ARBIN FCTS Fuel Cell System

Arbin offers a wide range of test systems for various fuel cell applications. In addition to our standard systems for PEM, DM, and PEM/DM, we offer many custom systems to meet your exact testing needs. We work in a wide range of power from the microwatt level up to hundreds of kilowatts. All of our instruments are complete turn-key systems that enable the user to begin testing within minutes of installation and our systems come standard with many features that our competitors offer as optional equipment.

Every FCTS system we build is completely integrated, automatic, and software controlled. Our systems are designed to be "set-and-forget." In other words, once the test schedule is programmed, the systems require very little user intervention so that long term tests can be run easily.

Arbin offers solutions for all types of fuel cells ranging from PEM, DM, and SOFC. Utilizing Arbin’s patented Dew Point Humidifier technology, as well as extremely precise components, the FCTS series offers an extremely reliable testing solution.

HARDWARE

Arbin’s Fuel Cell Test Stations are completely customizable to fit every application. Each system is based off one of our standard designs for various power requirements. The common options included with every FCTS station are:

**Input Gas Handling** This module usually consists of a number of Mass Flow Controllers (MFC) for working anode and cathode gasses, a rotameter for purge gas, duel mixing headers for anode and cathode gasses (as required), and all the plumbing and valves necessary for automated operation.

**Liquid Reactant Handling** The Liquid Reactant Handling (LRH) module is optional and needed for those applications employing a liquid fuel (such as Methanol) for testing DM or other liquid fuel cells. The LRH module consists of a liquid reactant recirculation loop with heating/cooling capability, pressure control, and flow rate control. The user simply selects which type of fuel they wish to use (gas or liquid) in the software, and the system automatically uses the selected fuel for the anode.

**Patented Dew Point Humidifier**

The DPH module addresses one of the most important issues related to accurate fuel cell testing – humidity control. The DPH uses a patented technology that makes it the best performing gas stream humidifier on the market. It has major advantages over all other competing technologies in stability, controllability, accuracy, dynamic range, turn-down ratio, gas mixing, and size.

**Exhaust Gas Treatment**

The Exhaust Gas Treatment module handles the exhaust gas leaving the fuel cell. It consists of a gas-water segregation system which cools the exhaust and back pressure controller for controlling the stack or cell operating pressure.
Stack Cooling/Heating
Arbin Instruments’ Stack Cooling/Heating module is a common but optional module. It allows the user to accurately control the temperature of the fuel cell stack using a liquid coolant. Typically, this module is used to keep a higher power stack cool, but it can be used to heat a stack to operating temperature as well.

Electronic Load
Arbin Instruments Electronic Load module is a highly robust electronics system that employs the most recent and powerful technology on the market. Arbin Instruments’ background is in the electrochemical storage device testing market and has been producing battery and supercapacitor testing systems for many years. It is this knowledge and know-how that transfers into the most reliable ELOAD on the market.

SOFTWARE
All Arbin Test Stations are controlled by an external PC running our MITS Pro software. MITS Pro is the most comprehensive battery testing software solution available on the market place today. MITS Pro has been developed by Arbin Software Engineers at Arbin to easy and intuitive control over all of our test stations. This flexibility has allowed Arbin to refine and simplify the software and user interface for improved stability and ease of use. For more information please visit the Software section of our website!
Arbin’s FCTS uses MITS Pro 5.0 which provides an additional control page to specify all of the flow rates, humidity, back pressure control, and all other control functions required for testing your fuel cells. Some of the common software applications for Fuel Cell research include:

Life Time Testing.
Apply a constant current discharge on the fuel cell until the voltage drops by 10% or our of the acceptable range.

Cyclic Voltammetry.
Provides insight into the fuel cell reaction kinetics. It is used to characterize the fuel cell catalyst activity in greater detail. Capacitive charging current flows in response to the linearly changing voltage. The second current response is nonlinear and corresponds to a hydrogen adsorption increase. Following, the reaction current reaches a peak and then falls off as the entire catalyst surface becomes fully saturated with hydrogen. Performing CV experiments is easy with the Arbin FCTS equipped with a potentiostat load and charging power supply option.

Internal Resistance Measurement
Using a current interrupt method, all Arbin FCTS systems can measure the DC Internal Resistance and use the collected value to control the test.

Polarization Curves
Provides useful information about the optimal operating point and performance characteristics for a fuel cell. Generating the polarization curve is an easy process with the FCTS system and this can be done with a variety of fuel cell operating conditions.
OPTIONS

Arbin can provide a number of auxiliary channel options in order to obtain more data during the experiment including:

- **Auxiliary Voltage Channels** can be used for numerous applications but the most common is to measure individual cell voltages within a pack. They can also be used to measure and monitor a reference or working electrode in a multi-electrode experiment.

- **Auxiliary Temperature Channels** can be used to measure and record temperature data. They can be inserted into the pack or cell or just used to measure room temperature.

- **Digital Input/Out Channels**
  - **Temperature controlled AC power outlet** for cartridge heater (or the like) control
  - **Water fill/drain meter or metering pump** for water balance testing
  - **Humidity sensors** for secondary humidity measurement