

# Hydrogen/Fuel Cell Codes & Standards

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## Portable & Micro Fuel Cells

Published

[Under Development / Proposed](#)

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## Portable Fuel Cells - System Design/Testing

[ANSI/CSA America FC3](#) Portable Fuel Cell Power Systems (United States)

[IEC 62282-5-1](#) Portable Fuel Cell Appliances - Safety (International)

[EN 62282-5-1:2007](#) Portable Fuel Cell Appliances - Safety (European Union)

## Portable Fuel Cells - Fuel Tanks

[CGA Publication C21](#) Design, Qualification and Testing for Pressure Vessels for Portable, Reversible Metal Hydride Systems (United States)

[CGA Publication H1](#) Service Conditions for Portable, Reversible Metal Hydride Systems (United States)

[CGA Publication H2](#) Guidelines for the Classification and Labeling of Hydrogen Storage Systems with Hydrogen Absorbed in Reversible Metal Hydrides (United States)

[ISO 16111](#) Transportable Gas Storage Devices - Hydrogen Absorbed in Reversible Metal Hydrides (International)

## Portable Fuel Cells - Micro Fuel Cells

[Outline of Investigation UL Subject 2265A](#) Hand held and Hand Transportable Fuel Cell Power Units with Methanol Fuel Cartridges (United States & Other Locales)

[Outline of Investigation UL Subject 2265C](#) Hand held and Hand Transportable Fuel Cell Power Units with Borohydride Fuel Cartridges (United States & Other Locales)

[IEC/PAS 62282-6-1](#) Micro Fuel Cell Power System - Safety (International)

[IEC 62282-6-200](#) Micro Fuel Cell Power System - Performance (International)

[IEC 62282-6-300](#) Micro Fuel Cell Power System - Fuel Cartridge Interchangeability (International)

[US Department of Transportation](#) Transport of Micro Fuel Cells on Passenger Aircraft (United States)

## Portable Fuel Cells - System Design/Testing

[CAN/CSA-IEC 62282-5](#) Fuel Cell Technologies-Part 5: Portable Fuel Cell Appliances (Canada)

## Portable Fuel Cells - Fuel Tanks

## Portable Fuel Cells - Micro Fuel Cells

## Codes & Standards – USA (CSA FC 3)

ANSI/CSA America FC3-2004

### American National Standard For Portable Fuel Cell Power Systems

<b>Scope</b>	This standard applies to ac and dc type portable fuel cell power systems, with a rated output voltage not exceeding 600V, for commercial, industrial and residential indoor use in non-hazardous locations.
<b>Status</b>	Published in 2004. Considering adopting IEC 62282-5-1 (TC105 WG#7) when it is published in 2007.
<b>Contact</b>	Connie Bielawski, CSA America

**Working Group #7 / IEC 62282-5-1 (2007-02)**  
**Portable Fuel Cell Appliances - Safety**

Published

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**Organization** Technical Committee No. 105 -Fuel Cell Technologies

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**Identification** Working Group #7  
Portable Fuel Cell Appliance – Safety  
IEC 62282-5-1

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**Scope** Applies to all ac and dc type portable fuel cell appliances, not exceeding 600V, for commercial, industrial and residential indoor and outdoor use in non-hazardous locations. (Includes moveable, transportable and hand-held equipment. Does not include systems that are permanently connected, export to the grid, or for propulsion or auxiliary power for transportation.)

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**Status** Published in 2007 as IEC 62282-5-1 (2007-02). Available from [www.iec.ch](http://www.iec.ch) in English and French.

Also adopted by the E.U. as EN 62282-5-1:2007.

National Committee comments to the Committee Draft for the 2nd edition were posted on the TC105 website in November 2009. The major changes deal with vibration and shock testing.

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**Committee Information**

<b>Chairman</b>	Robert Wichert
<b>Secretariat</b>	Canadian Standard Association
<b>Secretary</b>	Senka Krsikapa

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**Identification**      **CAN/BNQ 1784-000**  
National Standards of Canada  
Canadian Hydrogen Installation Code  
Published

**Scope**                The purpose of this code is to establish the installation requirements for hydrogen generating equipment, hydrogen utilizing equipment, hydrogen dispensing equipment, hydrogen storage containers, hydrogen piping systems and their related accessories.

