

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

**Fuel cell technologies –
Part 1: Terminology**

**Technologies des piles à combustible –
Partie 1: Terminologie**

IEC TS 62282-1:2013

<https://standards.iteh.ai/standards/iec/ce7a03f3-da8b-479f-a25a-a1d735f40243/iec-ts-62282-1-2013>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente. un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

**Fuel cell technologies –
Part 1: Terminology**

**Technologies des piles à combustible –
Partie 1: Terminologie**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

W

ICS 27.070

ISBN 978-2-83221-190-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Diagrams of generalized fuel cell systems	5
2.1 Diagrams	5
2.2 Definition of diagram functions.....	7
3 Terms, definitions and abbreviations	8
Bibliography.....	32
Index	33
Figure 1 – Stationary fuel cell power systems (3.49.3)	5
Figure 2 – Portable fuel cell power systems (3.49.2).....	6
Figure 3 – Micro fuel cell power systems (3.49.1)	6
Figure 4 – Fuel cell vehicles (3.51)	7

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

IEC TS 62282-1:2013

<https://standards.iteh.ai/catalog/standards/iec/cc/3a03f3-da8b-479f-a25a-a1d735f40243/iec-ts-62282-1-2013>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FUEL CELL TECHNOLOGIES –**Part 1: Terminology**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 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.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62282-1, which is a technical specification, has been prepared by IEC technical committee 105: Fuel cell technologies.

This third edition cancels and replaces the second edition, published in 2010. This third edition constitutes a technical revision.

The first edition of IEC/TS 62282-1:2005 was intended as a resource for the working groups of TC 105 and users of the TC 105 standards series; therefore, it only included terms and definitions used in the other IEC 62282 standards to provide consistency among those documents.

This third edition, as was the second edition, is a general fuel cell glossary, including all terms unique to fuel cell technologies; it has:

- a) added four new terms; 3.20, 3.43.1, 3.58 and 3.86.2;
- b) made editorial changes to thirty terms; 3.1, 3.4.2.3, 3.4.4, 3.14, 3.28, 3.33.1, 3.42.1, 3.42.2, 3.42.3, 3.45, 3.48, 3.49, 3.52, 3.57, 3.66, 3.67, 3.69.2, 3.77.6, 3.82.2, 3.83, 3.84, 3.86.3, 3.86.4, 3.90, 3.94, 3.100, 3.108.4, 3.110.1, 3.110.4 and 3.115.5; and
- c) removed the term "heat rate".

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
105/450/DTS	105/471/RVC

Full information on the voting for the approval of this technical specification 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 parts of IEC 62282 series, published under the general title *Full 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;

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

FUEL CELL TECHNOLOGIES –

Part 1: Terminology

1 Scope

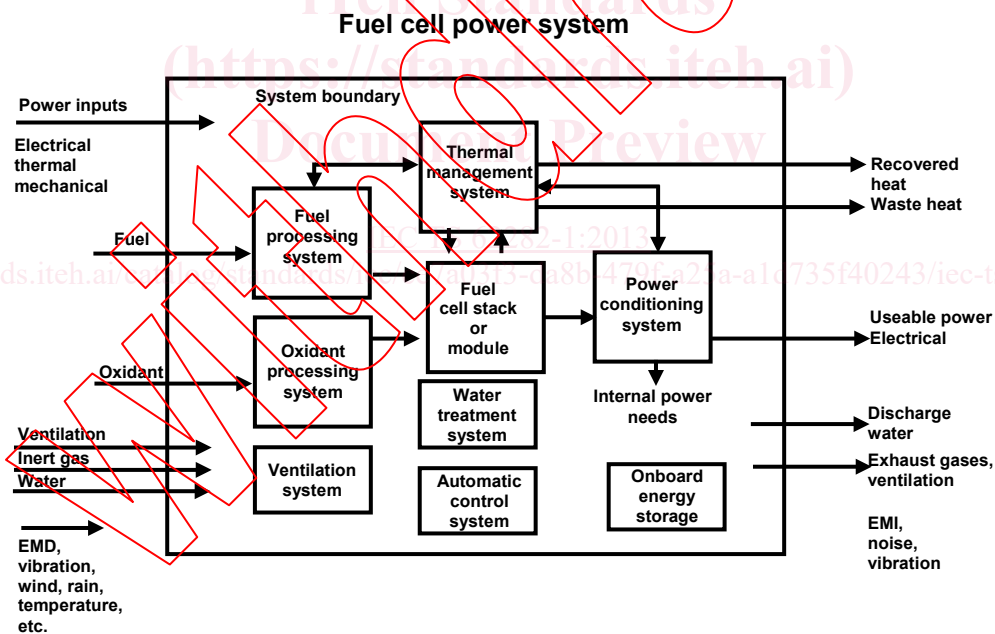
This part of IEC 62282 provides uniform terminology in the forms of diagrams, definitions and equations related to fuel cell technologies in all applications including but not limited to stationary power, transportation, portable power and micro power applications.

