

840 Advanced Fuel Cell Test System

- ✓ Integrated Turn-Key Test System
- ✓ Flow Rate Upto 12 SLPM
- ✓ Humidifier Bypass for Wet/Dry Testing
- ✓ Multiple Current Ranges for Accurate Measurement Over Wide Dynamic Range
- ✓ Impedance Spectroscopy & HFR Option
- ✓ Anode & Cathode Gas Mixing Options

Features:

- Suitable for up to 50 cm² cells & small stacks
- **890e Electronic Load:** 125W (5/25/50A or 10/50/100A) 20V; or 500W (12/62/125A or 25/125/250A) 20V
- **892e Data Acquisition Module:** 16 channels of voltage/temperature integrated with FuelCell[®]
- **Dual Anode & Cathode** mass flow controllers for enhanced accuracy over wide flow range
- **New:** Automated Anode & Cathode input gas selector valves
- Automated humidifier by-pass for wet/dry cycling
- Large capacity Anode & Cathode SS humidifiers with automatic water fill
- Flexible SS temperature controlled heated gas transfer lines
- *FuelCell[®]* software for user-friendly computer-controlled cell operation & experimentation
- Constant or stoichiometric-controlled reactant flow rate
- Constant current, voltage or power control modes
- Continuous, real time cell resistance measurement by Current Interrupt & HFR
- High impedance whole cell & reference electrode voltage sense inputs
- Simultaneous 3 channel whole and half-cell EIS
- Automatic shutdown & purge for safe, reliable operation
- Single USB interface

Available Options:

- **Anode & Cathode backpressure** – standard & high capacity
- **Built-in impedance analyzer for EIS & HFR**
- **32 channel stack voltage monitor**
- **Additional MFCs for gas mixing on Anode & Cathode**

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Specifications:

Electronic Load:

Maximum Load Current:	5/25/50A; 10/50/100A; 12/62/125A; 25/125/250A (config. dependent)
Maximum Load Power:	125 W or 500 W (configuration dependent)
Minimum Load Resistance:	< 2 m Ω (100 mV @ 50 A at load terminals)
Current Resolution:	1 mA at low currents – up to 100mA (current setting dependent)
Current Accuracy:	$\pm 0.3\%$ of full scale current of selected range

Voltage Measurement and Data Acquisition:

Max. Whole Cell Voltage:	20 V
Max. Reference Electrode Voltage:	9.999 V
Voltage Resolution:	1 mV
Voltage Accuracy:	± 3 mV $\pm 0.3\%$ of reading
Voltage & Current Data Update Rate:	100 Hz
Whole Cell Sense Input Resistance:	> 35 k Ω
Reference Electrode Input Resistance:	> 10 ⁹ Ω

Impedance Analyzer (Optional 880):

Internal Impedance Analyzer Type:	Single sine, one generator and two gain/phase measurement channels
Internal Analyzer Frequency Range:	1 mHz to 10 kHz
Measurement Channels:	Three: whole cell plus two half cell vs. Reference Electrode

Reactant Gas Control System:

All 316 SS construction (humidifiers, flow path, valves and mass flow controllers) with Swagelok[®] fittings
Temperature controlled reactant transfer lines

Mass Flow Control:

Dual, software controlled mass flow controllers per channel,
Anode: 6 SLPM (1 + 5 SLPM), Cathode: 12 SLPM (2 + 10 SLPM). Other sizes available on request. Automatic N₂ purge valves

Alarm Inputs:

Gas supply pressures (3), humidifier water levels (2), external (1),
System alarm output (1)

Backpressure Control (Optional):

Manual or Automatic: 0 – 3 atm (0 – 30 PSIG). High Capacity: forced air condensers with large tanks and SS regulators.

Temperature Controllers:

Set & Report Accuracy:	$\pm 0.25\%$ of span, ± 1 least significant digit
Sensor Type:	Thermocouple, Type T for cell (Type K optional for high temperature)

Humidifiers:

Temperature Range:	Dual sparger-type, passivated 316L, 1650 W heaters per bottle Ambient to 99 °C
Fill Method:	Automatic water fill. Requires 3 atm (45 PSIG) minimum water feed or 1.4 atm (20 PSIG) above back pressure

Environment:

Operating Temperature:	5 to 35 °C
Power Source:	220-240 V, 50-60 Hz, 20 A
Enclosure Type:	Single bench top enclosure
Size and Weight:	91 cm H x 61 cm W x 61 cm D (+ 41 cm for heated gas lines), 55 kg 36" H x 24" W x 24" D (+ 16" for heated gas lines), 120 lb.

Safety Features:

Automatic shutdown and N₂ purge on under-voltage, over-current, over-temperature, loss of reactant or purge gas pressure, low water, communications failure or external alarm, Emergency Stop switch for manual operator shutdown

Specifications given for 25 °C ambient temperature unless otherwise noted.

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