

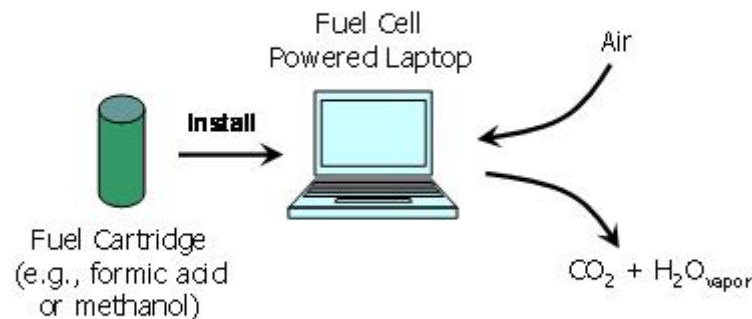
What is a fuel cell system?

Growing demand for more powerful portable electronic devices, such as laptop computers, mobile phones, PDA, DVD players, etc., is pushing battery storage well beyond their capabilities. Fuel cell technology has emerged as a strong candidate to replace and supplement batteries in these portable applications, offering numerous benefits over the most advanced battery chemistries, including longer runtimes, more consistent higher quality power output and better lifecycle performance. All fuel cells operate on the same basic electrochemical principles although they can be powered with different fuels, each with distinct attributes.

Developers of micro fuel cells have worked closely with International and National Organizations such as IATA, ICAO, the United Nations, the International Electro-technical Commission and the US DOT to develop standards of safety for these devices, no matter what fuel is used. The industry objective is to ensure fuel cell power systems deliver enhanced functionality while maintaining the highest standard of safety.

Power in the form of electricity is produced in a fuel cell by the reaction, without combustion, of a fuel with an oxidant (usually oxygen supplied from the ambient air) through a membrane. Efficiencies of fuel cells are high, even in small sizes, while emissions are low. Carbon based fuels, such as methanol, formic acid and butane, produce electricity and emit only water and carbon dioxide as byproducts.

How Fuel Cells Work

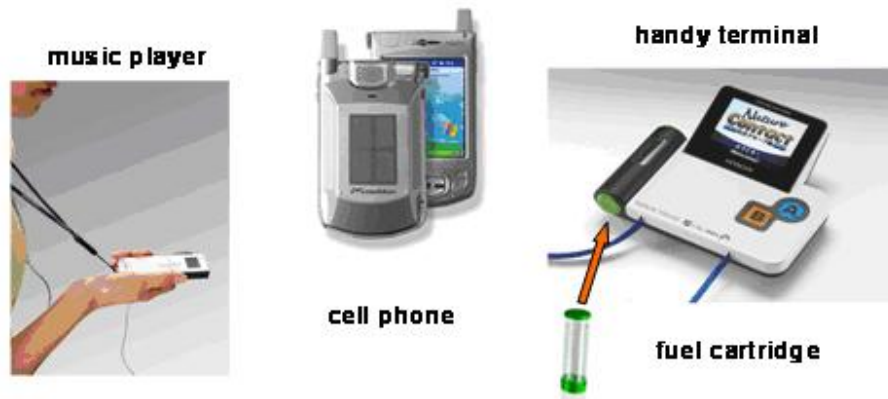


Examples of fuel cell powered devices appear below.



Portable electronic devices are used today in many diverse environments, including the passenger cabin of an aircraft. The 2007-2008 ICAO Technical Instructions and the 2007 edition of the IATA Dangerous Goods Regulations permit the carriage and use of certain fuel cell power systems and fuel cell cartridges by passengers and crew. The only fuel cell power systems and fuel cell cartridges permitted are those designed and built to meet stringent safety standards to ensure the products are safe for consumers to use and transport. Technical experts from across the fuel cell industry have developed a comprehensive micro fuel cell safety standard (IEC-62282-6-1) that these products and their cartridges must meet prior to carriage and/or use on aircraft. This standard, which is now referenced in the ICAO and IATA provisions, complements existing standards and regulatory requirements for consumer electronic products, which also apply to micro fuel cell systems.

Fuel Cell Powered Small Devices



Certain fuel cell cartridges and systems will be permitted to be carried by air by passengers and crew as of January 1, 2007 under the following conditions (**Note**: key words appear in **bold**):

- fuel cell cartridges may only contain **flammable liquids** (including methanol), **formic acid**, and **butane**;
- fuel cell cartridges **must not be refillable by the user**. Refueling of fuel cell systems is not permitted except that the **installation of a spare cartridge is allowed**.
Note: Fuel cell cartridges which are used to refill fuel cell systems but which are not designed or intended to remain installed (fuel cell refills) are not permitted to be carried;
- fuel cell cartridges must comply with IEC PAS 62282-6-1 Edition 1;
- the maximum quantity of fuel in any fuel cell cartridge must not exceed:
 - for **liquids 200 ml**;
 - for **liquefied gases 120 ml** for nonmetallic fuel cell cartridges **or 200 ml** for metal fuel cell cartridges
- each fuel cell cartridge must be marked with a manufacturer's certification that it **conforms to IEC PAS 62282-6-1 Ed. 1**, and with the **maximum quantity and type of fuel** in the cartridge;

- no more than **two spare** fuel cell cartridges may be carried by a passenger;
- fuel cell systems containing fuel and fuel cell cartridges including spare cartridges are **permitted in carry-on baggage only**;
- Interaction between fuel cells and integrated batteries in a device must conform to IEC PAS 62282-6-1 Ed. 1. Fuel cell systems whose sole function is to charge a battery in the device are not permitted; and
- Fuel cell systems must be of a type that will not charge batteries when the portable electronic device is not in use and must be **durably marked** by the manufacturer: **‘APPROVED FOR CARRIAGE IN AIRCRAFT CABIN ONLY’**.

In addition to the fuel cell systems and cartridges containing flammable liquids, formic acid and butane, a number of other rapidly advancing fuel technologies employing a range of other fuels such as hydrogen and potassium and sodium borohydride exists. The fuel cell industry is actively engaged in obtaining regulatory approvals to allow these fuel systems to be transported by air.