Not found here are words and phrases, which can be found in standard dictionaries, engineering references or the IEC 60050 series.

NOTE The first edition of IEC 62282 was intended as a resource for the working groups and users of the IEC 62282 series of fuel cell standards. This third edition, as well as the second edition, has been expanded into a general fuel cell glossary.

2 Diagrams of generalized fuel cell systems

2.1 Diagrams



IEC 724/10

Figure 1 – Stationary fuel cell power systems (3.49.3)

Fuel cell power system

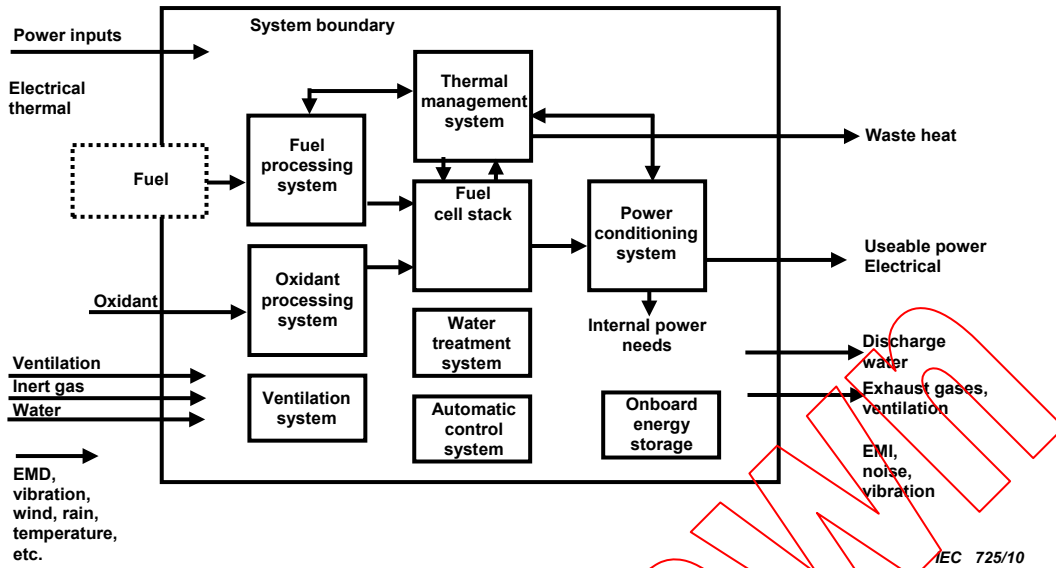


Figure 2 – Portable fuel cell power systems (3.49.2)

