SVENSK STANDARD SS-EN 62282-3-1

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# Bränsleceller – Del 3-1: Stationära system – Säkerhet

*Fuel cell technologies – Part 3-1: Stationary fuel cell power systems – Safety*

Som svensk standard gäller europastandarden EN 62282-3-1:2007. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62282-3-1:2007.

## Nationellt förord

Europastandarden EN 62282-3-1:2007

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC

– **IEC 62282-3-1, First edition, 2007 - Fuel cell technologies - Part 3-1: Stationary fuel cell power systems - Safety**

utarbetad inom International Electrotechnical Commission, IEC.

ICS 27.070

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

# EN 62282-3-1

June 2007

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English version

# Fuel cell technologies - Part 3-1: Stationary fuel cell power systems - Safety

(IEC 62282-3-1:2007)

Technologies des piles à combustible - Partie 3-1: Systèmes à piles à combustible stationnaires - Sécurité
(CEI 62282-3-1:2007)

Brennstoffzellentechnologien - Teil 3-1: Stationäre Brennstoffzellen-Energiesysteme - Sicherheit
(IEC 62282-3-1:2007)

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CENELEC

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**



Ref. No. EN 62282-3-1:2007 E

## Foreword

The text of document 105/138/FDIS, future edition 1 of IEC 62282-3-1, prepared by IEC TC 105, Fuel cell technologies, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62282-3-1 on 2007-05-01.

The following dates were fixed:

| | | |
|---|---|---|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2008-02-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2010-05-01 |

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 62282-3-1:2007 was approved by CENELEC as a European Standard without any modification.

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# Annex ZA
(normative)

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

The following referenced documents are indispensable for the application 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.

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

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60079-0 (mod) | - [1)] | Electrical apparatus for explosive gas atmospheres - Part 0: General requirements | EN 60079-0 | 2006 [2)] |
| IEC 60079-2 | - [1)] | Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p" | - | - |
| IEC 60079-10 | - [1)] | Electrical apparatus for explosive gas atmospheres - Part 10: Classification of hazardous areas | EN 60079-10 | 2003 [2)] |
| IEC/TR 60079-16 | - [1)] | Electrical apparatus for explosive gas atmospheres - Part 16: Artificial ventilation for the protection of analyzer(s) houses | - | - |
| IEC/TR 60079-20 | - [1)] | Electrical apparatus for explosive gas atmospheres - Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus | - | - |
| IEC 60204-1 (mod) | - [1)] | Safety of machinery - Electrical equipment of machines - Part 1: General requirements | EN 60204-1 | 2006 [2)] |
| IEC 60300-3-9 | - [1)] | Dependability management - Part 3: Application guide - Section 9: Risk analysis of technological systems | - | - |
| IEC 60335-1 (mod) | - [1)] | Household and similar electrical appliances - Safety - Part 1: General requirements | EN 60335-1<br>+ A11<br>+ A12 | 2002 [2)]<br>2004<br>2006 |

[1)] Undated reference.

