ISO 10439	-
ISO 10440-1	-	Petroleum and natural gas industries - Rotary-type positive-displacement compressors - Part 1: Process compressors (oil-free)	EN ISO 10440-1	-
ISO 10440-2	-	Petroleum and natural gas industries - Rotary-type positive-displacement compressors - Part 2: Packaged air compressors (oil-free)	EN ISO 10440-2	-
ISO 10442	-	Petroleum, chemical and gas service industries - Packaged, integrally geared centrifugal air compressors	EN ISO 10442	-
ISO 12499	-	Industrial fans - Mechanical safety of fans - Guarding	EN ISO 12499	-
ISO 13631	-	Petroleum and natural gas industries - Packaged reciprocating gas compressors	EN ISO 13631	-
ISO 13707	-	Petroleum and natural gas industries - Reciprocating compressors	-	-
ISO 13709	-	Centrifugal pumps for petroleum, petrochemical and natural gas industries	EN ISO 13709	-
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	-
ISO 13850	-	Safety of machinery - Emergency stop - Principles for design	EN ISO 13850	-
ISO 14847	-	Rotary positive displacement pumps - Technical requirements	EN ISO 14847	-
ISO 15649	-	Petroleum and natural gas industries - Piping -	-	-
ISO 16111	-	Transportable gas storage devices - Hydrogen-absorbed in reversible metal hydride	-	-

**I.S. EN 62282-3-100:2012**

EN 62282-3-100:2012

- 6 -

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 23550	-	Safety and control devices for gas burners and gas-burning appliances - General requirements	-	-
ISO 23551-1	-	Safety and control devices for gas burners and gas-burning appliances - Particular requirements - Part 1: Automatic valves	-	-
ISO 23553-1	-	Safety and control devices for oil burners and oil-burning appliances - Particular requirements - Part 1: Shut-off devices for oil burners	EN ISO 23553-1	-
ISO 26142	-	Hydrogen detection apparatus - Stationary applications	-	-



## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references .....	10
3 Terms and definitions .....	12
4 Safety requirements and protective measures .....	17
4.1 General safety strategy .....	17
4.2 Physical environment and operating conditions .....	18
4.2.1 General .....	18
4.2.2 Electrical power input .....	18
4.2.3 Physical environment .....	18
4.2.4 Fuel input .....	18
4.2.5 Water input.....	18
4.2.6 Vibration, shock and bump .....	19
4.2.7 Handling, transportation, and storage .....	19
4.2.8 System purging .....	19
4.3 Selection of materials.....	19
4.4 General requirements.....	20
4.5 Pressure equipment and piping .....	22
4.5.1 Pressure equipment.....	22
4.5.2 Piping systems .....	22
4.5.3 Flue gas venting .....	23
4.5.4 Gas-conveying parts.....	24
4.6 Protection against fire or explosion hazards .....	24
4.6.1 Prevention against fire and explosion hazards in fuel cell power systems provided with cabinets .....	24
4.6.2 Prevention of fire and explosion hazards in burners.....	26
4.6.3 Prevention of fire and explosion hazards in catalytic fuel oxidation systems (catalytic burners).....	28
4.7 Electrical safety.....	29
4.8 Electromagnetic compatibility (EMC) .....	29
4.9 Control systems and protective components.....	29
4.9.1 General requirements .....	29
4.9.2 Control systems.....	29
4.9.3 Protective components .....	32
4.10 Pneumatic and hydraulic powered equipment.....	33
4.11 Valves .....	33
4.11.1 Shut-off valves .....	33
4.11.2 Fuel valves .....	33
4.12 Rotating equipment .....	34
4.12.1 General requirements .....	34
4.12.2 Compressors .....	34
4.12.3 Pumps.....	34
4.13 Cabinets.....	35
4.14 Thermal insulating materials.....	35
4.15 Utilities .....	36
4.15.1 General requirements .....	36

4.15.2	Water supply .....	36
4.15.3	Fuel gas supply .....	36
4.15.4	Electrical connections .....	36
4.16	Installation and maintenance .....	38
4.16.1	Installation .....	38
4.16.2	Maintenance .....	38
5	Type tests .....	38
5.1	General requirements .....	38
5.1.1	Operating parameters for tests .....	39
5.2	Test fuels .....	40
5.3	Basic test arrangements .....	41
5.4	Leakage tests .....	41
5.4.1	General .....	41
5.4.2	Pneumatic leakage tests .....	41
5.4.3	Hydrostatic leakage tests .....	43
5.5	Strength tests .....	44
5.5.1	General .....	44
5.5.2	Pneumatic strength tests .....	44
5.5.3	Hydrostatic strength test .....	45
5.6	Normal operation type test .....	46
5.7	Electrical overload test .....	46
5.8	Shutdown parameters .....	46
5.9	Burner operating characteristics tests .....	46
5.9.1	General .....	46
5.9.2	General testing .....	46
5.9.3	Limit testing .....	47
5.10	Automatic control of burners and catalytic oxidation reactors .....	47
5.10.1	General .....	47
5.10.2	Automatic ignition control burners .....	47
5.10.3	Automated control of catalytic oxidation reactors .....	50
5.11	Exhaust gas temperature test .....	50
5.12	Surface and component temperatures .....	50
5.13	Wind tests .....	51
5.13.1	General .....	51
5.13.2	Wind source calibration procedure for winds directed perpendicular to the wall .....	51
5.13.3	Verification of operation of outdoor fuel cell power systems under wind conditions .....	52
5.13.4	Verification of operation of indoor fuel cell power systems vented horizontally through an outside wall .....	53
5.13.5	Carbon monoxide (CO) and flammable gas components emissions under wind – Indoor units .....	55
5.13.6	Carbon monoxide (CO) and flammable gas components emissions under wind – Outdoor units .....	55
5.14	Rain test .....	56
5.15	Emissions .....	56
5.15.1	General .....	56
5.15.2	Carbon monoxide (CO) and flammable gas emissions .....	56
5.15.3	Normal conditions .....	57
5.16	Blocked condensate line test .....	57

5.17	Condensate discharge test .....	57
5.18	Electrical safety tests .....	58
5.19	EMC test .....	58
5.20	Vent system leakage test .....	58
5.21	Leakage tests (repeat) .....	59
6	Routine tests .....	59
7	Marking, labelling and packaging .....	60
7.1	General requirements .....	60
7.2	Fuel cell power system marking .....	60
7.3	Marking of components .....	61
7.4	Technical documentation .....	61
7.4.1	General .....	61
7.4.2	Installation manual .....	61
7.4.3	User's information manual .....	62
7.4.4	Operating manual .....	65
7.4.5	Maintenance manual .....	66
Annex A (informative) Significant hazards, hazardous situations and events dealt with in this standard .....		67
Annex B (informative) Carburization and material compatibility for hydrogen service .....		69
Bibliography .....		75
Figure 1 – Stationary fuel cell power systems .....		7
Figure 2 – Test wall with static pressure ports and vent terminal locations .....		52
Figure 3 – Vent test wall .....		53
Figure 4 – Piezo ring and details of typical construction .....		54
Figure 5 – Safety precautions for odorized gas-fuelled systems .....		63
Figure 6 – Safety precautions for odorant-free gas fuelled systems .....		64
Figure 7 – Safety precautions for liquid fuelled systems .....		64
Table 1 – Allowable surface temperatures rises .....		21
Table 2 – Leakage test requirements <sup>a, d, e</sup> .....		43
Table 3 – Ultimate strength test requirements <sup>a, d</sup> .....		45
Table 4 – Wind calibration .....		52
Table A.1 – Hazardous situations and events .....		67

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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### **FUEL CELL TECHNOLOGIES –**

### **Part 3-100: Stationary fuel cell power systems – Safety**

#### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62282-3-100 has been prepared by IEC technical committee 105: Fuel cell technologies.