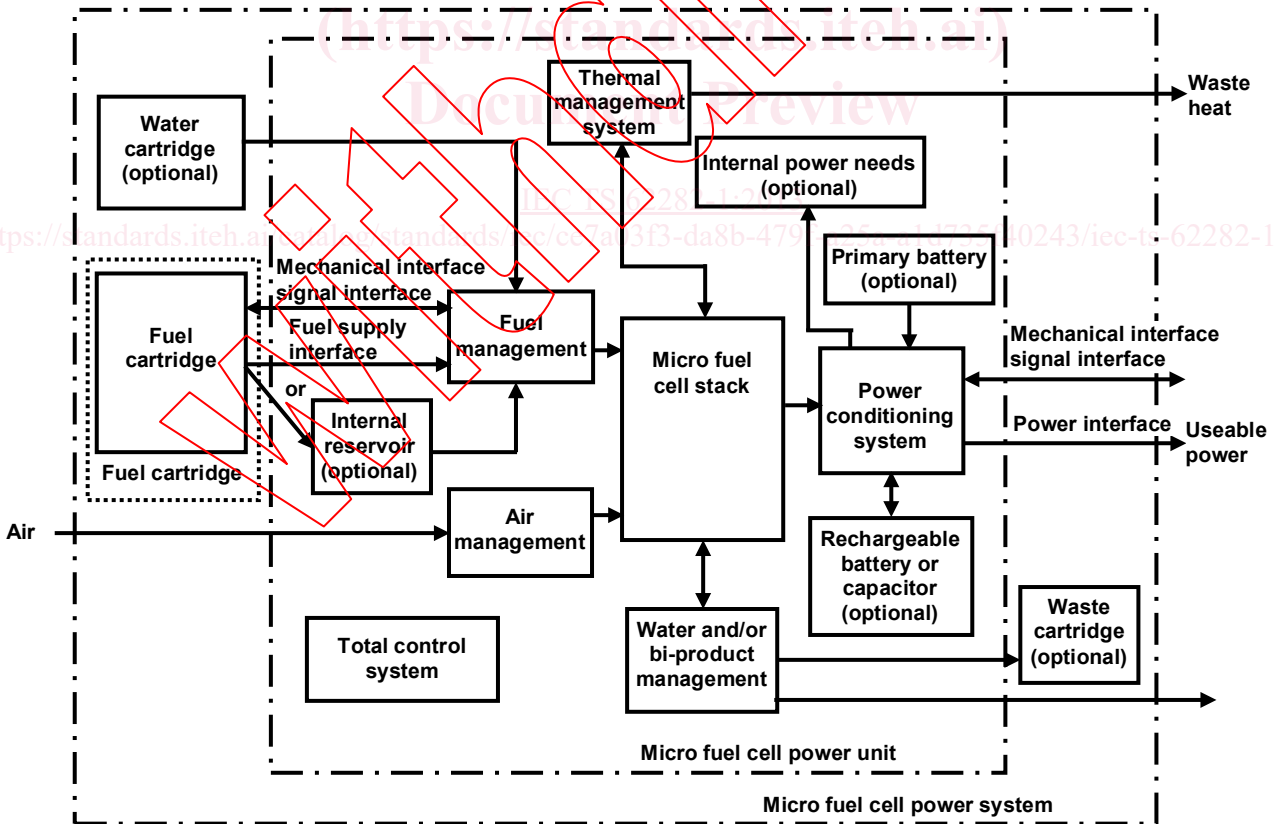
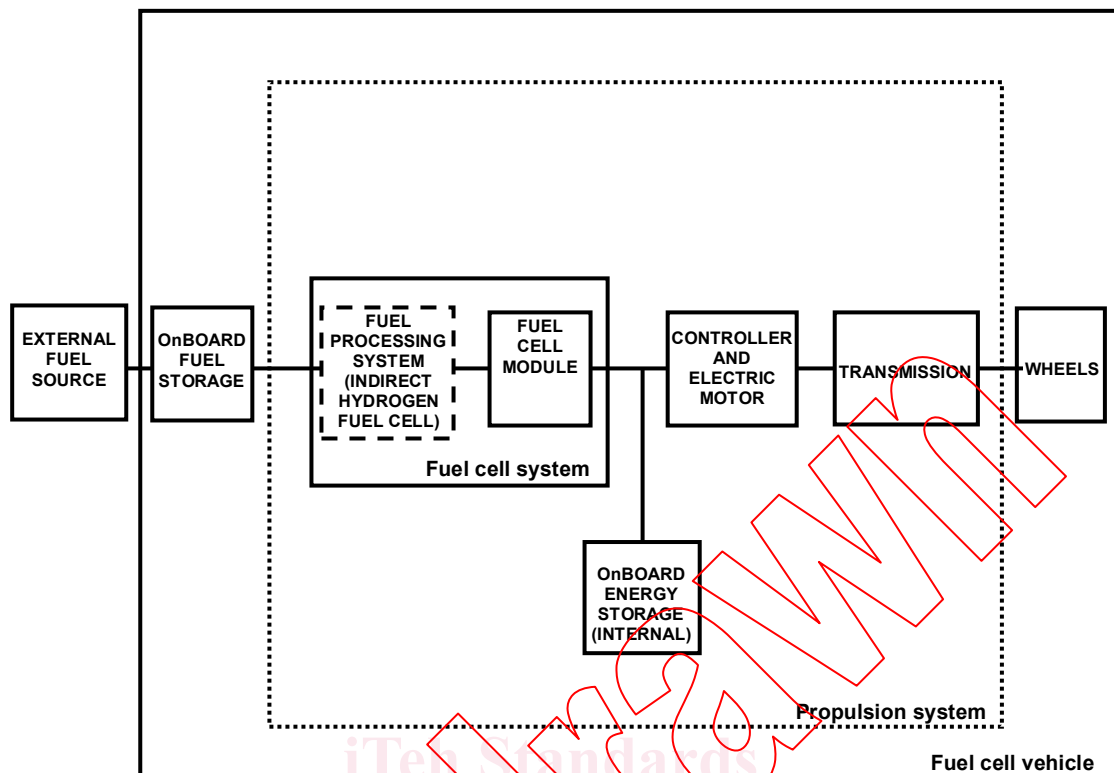


Figure 3 – Micro fuel cell power systems (3.49.1)



IEC 727/10

Figure 4 – Fuel cell vehicles (3.51)

2.2 Definition of diagram functions

The overall design of the power systems anticipated by this part of IEC 62282 are formed by an assembly of integrated systems, as necessary, intended to perform designated functions, as follows:

- Automatic control system – System that is composed of sensors, actuators, valves, switches and logic components that maintain the fuel cell power system (3.49) parameters within the manufacturer's specified limits without manual intervention.
- Fuel cell module – Equipment assembly of one or more fuel cell stacks (3.50) which electrochemically converts chemical energy to electric energy and thermal energy intended to be integrated into a vehicle or power generation system.
- Fuel cell stack – Equipment assembly of cells, separators, cooling plates, manifolds (3.70) and a supporting structure that electrochemically converts, typically, hydrogen rich gas and air reactants to DC power, heat and other reaction products.
- Fuel processing system – System of chemical and/or physical processing equipment plus associated heat exchangers and controls required to prepare, and if necessary, pressurize, the fuel for utilization within a fuel cell power system (3.49).
- Onboard energy storage – System of internal electric energy storage devices intended to aid or complement the fuel cell module (3.48) in providing power to internal or external loads.
- Oxidant processing system – System that meters, conditions, processes and may pressurize the incoming supply of oxidant for use within the fuel cell power system (3.49).
- Power conditioning system – Equipment that is used to adapt the electrical energy produced by the fuel cell stack(s) (3.50) to application requirements as specified by the manufacturer.

- Thermal management system – System that provides heating or cooling and heat rejection to maintain the fuel cell power system (3.49) in the operating temperature range, and may provide for the recovery of excess heat and assist in heating the power train during start-up.
- Ventilation system – System that provides air through forced or natural means to the fuel cell power system's (3.49) enclosure.
- Water treatment system – System that provides all of the necessary treatment of the recovered or added water for use within the fuel cell power system (3.49).

For micro fuel cell power systems

- Fuel cartridge – Removable article that contains and supplies fuel to the micro fuel cell power unit (3.74) or internal reservoir, not to be refilled by the user. Possible variations include:
 - attached – having its own enclosure that connects to the device powered by the micro fuel cell power system (3.49.1);
 - exterior – having its own enclosure that forms a portion of the enclosure of the device powered by the micro fuel cell power system (3.49.1);
 - insert – having its own enclosure and is installed within the enclosure of the device powered by the micro fuel cell power system (3.49.1);
 - satellite – intended to be connected to and removed from the micro fuel cell power unit (3.74) to transfer fuel to the internal reservoir inside micro fuel cell power unit.
- Micro fuel cell power unit – Micro fuel cell power system (3.49.1) excluding its fuel cartridge

Other terms used in the diagrams, include the following:

- Discharge water – Water discharged from the fuel cell power system (3.49) including wastewater and condensate.
- EMD (electromagnetic disturbance) – Any electromagnetic phenomenon that may degrade the performance of a device, equipment or system, or adversely affect living or inert matter (IEC 60050-161:1990, 161-01-05).
- EMI (electromagnetic interference) – Degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance. (IEC 60050-161:1990, 161-01-06).
- Recovered heat – Thermal energy that has been recovered for useful purposes.
- Waste heat – Thermal energy released and not recovered.

3 Terms, definitions and abbreviations

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

3.1

air bleed

introduction of small levels of air (around 5 %) into the fuel stream, upstream of the fuel inlet to the fuel cell (3.43) or within the anode (3.2) compartment

Note 1 to entry: The purpose of air bleed is to mitigate poisoning by species such as carbon monoxide by catalytic oxidation of the poison within the anode (3.2) compartment of the fuel cell (3.43).

3.2

anode

electrode (3.33) at which the oxidation of the fuel takes place

[SOURCE: IEC 60050-482:2004, 482-02-27, modified]

3.3

active layer

See catalyst layer (3.14).

3.4

area

3.4.1

cell area

geometric area of the bipolar plate (3.9) perpendicular to the direction of current flow

Note 1 to entry: The cell area is expressed in m^2 .

3.4.2

electrode area

3.4.2.1

active area

geometric area of the electrode (3.33) perpendicular to the direction of the current flow

Note 1 to entry: The active area is expressed in m^2 .

Note 2 to entry: The active area, also called effective area is used in the calculation of the cell current density (3.27).

3.4.2.2

effective area

See active area (3.4.2.1).

3.4.2.3

electrochemical surface area

area of the electrochemically accessible electrocatalyst (3.31) surface

Note 1 to entry: The electrochemical surface area is expressed as the product of the surface per unit volume (m^2/m^3) and the volume of the electrode.

Note 2 to entry: The electrochemical surface area is expressed in m^2 .

3.4.3

membrane electrode assembly (MEA) area

geometric area of the entire MEA (3.73) perpendicular to the direction of net current flow, including active area (3.4.2.1), and uncatalysed areas of the membrane

Note 1 to entry: The membrane electrode assembly (MEA) area is expressed in m^2 .

3.4.4

specific surface area

electrochemical surface area (3.4.2.3) per unit mass (or volume) of the catalyst (3.11)

Note 1 to entry: The specific surface area corresponds to the area of an electrocatalyst (3.31) accessible to reactants due to its open porous structure, per unit mass (or volume) of the catalyst (3.11).

Note 2 to entry: The specific surface area is expressed in m^2/g , m^2/m^3 .

3.5

availability factor

ratio of the up-duration to the period of time under consideration

[SOURCE: IEC 60050-603:1986, 603-05-09]

3.6**axial load**

compressive load applied to the end plates (3.40) of a fuel cell stack (3.50) to assure contact and/or gas tightness

Note 1 to entry: The axial load is expressed in Pa.

3.7**balance of plant****BOP**

supporting/auxiliary components based on the power source or site-specific requirements and integrated into a comprehensive power system package

Note 1 to entry: In general, all components besides the fuel cell stack (3.50) or fuel cell module (3.48) and the fuel processing system are called balance of plant components.

3.8**base load operation**

See full load operation (3.77.4).

3.9**bipolar plate**

conductive plate separating individual cells in a stack, acting as current collector (3.26) and providing mechanical support for the electrodes (3.33) or membrane electrode assembly (3.73)

Note 1 to entry: The bipolar plate usually incorporates flow fields on either side for the distribution of reactants (fuel and oxidant) and removal of products, and may also contain conduits for heat transfer. The bipolar plate provides a physical barrier to avoid mixing of oxidant, fuel and coolant fluids. The bipolar plate is also known as the bipolar separating plate.

3.10**bus bar**

See stack terminal (3.105).

3.11**catalyst**

substance that accelerates (increases the rate of) a reaction without being consumed itself

See also electrocatalyst (3.31).

Note 1 to entry: The catalyst lowers the activation energy of the reaction, allowing for an increase in the reaction rate.

3.12**catalyst coated membrane****CCM**

(in a PEFC (3.43.7)) membrane whose surfaces are coated with a catalyst layer (3.14) to form the reaction zone of the electrode (3.33)

See also membrane electrode assembly (MEA) (3.73).

3.13**catalyst coated substrate****CCS**

substrate whose surface is coated with a catalyst layer (3.14)

3.14**catalyst layer**

surface adjacent to either side of the membrane containing the electrocatalyst (3.31), typically with ionic and electronic conductivity

Note 1 to entry: The catalyst layer comprises the spatial region where the electrochemical reactions take place.

3.15

catalyst loading

amount of catalyst (3.11) incorporated in the fuel cell (3.43) per unit active area (3.4.2.1), specified either per anode (3.2) or cathode (3.18) separately, or combined anode and cathode loading

Note 1 to entry: The catalyst loading is expressed in g/m².

3.16

catalyst poisoning

inhibition of the catalyst (3.11) properties by substances (poisons)

Note 1 to entry: Electrocatalyst (3.31) poisoning causes degradation of the fuel cell (3.43) performance.

3.17

catalyst sintering

binding together of catalyst (3.11) particles due to chemical and/or physical processes

3.18

cathode

electrode (3.33) at which the reduction of the oxidant takes place

[SOURCE: IEC 60050-482:2004, 482-02-28, modified]

3.19

cell(s)

3.19.1

planar cell

fuel cell (3.43) formed in a flat structure

3.19.2

single cell

basic unit of a fuel cell (3.43) consisting of a set of an anode (3.2) and a cathode (3.18) separated by electrolyte (3.34)

3.19.3

tubular cell

fuel cells (3.43) with a cylindrical structure that allows fuel and oxidant to flow on the inner or outer surface of the tube

Note 1 to entry: Different cross section types can be used (e.g. circular, elliptical).

3.20

clamping plate

See end plate (3.40).

3.21

compression end plate

See end plate (3.40).

3.22

conditioning

(related to cells/stacks) preliminary step that is required to properly operate a fuel cell (3.43) and that is realized following a protocol specified by the manufacturer

Note 1 to entry: The conditioning may include reversible and/or irreversible processes depending on the cell technology.

3.23**cross leakage**

See crossover (3.24).

3.24**crossover**

leakage between the fuel side and the oxidant side, of a fuel cell (3.43), in either direction, generally through the electrolyte (3.34)

Note 1 to entry: Crossover is also called cross leakage.

3.25**current****3.25.1****leakage current**

electric current in an unwanted conductive path other than a short-circuit

Note 1 to entry: The leakage current is expressed in A.

[SOURCE: IEC 60050-151:2001, 151-15-49]

3.25.2**rated current**

maximum continuous electric current as specified by the manufacturer, at which the fuel cell power system (3.49) has been designed to operate

Note 1 to entry: The rated current is expressed in A.

3.26**current collector**

conductive material in a fuel cell (3.43) that collects electrons from the anode (3.2) side or conducts electrons to the cathode (3.18) side

3.27**current density**

current per unit active area (3.4.2.1)

Note 1 to entry: The current density is expressed in A/m² or A/cm².

3.28**degradation rate**

rate at which a cell's performance deteriorates over time

Note 1 to entry: The degradation rate can be used to measure both recoverable and permanent losses in cell performance.

The typical unit of measure is volts (DC) per unit time or % of initial value (volt DC) per a fixed time, at rated current.

3.29**desulfurizer**

reactor to remove sulfur components contained in raw fuel (3.89)

Note 1 to entry: Adsorbent desulfurizer, catalytic hydro-desulfurizer, etc.

3.30**efficiency**

ratio of output useful energy flows to input energy flows of a device

Note 1 to entry: The energy flows can be measured by measuring the relevant in and output values over one single defined time interval, and can, therefore, be understood as mean value of the respective flows.