SLOVENSKI STANDARD
SIST EN IEC 62282-2-100:2020

01-september-2020

Nadomešča:
SIST EN 62282-2:2012

Tehnologije gorivnih celic - 2-100. del: Moduli gorivnih celic - Varnost (IEC 62282-2-100:2020)

Fuel cell technologies - Part 2-100: Fuel cell modules - Safety (IEC 62282-2-100:2020)

Brennstoffzellentechnologien - Teil 2-100: Brennstoffzellenmodule - Sicherheit (IEC 62282-2-100:2020)

Technologies des piles à combustible - Partie 2-100: Modules à piles à combustible - Sécurité (IEC 62282-2-100:2020)

Ta slovenski standard je istoveten z: **EN IEC 62282-2-100:2020**

ICS:

27.070	Gorilne celice	Fuel cells

SIST EN IEC 62282-2-100:2020 **en**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN IEC 62282-2-100

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Supersedes EN 62282-2:2012 and all of its amendments and corrigenda (if any)

English Version

Fuel cell technologies - Part 2-100: Fuel cell modules - Safety (IEC 62282-2-100:2020)

Technologies des piles à combustible - Partie 2-100: Modules à piles à combustible - Sécurité (IEC 62282-2-100:2020)

Brennstoffzellentechnologien - Teil 2-100: Brennstoffzellenmodule - Sicherheit (IEC 62282-2-100:2020)

This European Standard was approved by CENELEC on 2020-06-11. 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.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 105/782/FDIS, future edition 1 of IEC 62282-2-100, prepared by IEC/TC 105 "Fuel cell technologies" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62282-2-100:2020.

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) 2021-03-11
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-06-11

This document supersedes EN 62282-2:2012 and all of its amendments and corrigenda (if any).

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

Endorsement notice

The text of the International Standard IEC 62282-2-100:2020 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 60812	NOTE	Harmonized as EN IEC 60812
IEC 61025	NOTE	Harmonized as EN 61025
ISO/IEC 80079-20-1:2017	NOTE	Harmonized as EN ISO/IEC 80079-20-1:2019 (not modified)
ISO 1307	NOTE	Harmonized as EN ISO 1307
ISO 1402	NOTE	Harmonized as EN ISO 1402
ISO 10619-1	NOTE	Harmonized as EN ISO 10619-1
ISO 10619-2	NOTE	Harmonized as EN ISO 10619-2
ISO 10619-3	NOTE	Harmonized as EN ISO 10619-3
IEC 62282-3-100	NOTE	Harmonized as EN IEC 62282-3-100
IEC 60079 (series)	NOTE	Harmonized as EN IEC 60079 (series)

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60079-10-1	-	Explosive atmospheres - Part 10-1: Classification of areas - Explosive gas atmospheres	EN 60079-10-1	-
IEC 60204-1	-	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	EN 60204-1	-
IEC 60335-1	-	Household and similar electrical appliances - Safety - Part 1: General requirements	EN 60335-1	-
IEC 60352	series	Solderless connections	EN 60352	series
IEC 60512-15	series	Connectors for electronic equipment - Tests and measurements - Part 15: Connector tests (mechanical)	EN 60512-15	series
IEC 60512-16	series	Connectors for electronic equipment - Tests and measurements - Part 16: Mechanical tests on contacts and terminations	EN 60512-16	series
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
IEC 60617	series	Graphical symbols for diagrams	EN 60617	series
IEC 60695	series	Fire hazard testing	EN 60695	series
IEC 60730-1	-	Automatic electrical controls - Part 1: General requirements	EN 60730-1	-
IEC 61010-1	-	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1	-
IEC 61204-7	-	Low-voltage switch mode power supplies - Part 7: Safety requirements	EN IEC 61204-7	-
IEC 61508	series	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	series

Publication	Year	Title	EN/HD	Year
IEC 62040-1	-	Uninterruptible power systems (UPS) - Part 1: Safety requirements	EN IEC 62040-1	-
IEC 62061	-	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	EN 62061	-
IEC 62282-4-101	-	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	EN 62282-4-101	-
IEC 62368-1	-	Audio/video, information and communication technology equipment - Part 1: Safety requirements	EN IEC 62368-1	-
IEC 62477-1	2012	Safety requirements for power electronic converter systems and equipment - Part 1: General	EN 62477-1	2012
-	-		+ A11	2014
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	-
ISO 23550	-	Safety and control devices for gas burners and/or gas-burning appliances - General requirements	-	-

IEC 62282-2-100

Edition 1.0 2020-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fuel cell technologies – Part 2-100: Fuel cell modules – Safety

Technologies des piles à combustible – Partie 2-100: Modules à piles à combustible – Sécurité

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FUEL CELL TECHNOLOGIES – Part 2-100: Fuel cell modules – 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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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 62282-2-100 has been prepared by IEC technical committee 105: Fuel cell technologies.

This first edition cancels and replaces IEC 62282-2, published in 2012.

This edition includes the following significant technical changes with respect to IEC 62282-2:2012:

- references to IEC 60050-485[1] instead of IEC TS 62282-1;
- update of normative references;
- update of definitions, in particular **fuel cell module** for **normal operation**;
- leakage values under normal and abnormal operation have been addressed;
- a delayed ignition test has been included;
- protective measures to limit gas leakage have been included;

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1 Under preparation. Stage at the time of publication IEC BPUB 60050-485:2019.

- the requirements for insulation between live parts and **SELV** have been updated;
- the general safety strategy has been modified to reflect the needs for different application standards; the modifications are in line with similar modifications made to IEC 62282-3-100;
- the electrical components clause has been modified to reflect the needs for different application standards; the modifications are in line with similar modifications made to IEC 62282-3-100;
- protective earthing as part of the module or bonding as a measure within the installation has been introduced;
- a dielectric strength test has been completely updated by referring to IEC 62744-1 for voltages up to 1 000 V AC/1 500 V DC;
- a new “pressure drop method” leakage test method has been included;
- terms such as normal/abnormal e.g. in conjunction with operating conditions are used in a more consistent way;
- inclusion of definitions for **hazards** and **hazardous situations** based on the IEC 60079 series;
- the marking and instructions have been enlarged to provide the system integrator with the necessary information;
- a new Annex A addressing significant **hazards**, **hazardous situations** and events dealt with in this document, and linked to 4.1 (General safety strategy) has been added.

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

FDIS	Report on voting
105/782/FDIS	105/793/RVD

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

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

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.

NOTE In this document, the following print type is used:

– terms defined in Clause 3: **in bold type**.

The reader's attention is drawn to the fact that Annex C lists all of the “in-some-country” clauses on differing practices of a less permanent nature relating to the subject of this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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 publication 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.

FUEL CELL TECHNOLOGIES – Part 2-100: Fuel cell modules – Safety

1 Scope

This part of IEC 62282 provides safety related requirements for construction, operation under normal and abnormal conditions and the testing of **fuel cell modules**. It applies to **fuel cell modules** with the following electrolyte chemistry:

- alkaline;
- polymer electrolyte (including direct methanol **fuel cells**)[2];
- phosphoric acid;
- molten carbonate;
- solid oxide;
- aqueous solution of salts.

Fuel cell modules can be provided with or without an enclosure and can be operated at significant pressurization levels or close to ambient pressure.

This document deals with conditions that can yield **hazards** to persons and cause damage outside the **fuel cell modules**. Protection against damage inside the **fuel cell modules** is not addressed in this document, provided it does not lead to **hazards** outside the module.

These requirements can be superseded by other standards for equipment containing **fuel cell modules** as required for particular applications.

This document does not cover **fuel cell** road vehicle applications.

This document is not intended to limit or inhibit technological advancement. An appliance employing materials or having forms of construction differing from those detailed in the requirements of this document can be examined and tested according to the purpose of these requirements and, if found to be substantially equivalent, can be considered to comply with this document.

The **fuel cell modules** are components of final products. These products require evaluation according to appropriate end-product safety requirements.

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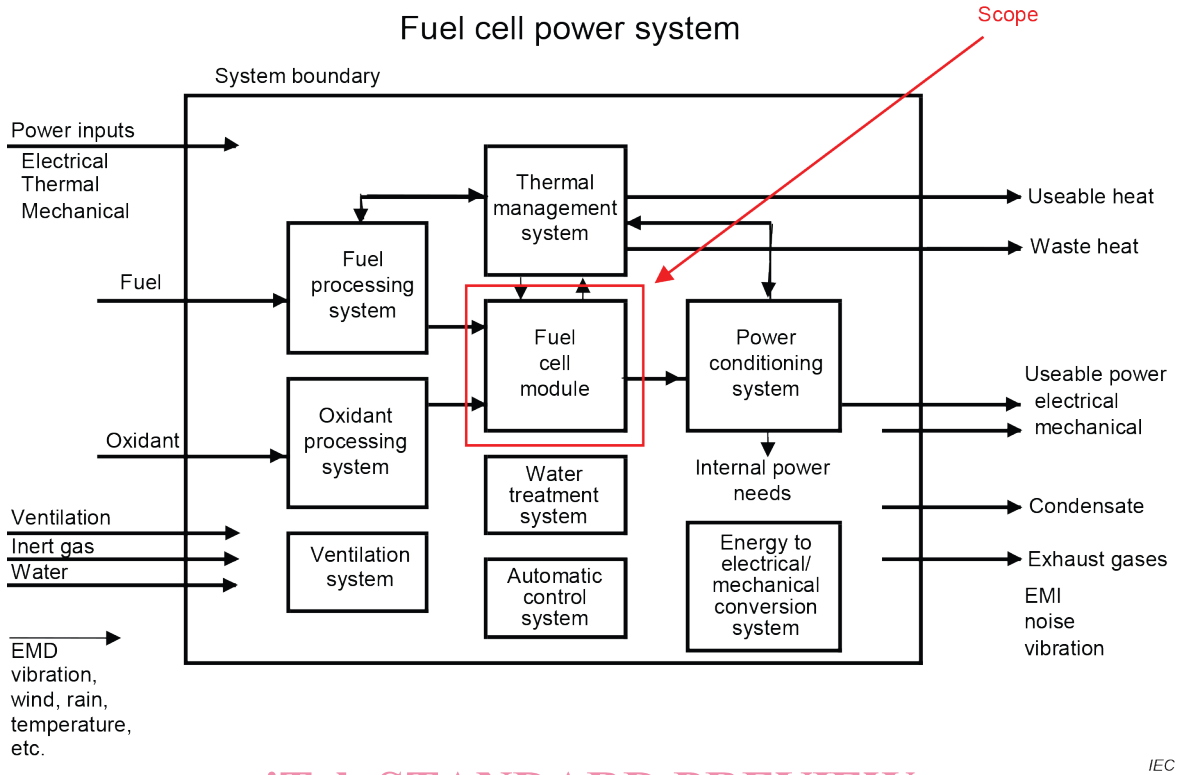
2 Also known as proton exchange membrane fuel cell.