As an example, the CHIC defines the installation requirements of hydrogen filling stations that dispense gaseous hydrogen, whether the hydrogen is produced by water electrolysis or natural gas reforming or delivered by truck in a liquid or gaseous form. It also provides guidelines for the installation of fuel cell and internal combustion engines that provide emergency or back-up power to commercial buildings and residential homes.

**Status**                Published 2007

**Contact**              Sylvie Gingras, BHQ      [Sylvie.gingras@bnq@qc.ca](mailto:Sylvie.gingras@bnq@qc.ca)

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**Identification**      **CAN/CSA C22.2 No. 62282-2:07**  
Fuel Cell Technologies - Part 2  
Fuel Cell Modules  
Published

**Scope**                The adoption of the international standard, IEC 62282-2, with Canadian modifications.

**Status**                Published 2007

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**Identification**      **CAN/CSA – IEC 62282-3**  
Fuel Cell Technologies – Part 3:  
Fuel Cell Power Systems – Safety  
Under Development

**Scope**                The adoption of the international standard, IEC 62282-3-1 with Canadian modifications.

**Status**                Under Development.

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**Identification**      **CAN/CSA – IEC 62282-5**  
Fuel Cell Technologies – Part 5:  
Portable Fuel Cell Appliances  
Under Development

**Scope**                The adoption of the international standard, [IEC 62282-5-1](#) with Canadian modifications.

**Status**                Under Development.

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**Classification 2.1**  
**Hydrogen in a Metal Hydride Storage System**  
**(classification for packaging)**

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## CGA Publication C-21

### Design, Qualification and Testing for Pressure Vessels for Portable, Reversible Metal Hydride Systems

Published  
United States

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**Organization** Compressed Gas Association

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**Identification** CGA C-21  
Design, Qualification and Testing for Pressure Vessels for Portable, Reversible Metal Hydride Systems

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**Summary** This publication specifies requirements for design, manufacture, testing, marking, inspection, and approval of a cylindrical pressure vessel component in excess of 4 fl oz (120ml) internal capacity of a portable, reversible metal hydride system. Published May 2007.

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**Contact** [www.cganet.com](http://www.cganet.com)

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## CGA Publication H-1

### Service Conditions for Portable, Reversible Metal Hydride Systems

Published  
United States

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**Organization** Compressed Gas Association

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**Identification** CGA H-1  
Service Conditions for Portable, Reversible Metal Hydride Systems

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**Summary** This publication outlines the service conditions expected for the system and various system components in a portable, reversible metal hydride system. These systems do not include metal hydride battery systems. Published 2004 1st edition.

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**Contact** [www.cganet.com](http://www.cganet.com)

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## CGA Publication H-2

### Guidelines for the Classification and Labeling of Hydrogen Storage Systems with Hydrogen Absorbed in Reversible Metal Hydrides

Published  
United States

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**Organization** Compressed Gas Association

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**Identification** CGA H-2  
Guidelines for the Classification and Labeling of Hydrogen Storage Systems with Hydrogen Absorbed in Reversible Metal Hydrides

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**Summary** Hydrogen storage systems based on reversible metal hydride technology are being introduced for consumer use. Due to the lack of appropriate regulations, codes and standards and experience for this emerging technology, there is the potential for inconsistency in their classification, labeling and treatment for shipping and installation. This document gives guidance to regulators, manufacturers and users of these systems to establish a consistent and uniform basis for the classification, labeling and treatment of such products. Published 2004 1st edition.

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**Contact** [www.cganet.com](http://www.cganet.com)

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**Working Group #10 / ISO 16111**

**Transportable Gas Storage Devices - Hydrogen Absorbed in Reversible Metal Hydrides**

Published  
International

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**Organization** International Organization for Standardization (ISO)

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**Identification** ISO 16111  
Transportable Gas Storage Devices - Hydrogen Absorbed in Reversible Metal Hydrides

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**Scope** Addresses all metal hydride hydrogen storage systems that are intended to be mobile, i.e. not fixed in stationary installations, excludes systems intended for permanent mounting on motor vehicles. It includes design considerations and qualification testing.

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**Status** Published 2008.

This International Standard is now referenced in the 16th Revision of U.N *Model Regulations for the Transportation of Dangerous Goods*.

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**Committee Information** Chairman Ned Stetson

**Underwriters' Laboratories  
Hand Held or Transportable Fuel Cell Power Units**

UL Subject 2265

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<b>Identification</b>	<b>Outline of Investigation UL Subject 2265 A</b> Hand Held or Transportable Fuel Cell Power Units with Fuel Containers - Methanol Fuel Cartridges
<b>Scope</b>	Covers hand-held or hand-transportable fuel cells that provide dc outputs rated <60 Vdc and < 240 VA and use disposable methanol fuel cartridges. The disposable cartridges are also covered, and are limited with a capacity <950 mL, are un-refillable, and limited in pressure to the vapor pressure of the methanol fuel.
<b>Status</b>	Published

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<b>Identification</b>	<b>Outline of Investigation UL Subject 2265 C</b> Hand Held or Transportable Fuel Cell Power Units with Fuel Containers - Borohydride Fuel Cartridges
<b>Scope</b>	Covers hand-held or hand-transportable fuel cells that provide dc outputs rated <60 Vdc and <240 VA and use un-refillable borohydride alkaline fuel. The fuel is either sodium or potassium borohydride compound or a mixture of these compounds.
<b>Status</b>	Published

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**Organization** International Electrotechnical Commission

**Identification** Technical Committee No. 105 -Fuel Cell Technologies  
Working Group #8  
Micro Fuel Cells - Safety  
IEC/PAS 62282-6-1 (2006-02)

**Scope** Safety standard for micro fuel cell power systems. (Fuel cell power systems and fuel containers that are wearable or easily carried by hand, providing dc outputs that do not exceed 60 V d.c. and power output of 240 VA. These DC units power or recharge consumer electric devices.)

The International Civil Aviation Organization (ICAO) has drafted conditions that will allow the transportation and use of fuel cells and fuel cell cartridges on board passenger airlines. The draft language addresses: (a) fuel cells using butane, formic acid, direct methanol, and reformed methanol fuels; (b) requires compliance with this standard; (c) places limits on the size and number of fuel cell cartridges, and (d) allows transportation in carry-on baggage only. Once ratified by member countries, these instructions will go into effect on January 1, 2007.

On April 30, 2008, the US Department of Transportation Pipeline and Hazardous Materials Safety Administration agency published their final rule to revise 49 CFR Parts 171, 173, and 175. This allows fuel cartridges for fuel cell devices and fuel cell systems to be transported on board passenger aircraft in carry-on baggage and used in flight. The types of fuel cell permitted include: methanol, formic acid, butane, and specific borohydride formulations that comply with requirements of IEC/PAS 62282-6-1.

**Status** A PAS was published in 2006 as IEC/PAS 62282-6-1 (2006-02) and modified as IEC/PAS 62282-6-1 Corr. 1 (2007-04). Available from [www.IEC.ch](http://www.IEC.ch) in English only.

The Final Draft International Standards (FDIS) was approved in January 2010 and will be published shortly as IEC 62282-6-100.

**Committee Information**

Chairman	Harry Jones
Secretariat	Connie Bielawski
Secretary	Robert Wichert

**Members**

Adams, Paul	Atti, Anthony	Babiak, Michael
Cameron, Don	Chelhaoui, Samira	Chirdon, Greg
Clarke, M	Coutts, Allan *	Dyck, Alexander
Hallmark, Jerry	Hasebe, Hiroyuki	Ishida, Ichiro
Kelty, Kurt	Lakeman, Barry	Laurent, Jean-Yves
Moir, James	Pointon, K	Souma, Kenichi
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Laurent, Jean-Yves	Voigt, Claus	Koseki, Kazuo
Reichert, David	Dinh, Huyen	Ueno, Fumio
Higuchi, Kohei	Saito, Shuichiro	Yokoyama, Hiroshi
Satoh, Mitsuo	Kinoshita, Hiromichi	Yoshitake, Tsutomu
Miyazaki, Yoshinori	Lee, Seungjae	

\* ISO/TC197 expert

**Working Group #9 / IEC 62282-6-200 (2007-11)**  
**Micro Fuel Cell Power Systems - Performance**

Published

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**Organization** International Electrotechnical Commission

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**Identification** Technical Committee No. 105 -Fuel Cell Technologies  
Working Group #9  
Micro Fuel Cell Power Systems – Performance  
IEC 62282-6-200

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**Scope** International standard providing testing method for performance evaluation based requirement for micro fuel cell power systems such as laptops, cell phones and PDA's. Performance evaluation will include characteristics such as of output power, fuel consumption, operational durability, mechanical durability, starting uptime, load responding, etc. It will exclude the field of safety.

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**Status** Published November 2007, and is available from [www.iec.ch](http://www.iec.ch) in English and French.

Maintenance cycle schedule:

CD - June 2010  
CDV - March 2011  
FDIS - June 2012  
IS - January 2013

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**Committee Information**

**Chairman**  
**Secretariat**  
**Secretary**

Hiroshi Yokoyama  
JEMA  
Hiromichi Kinoshita  
Shoko Falvo (translator)

**Members**

Adam, P  
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Man, M  
Moriga, T  
Ueno, F.

Atti, A  
Higuchi, K.  
Lakeman, B.  
Miyahara, M  
Nishimura, Y.  
Wicelinski, S.

Chirdon, G  
Jones, H.  
Koseki, K.  
Mora, J.  
Tamura, K.  
Yoshitake, T.

## IEC 62282-6-300

### Micro Fuel Cell Power System - Fuel Cartridge Interchangeability

Under Development  
International

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**Organization** International Electrotechnical Commission

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**Identification** Technical Committee No. 105 - Fuel Cell Technologies  
Working Group #10  
Micro Fuel Cell Power System – Fuel Cartridge Interchangeability  
IEC 62282-6-300

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**Scope** International standard providing interchangeable based requirements for the micro fuel cell power unit to the electric devices and the fuel cartridge to the fuel cell power unit including the mechanical interface(s), electrical interface(s), communication protocol, retention feature, interface dimensions (as required), datum/orientation feature.

The first edition covers only methanol and methanol/water fuels. Later editions will expand to other fuels.

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**Status** Published in June 2009. Available through [www.iec.ch](http://www.iec.ch) and [www.ansi.org](http://www.ansi.org).

A second convener has been added for this Working Group. T. Moriga (JP) will address fuel cartridges and the fuel cartridge interface with the fuel cell, and Ms. Hyejung Cho (KR) will address power and data interchangeability between the electronics and the fuel cell.

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**Committee Information** Chairman T. Moriga / Ms. Hyejung Cho  
Secretariat JEMA  
Secretary Makoto Miyahara

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## US Department of Transportation

### Transport of Micro Fuel Cells on Passenger Aircraft

Published  
United States

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**Organization** Department of Transportation  
Pipeline and Hazardous Materials Safety Administration

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**Identification** Code of Federal Regulations  
49 CFR Parts 171, 173 and 175

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**Scope** On April 30, 2008 the US Department of Transportation Pipeline and Hazardous Materials Safety Administration agency published their final rule to revise 49 CFR 171, 173 and 175. This allows fuel cartridges for fuel cell devices and fuel cell systems to be transported on board passenger aircraft in carry-on baggage and used in flight. The types of fuel cell fuels permitted include: methanol, formic acid, butane, and specific borohydride formulations that comply with requirements of IEC/PAS 62282-6-1. The DOT action harmonized worldwide regulations, allowing all airlines passengers to take advantage of these new power systems.

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