IEC 62282-3-100 cancels and replaces IEC 62282-3-1 published in 2007. IEC 62282-3-100 constitutes a technical revision.

IEC 62282-3-100 includes the following significant technical changes with respect to IEC 62282-3-1:

- a) general reorganization of the safety requirements;
- b) major changes for addressing electrical safety requirements for internal components;
- c) clarifications for numerous requirements and tests, particularly the pressure leakage and strength tests;
- d) expanded wind tests;

e) additional tests for condensate discharge and ventilation leakage.

The text of this standard is based on the following documents:

FDIS	Report on voting
105/371/FDIS	105/384/RVD

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

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

A list of all the parts of the IEC 62282 series, under the general title *Fuel cell technologies*, can be found on the IEC website.

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

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

A bilingual version of this standard may be issued at a later date.

## INTRODUCTION

A typical stationary fuel cell power system is shown in Figure 1.

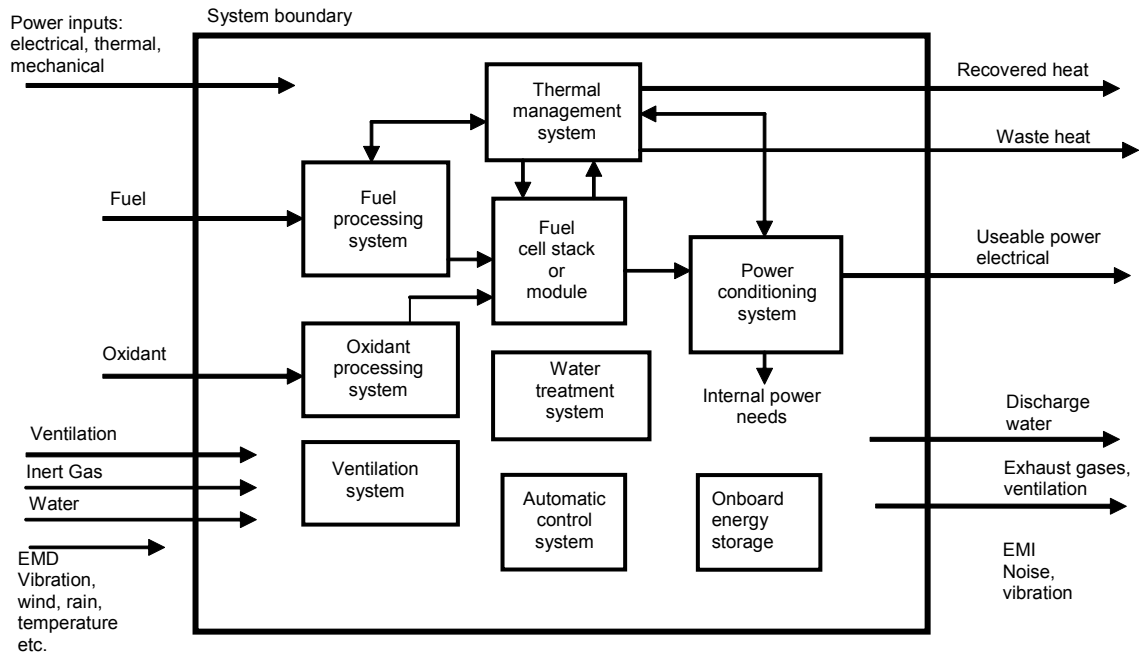


Figure 1 – Stationary fuel cell power systems

The overall design of the power system anticipated by this standard forms an assembly of integrated systems, as necessary, intended to perform designated functions, as follows.

- **Fuel processing system** – System of chemical and/or physical processing equipment plus associated heat exchanges and controls required to prepare, and if necessary, pressurize, the fuel for utilization within a fuel cell power system.
- **Oxidant processing system** – System that meters, conditions, processes and may pressurize the incoming supply for use within the fuel cell power system.
- **Thermal management system** – System that provides heating or cooling and heat rejection to maintain the fuel cell power system in the operating temperature range, and may provide for the recovery of excess heat and assist in heating the power train during start-up.
- **Water treatment system** – System that provides all the necessary purification treatment of the recovered or added water for use within the fuel cell power system.
- **Power conditioning system** – Equipment that is used to adapt the electrical energy produced by the fuel cell stack(s) to application requirements as specified by the manufacturer.
- **Automatic control system** – System(s) that is composed of sensors, actuators, valves, switches and logic components that maintain the fuel cell power system parameters within the manufacturer's specified limits including moving to safe states without manual intervention.
- **Ventilation system** – System that provides air through forced or natural means to the fuel cell power system's enclosure.
- **Fuel cell modules** – Equipment assembly of one or more fuel cell stacks which electrochemically converts chemical energy to electric energy and thermal energy intended to be integrated into a power generation system.

- **Fuel cell stack** – Equipment assembly of cells, separators, cooling plates, manifolds and a support structure that electrochemically converts, typically, hydrogen rich gas and air reactants to DC power, heat and other reactant bi-products.
- **Onboard energy storage** – System of internal electric energy storage devices intended to aid or complement the fuel cell module in providing power to internal or external loads.

## FUEL CELL TECHNOLOGIES –

### Part 3-100: Stationary fuel cell power systems – Safety

#### 1 Scope

This part of IEC 62282 applies to stationary packaged, self-contained fuel cell power systems or fuel cell power systems comprised of factory matched packages of integrated systems which generate electricity through electrochemical reactions.

This standard applies to systems

- intended for electrical connection to mains direct, or with a transfer switch, or to a stand-alone power distribution system;
- intended to provide AC or DC power;
- with or without the ability to recover useful heat;
- intended for operation on the following input fuels
  - a) natural gas and other methane rich gases derived from renewable (biomass) or fossil fuel sources, for example, landfill gas, digester gas, coal mine gas;
  - b) fuels derived from oil refining, for example, diesel, gasoline, kerosene, liquefied petroleum gases such as propane and butane;
  - c) alcohols, esters, ethers, aldehydes, ketones, Fischer-Tropsch liquids and other suitable hydrogen-rich organic compounds derived from renewable (biomass) or fossil fuel sources, for example, methanol, ethanol, di-methyl ether, biodiesel;
  - d) hydrogen, gaseous mixtures containing hydrogen gas, for example, synthesis gas, town gas.

This standard does not cover:

- micro fuel cell power systems;
- portable fuel cell power systems;
- propulsion fuel cell power systems.

NOTE For special application such as “marine auxiliary power”, additional requirements may be given by the relevant marine ship register standard.

This standard is applicable to stationary fuel cell power systems intended for indoor and outdoor commercial, industrial and residential use in non-hazardous (unclassified) areas.

This standard contemplates all significant hazards, hazardous situations and events, with the exception of those associated with environmental compatibility (installation conditions), relevant to fuel cell power systems, when they are used as intended and under the conditions foreseen by the manufacturer.

This standard deals with conditions that can yield hazards on the one hand to persons, and on the other to damage outside the fuel cell system only. Protection against damage to the fuel cell system internals is not addressed in this standard, provided it does not lead to hazards outside the fuel cell system.

The requirements of this standard are not intended to constrain innovation. When considering fuels, materials, designs or constructions not specifically dealt with in this standard, these



alternatives shall be evaluated as to their ability to yield levels of safety and performance equivalent to those prescribed by this standard.

## 2 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure «p»*

IEC 60079-10 (all parts), *Explosive atmospheres – Part 10: Classification of areas*

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

IEC 60079-30-1, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements*

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

IEC 60335-1:2010, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60335-2-51, *Household and similar electrical appliances – Safety – Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations*

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