[2)] Valid edition at date of issue.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60335-2-51 | - [1)] | 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 | 2003 [2)] |
| IEC 60384-14 | - [1)] | Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains | EN 60384-14 | 2005 [2)] |
| IEC 60417 | Data base | Graphical symbols for use on equipment | - | - |
| IEC 60529 | - [1)] | Degrees of protection provided by enclosures (IP Code) | EN 60529<br>+ corr. May | 1991 [2)]<br>1993 |
| IEC 60730-1 (mod) | - [1)] | Automatic electrical controls for household and similar use - Part 1: General requirements | EN 60730-1<br>+ A12<br>+ A13<br>+ A14<br>+ A15<br>+ A16 | 2000 [2)]<br>2003<br>2004<br>2005<br>2007<br>2007 |
| IEC 60730-2-5 (mod) | - [1)] | Automatic electrical controls for household and similar use - Part 2-5: Particular requirements for automatic electrical burner control systems | EN 60730-2-5<br>+ A11 | 2002 [2)]<br>2005 |
| IEC 60730-2-6 | - [1)] | 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 (mod) | - [1)] | Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls | EN 60730-2-9<br>+ A11<br>+ A12 | 2002 [2)]<br>2003<br>2004 |
| IEC 60730-2-17 | - [1)] | Automatic electrical controls for household and similar use - Part 2-17: Particular requirements for electrically operated gas valves, including mechanical requirements | - | - |
| IEC 60730-2-19 (mod) | - [1)] | Automatic electrical controls for household and similar use - Part 2-19: Particular requirements for electrically operated oil valves, including mechanical requirements | EN 60730-2-19<br>+ A11 | 2002 [2)]<br>2005 |
| IEC 60812 | - [1)] | Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA) | EN 60812 | 2006 [2)] |
| IEC 60950-1 (mod) | 2005 | Information technology equipment - Safety - Part 1: General requirements | EN 60950-1 | 2006 |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61000-3-2 | - [1)] | Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase) | EN 61000-3-2 | 2006 [2)] |
| IEC 61000-3-3 | - [1)] | 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 | EN 61000-3-3<br>+ corr. July<br>+ IS1 | 1995 [2)]<br>1997<br>2005 |
| IEC/TS 61000-3-4 | - [1)] | 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 | - [1)] | Electromagnetic compatibility (EMC) - Part 3-5: Limits - Section 5: Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 16 A | - | - |
| IEC 61000-6-1 | - [1)] | Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments | EN 61000-6-1 | 2007 [2)] |
| IEC 61000-6-2 | - [1)] | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments | EN 61000-6-2<br>+ corr. September | 2005 [2)]<br>2005 |
| IEC 61000-6-3 | - [1)] | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments | EN 61000-6-3 | 2007 [2)] |
| IEC 61000-6-4 | - [1)] | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments | EN 61000-6-4 | 2007 [2)] |
| IEC 61025 | - [1)] | Fault Tree Analysis (FTA) | EN 61025 | 2007 [2)] |
| IEC 61508 | Series | Functional safety of electrical/electronic/programmable electronic safety-related systems | EN 61508 | Series |
| IEC 61511-1 | - [1)] | Functional safety - Safety instrumented systems for the process industry sector - Part 1: Framework, definitions, system, hardware and software requirements | EN 61511-1 | 2004 [2)] |
| IEC 61511-3 | - [1)] | Functional safety - Safety instrumented systems for the process industry sector - Part 3: Guidance for the determination of the required safety integrity levels | EN 61511-3 | 2004 [2)] |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61779-4 (mod) | - [1)] | Electrical apparatus for the detection and measurement of flammable gases - Part 4: Performance requirements for group II apparatus indicating a volume fraction up to 100 % lower explosive limit | EN 61779-4 | 2000 [2)] |
| IEC 61779-6 | - [1)] | Electrical apparatus for the detection and measurement of flammable gases - Part 6: Guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of flammable gases | - | - |
| IEC 61882 | - [1)] | Hazard and operability studies (HAZOP studies) - Application guide | - | - |
| IEC 62086-1 | - [1)] | Electrical apparatus for explosive gas atmospheres - Electrical resistance trace heating - Part 1: General and testing requirements | EN 62086-1 [3)] | 2005 [2)] |
| IEC 62282-2 | - [1)] | Fuel cell technologies - Part 2: Fuel cell modules | EN 62282-2 | 2004 [2)] |
| IEC 62282-3-2 | - [1)] | Fuel cell technologies - Part 3-2 : Stationary fuel cell power plants - Performance test methods | EN 62282-3-2 | 2006 [2)] |
| IEC Guide 104 | 1997 | The preparation of safety publications and the use of basic safety publications and group safety publications | - | - |
| ISO 3864-2 | 2004 | Graphical symbols - Safety colours and safety signs - Part 2: Design principles for product safety labels | - | - |
| ISO 4413 | - [1)] | Hydraulic fluid power - General rules relating to systems | - | - |
| ISO 4414 | - [1)] | Pneumatic fluid power - General rules relating to systems | - | - |
| ISO 5388 | - [1)] | Stationary air compressors - Safety rules and code of practice | - | - |
| ISO 7000 | - [1)] | Graphical symbols for use on equipment - Index and synopsis | - | - |
| ISO 10439 | - [1)] | Petroleum, chemical and gas service industries - Centrifugal compressors | EN ISO 10439 | 2002 [2)] |

[3)] EN 62086-1 is superseded by EN 60079-30-1:2007, which is based on IEC 60079-30-1:2007.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| ISO 10440-1 | - [1)] | Petroleum and natural gas industries - Rotary-type positive- displacement compressors - Part 1: Process compressors (oil-free) | EN ISO 10440-1 | 2000 [2)] |
| ISO 10440-2 | - [1)] | Petroleum and natural gas industries - Rotary-type positive-displacement compressors - Part 2: Packaged air compressors (oil-free) | EN ISO 10440-2 | 2001 [2)] |
| ISO 10442 | - [1)] | Petroleum, chemical and gas service industries - Packaged, integrally geared centrifugal air compressors | EN ISO 10442 | 2002 [2)] |
| ISO 13631 | - [1)] | Petroleum and natural gas industries - Packaged reciprocating gas compressors | EN ISO 13631 | 2002 [2)] |
| ISO 13707 | - [1)] | Petroleum and natural gas industries - Reciprocating compressors | - | - |
| ISO 13709 | - [1)] | Centrifugal pumps for petroleum, petrochemical and natural gas industries | EN ISO 13709 | 2003 [2)] |
| ISO 13850 | - [1)] | Safety of machinery - Emergency stop - Principles for design | EN ISO 13850 | 2006 [2)] |
| ISO 14121 | - [1)] | Safety of machinery - Principles of risk assessment | - | - |
| ISO 14847 | - [1)] | Rotary positive displacement pumps - Technical requirements | EN ISO 14847 | 1999 [2)] |
| ISO 15649 | - [1)] | Petroleum and natural gas industries - Piping | - | - |
| ISO/TR 15916 | - [1)] | Basic considerations for the safety of hydrogen systems | - | - |
| ISO/TS 16528 | - [1)] | Boilers and pressure vessels - Registration of Codes and Standards to promote international recognition | - | - |
| ISO/IEC Guide 7 | 1994 | Guidelines for drafting standards suitable for use for conformity assessment | - | - |
| ISO/IEC Guide 51 | 1999 | Safety aspects - Guidelines for their inclusion in standards | - | - |

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# FUEL CELL TECHNOLOGIES –

# Part 3-1: Stationary fuel cell power systems – Safety

## 1 Scope

This part of IEC 62282 is a product safety standard suitable for conformity assessment as stated in IEC Guide 104:1997, ISO/IEC Guide 51:1999 and ISO/IEC Guide 7:1994.