Key

EMD electromagnetic disturbance

EMI electromagnetic interference

Figure 1 – Fuel cell power system components

This document covers only up to the DC output of the **fuel cell module**.

This document does not apply to peripheral devices as illustrated in Figure 1.

This document does not cover the storage and delivery of fuel and oxidant to the **fuel cell module**.

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

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

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

IEC 60352 (all parts), *Solderless connections*

IEC 60512-15 (all parts), *Connectors for electronic equipment – Tests and measurements – Part 15: Connector tests (mechanical)*

IEC 60512-16 (all parts), *Connectors for electronic equipment – Tests and measurements – Part 16: Mechanical tests on contacts and terminations*

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

IEC 60617, *Graphical symbols for diagrams* (available at http://std.iec.ch/iec60617)

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

IEC 60730-1, *Automatic electrical controls – Part 1: General requirements*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61204-7, *Low-voltage switch mode power supplies – Part 7: Safety requirements*

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

IEC 62040-1, *Uninterruptible power systems (UPS) – Part 1: Safety requirements*

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

IEC 62282-4-101, *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*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 62477-1:2012, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

ISO 13849-1, *Safety of machinery – Safety related parts of control systems – Part 1: General principles for design*

ISO 23550, *Safety and control devices for gas and/or oil burners and appliances – General requirements*

3 Terms and definitions

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

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

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

3.1
fuel cell module
assembly incorporating one or more **fuel cell stacks** and, if applicable, additional components, which is intended to be integrated into a power system or a vehicle

Note 1 to entry: A **fuel cell module** comprises the following main components: one or more **fuel cell stack**(s), a piping system for conveying fuels, oxidants and exhausts, electric connections for the power delivered by the stack(s) and means for monitoring, control or both. Additionally, a **fuel cell module** can comprise: means for conveying additional fluids (e.g. cooling media, inert gas), means for detecting normal and abnormal operating conditions, enclosures or pressure vessels and module **ventilation** systems, and the required electronic components for module operation and power **conditioning**.

[SOURCE: IEC 60050-485:—, 485-09-03]

3.2
acceptance test
contractual test to prove to the customer that the item meets certain conditions of its specification

[SOURCE: IEC 60050-151:2001, 151-16-23, modified – The admitted term "hand-over test" has been deleted.]

3.3
maximum allowable differential working pressure
maximum differential pressure between the anode and cathode side, specified by the manufacturer, which the **fuel cell module** can withstand without any damage or permanent loss of functional properties

Note 1 to entry: The maximum allowable differential working pressure is expressed in Pa.

[SOURCE: IEC 60050-485:—, 485-17-02, modified – "fuel cell" has been replaced with "fuel cell module".]

3.4
allowable working pressure
maximum gauge pressure specified by the manufacturer which the **fuel cell module** can withstand without any damage or permanent loss of functional properties

Note 1 to entry: For **fuel cell modules** incorporating pressure relief devices, this is normally used to define the threshold of the set pressure.

3.5
ambient temperature
temperature of the medium surrounding a device, equipment or installation which may affect the performance of the device, equipment or installation

3.6
conditioning
<related to cells and stacks> preliminary step that is required to properly operate a **fuel cell module** (3.1) to achieve a desired performance following a protocol specified by the manufacturer

Note 1 to entry: The **conditioning** can include reversible processes, or irreversible processes, or both depending on the cell technology.

[SOURCE: IEC 60050-485:—, 485-11-08, modified – "fuel cell" has been replaced with "fuel cell module".]