

**Kütuseelementide kasutamistehnika. Osa 3-100:
Kohtkindlad kütuseelement-energiaallikad. Ohutus**

**Fuel cell technologies - Part 3-100: Stationary fuel cell
power systems - Safety**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

| | |
|---|--|
| See Eesti standard EVS-EN 62282-3-100:2012 sisaldab Euroopa standardi EN 62282-3-100:2012 ingliskeelset teksti. | This Estonian standard EVS-EN 62282-3-100:2012 consists of the English text of the European standard EN 62282-3-100:2012. |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 20.04.2012. | Date of Availability of the European standard is 20.04.2012. |
| Standard on kättesaadav Eesti Standardikeskusest. | The standard is available from the Estonian Centre for Standardisation. |

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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)

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Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-03-22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 | - |

| <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 | - |

| <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 | - | - |

| <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 | - | - |

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INTRODUCTION

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

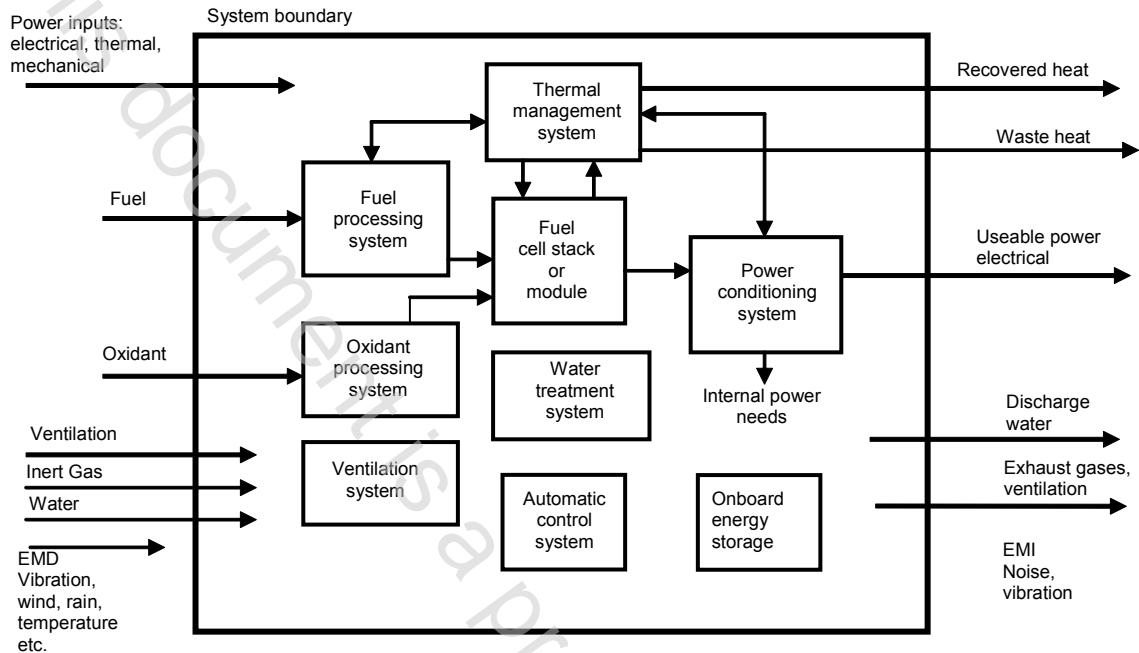


Figure 1 – Stationary fuel cell power systems

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.

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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*

IEC 60417, *Graphical symbols for use on equipment*. Available from: <<http://www.graphical-symbols.info/equipment>>

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60730-1, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60730-2-5, *Automatic electrical controls for household and similar use – Part 2-5: Particular requirements for automatic electrical burner control systems*

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*

IEC 60730-2-9, *Automatic electrical controls for household and similar use – Part 2-9: Particular requirements for temperature sensing controls*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic currents emissions (equipment input current ≤16 A per phase)*

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 ≤ 16 A per phase and not subject to conditional connection*

IEC 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 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 ≤ 75 A and subject to conditional connection*

IEC 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

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

IEC 62040-1, *Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS*

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

IEC/TS 62282-1, *Fuel cell technologies – Part 1: Terminology*

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ISO 13707, *Petroleum and natural gas industries – Reciprocating compressors*

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ISO 23551-1, *Safety and control devices for gas burners and gas-burning appliances – Particular requirements – Part 1: Automatic valves*

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ISO 26142, *Hydrogen detection apparatus – Stationary applications*

3 Terms and definitions

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

3.1

accessible

area to which, under normal operating conditions, one of the following applies:

- a) access can be gained without the use of a tool;
- b) the means of access is deliberately provided to the end user;
- c) the end user is instructed to enter regardless of whether or not a tool is needed to gain access