This standard 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;

– systems intended to provide a.c. or d.c. power;

– systems with or without the ability to recover useful heat;

– systems 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

– portable fuel cell power systems;

– propulsion fuel cell power systems.

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

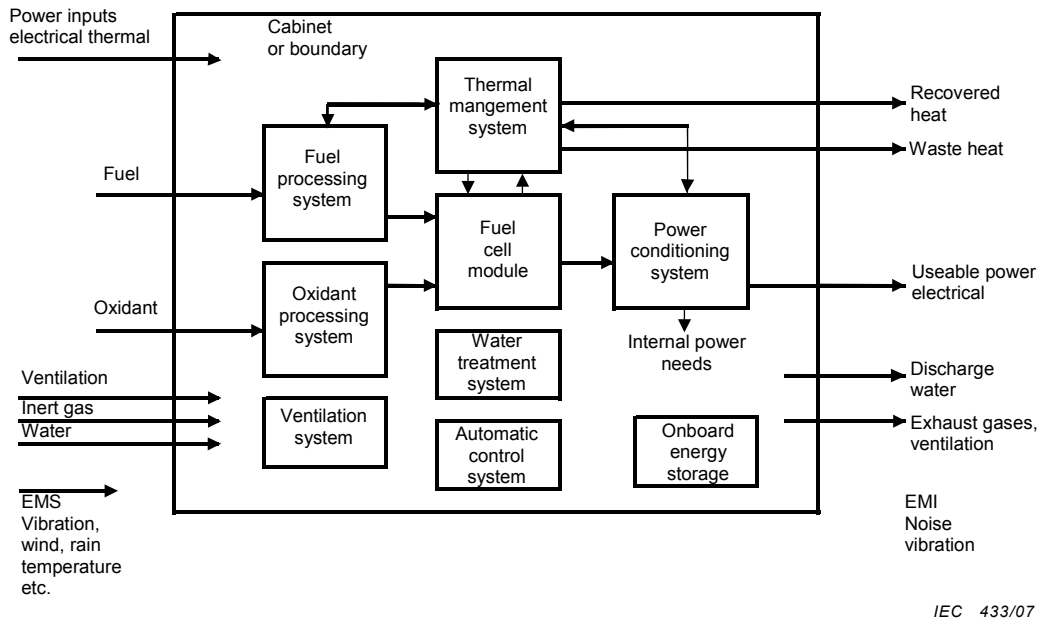


**Figure 1 – Stationary fuel cell power systems**

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

- Fuel processing system: Catalytic or chemical processing equipment plus associated heat exchangers and controls required to prepare the fuel for utilization within a fuel cell.
- Oxidant processing system: The system that meters, conditions, processes and may pressurize the incoming supply for use within the fuel cell power system.
- Thermal management system: Provides cooling and heat rejection to maintain thermal equilibrium within the fuel cell power system, and may provide for the recovery of excess heat and assist in heating the power train during startup.
- Water treatment system: Provides the treatment and purification of recovered or added water for use within the fuel cell power systems.
- Power conditioning system: Equipment which is used to adapt the electrical energy produced to the requirements as specified by the manufacturer.
- Automatic control system: The assembly of sensors, actuators, valves, switches and logic components that maintains the fuel cell power system parameters within the manufacturer's specified limits without manual intervention.
- Ventilation system: Provides, by mechanical means, air to a fuel cell power system's cabinet.
- Fuel cell module: Assembly of one or more fuel cell stacks, electrical connections for the power delivered by the stacks, and means for monitoring and/or control.
- Fuel cell stack: Assembly of cells, separators, cooling plates, manifolds and a supporting structure that electrochemically coverts, typically, hydrogen rich gas and air reactants to d.c. power, heat, water and other byproducts.

– Onboard energy storage: Internal energy source intended to aid or complement the fuel cell module in providing power to internal or external loads.

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 referenced documents are indispensable for the application 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 60079-0, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

IEC 60079-2, *Electrical apparatus for explosive gas atmospheres – Part 2: Pressurized enclosures "p"*

IEC 60079-10, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IEC 60079-16, *Electrical apparatus for explosive gas atmospheres – Part 16: Artificial ventilation for the protection of analyzer(s) houses*

IEC 60079-20, *Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus*

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

IEC 60300-3-9, *Dependability management – Part 3: Application guide – Section 9: Risk analysis of technological systems*

IEC 60335-1, *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 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment*