Fuel Cell Technology

Educational Training Equipment for the 21st Century

Bulletin 194D

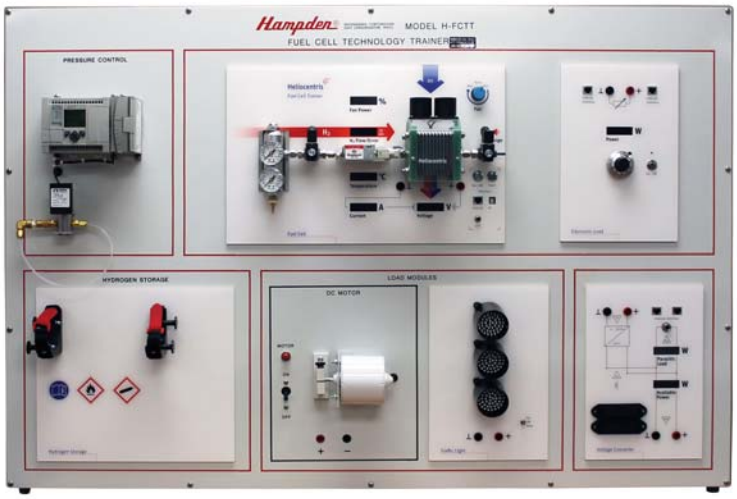
H-FCTT-1

Fuel Cell Technology Trainer

Purpose

The Hampden **Model H-FCTT-1** Fuel Cell Technology Trainer allows the student to create a grid independent power supply that uses only hydrogen as its fuel. The system familiarizes the student with fuel cell power supply technology, an environmentally friendly method of generating power directly from a hydrogen reaction.

Fuel cells are the most promising alternate energy supply and are already being used in a number of areas, including automotive engineering and power generation systems. The **Model H-FCTT-1** can also be connected to an external energy source, such as a solar panel or wind generator, for comparison between the different technologies. A switch located on the panel allows for switching between the fuel cell and an external source.



Model H-FCTT-1 Fuel Cell Technology Trainer
Dimensions: 32-3/4"H x 48-1/2"W x 12"D
Shipping Weight: 455 lbs

Description

The Hampden **Model H-FCTT-1** Fuel Cell Technology Trainer consists of a table-top unit with all components mounted on a steel panel. Meters located at critical points allow the student to monitor each step of the power generation/power distribution process. Pressure and flow of the hydrogen gas can be varied via a (PLC) programmable logic controller to analyze the effect on the power generated in different conditions. A DC motor and traffic light are provided for analysis of the power generated by the fuel cell when connected to a load. An electronic load is also provided that is capable of acting as a constant current or constant resistance device. The USB connection to the electronic load allows for interfacing to a computer to automatically record and plot voltage and current data. A fuel supply transfer switch is provided to allow the student to switch over to an alternate energy source, i.e., solar panel.

Specifications

CONSTRUCTION

The panel consistsof 11 gauge furniture grade steel, finished in baked-on gloss white enamel. The case and rear panel consist of 14 gauge furniture grade steel, finished in instrument tan texture enamel, with (4) rubber feet.

NOMENCLATURE

- Black KEM silkscreen enamel
- Red KEM silkscreen enamel

COMPONENTS

- Fuel cell stack, 50 watts, 5V DC maximum during rated output
- Fan power control
- Hydrogen storage container, 370 liters (empty)
- Electronic hydrogen flow controller
- PLC
- Electronic load
- DC-DC Converter
- DC motor with mechanical load
- Traffic light signal
- Digital voltmeter
- Digital ammeter
- Flowmeter
- USB interface
- Circuit breakers (3)
- Power supply transfer switch
- Power cord
- Cord wrap
- Digital watt meters (3)

Experiment Capabilities

- Measurement of fuel cell stack characteristic curves
- Determination of fuel cell efficiency
- Factors affecting the characteristic curve
- Maximum power versus optimum efficiency
- Internal resistance, voltage efficiency, and temperature of the fuel cell stack
- Load profiles and utilization ratio
- Fuel cell theory analysis:
  - How energy is converted electrochemically in a fuel cell
  - The thermodynamics of electrochemical conversion of energy
  - Electrode kinetics
  - Structure of the polymer electrolyte membrane fuel cell

Services Required

Electrical: 120V AC-1Ø-60Hz
Other: Hydrogen gas

All Hampden units are available for operation at any voltage or frequency

Hampden® ENGINEERING CORPORATION

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