

# High-Power 890e Fuel Cell Test Loads

**Multi-Current Range Load**  
**1 kW-50/250/500 A & 2 kW-100/500/1000 A**  
**with Integrated Multi-Channel Impedance Spectroscopy**



The model **890e-1kW/2kW** are the latest members of the 890 family of versatile Fuel Cell Test Loads. The instruments consist of an air-cooled, multi-range programmable electronic load with ultra-low internal resistance for full-voltage range evaluation of single cells. The new high-power **890e** loads are targeted at R&D of large single cells and short-stacks.

Additional features include mass flow, temperature and pressure controls in a compact, bench top unit. The **890e** has a small footprint, low cost and offers maximum value with extra features including powerful **FuelCell<sup>®</sup>** software.

The **890e** is used with custom or third-party fuel management unit, and optional internal **Model 880 Frequency Response Analyzer (FRA)**. An optional interface box may be included for non-integrated fuel system designs.

## Features

- Electronic load with three current ranges for accurate measurement over a wide dynamic range
- Control signals for two (2) main mass flow controllers plus five (5) additional mass flow controllers
- Continuous real-time cell resistance and IR-free voltage measurement by current interrupt
- Optional internal impedance analyzer for EIS and continuous real-time high frequency resistance (HFR)
- Simultaneous 3 channel impedance measurement using whole cell and reference electrode inputs
- Automatic shutdown in hardware for over-current, over-power, under-voltage and over load or cell temperature

## Features

- Whole cell sense voltage input and two high-impedance reference electrode inputs
- Cell main terminals and sense inputs tolerant of non-isolated cell
- Three (3) internal controllers for anode and cathode humidifier and cell temperatures
- Constant current, voltage or power control mode
- Contact inputs for three pressure sensors or alarms
- Low voltage output signal to control purge gas valves and to indicate alarm condition
- RS485 digital interface for external temperature controllers

## Specifications

### Electronic Load:

Maximum Load Current (3 range):	50/250/500 A or 100/500/1000 A
Maximum Load Power:	1 kW (500 A) or 2 kW (1000 A)
Minimum Load Resistance:	< 0.7 m $\Omega$ (1 kW), < 0.35 m $\Omega$ (2 kW) (at load terminals, at max. rated load current)
Current Resolution:	1 mA – 1 A (range & load rating dependent)
Current Accuracy:	0.3% of full scale current of selected range (0.5% for 2 kW model)

### Voltage Measurement and Data Acquisition:

Maximum Whole Cell Voltage:	20 V
Maximum Reference Electrode Voltage:	9.999 V
Whole Cell Sense Voltage Input Resistance:	> 35 k $\Omega$
Reference Electrode Input Resistance:	> 10 <sup>9</sup> $\Omega$
Voltage Resolution:	1 mV
Voltage Accuracy:	$\pm 3$ mV $\pm 0.3\%$ of reading
Voltage and Current Data Update Rate:	100 Hz

### Fuel Interface:

Outputs for flow controllers:	Up to Seven, Analog (0-5 V)
Alarm Inputs:	Six: Three for gas pressures, three auxiliary
Alarm Outputs:	One, 5 V logic.
Fuel Solenoid Control:	One, 5 V output (external relay needed, included with interface box)

### Temperature Controllers:

Quantity:	Three
Type:	On/off 5 V output (external SSR required)
Set and Report Accuracy:	$\pm 0.25\%$ of span, $\pm 1$ least significant digit
Sensor Type:	Thermocouple, Type T, K, or S (user specified)

### Impedance Measurement:

Interface for internal or external analyzers:	V & I output channels with variable DC bias rejection, generator input channel with selectable attenuation
Internal Impedance Analyzer Type:	Single sine, two gain/phase measurement channels, one generator output channel
Internal Analyzer Frequency Range:	1 mHz to 10 kHz
Measurement Channels:	Three: whole cell + two 1/2-cell vs. ref. electrode

### Environment:

Operating Temperature:	0-40 °C ambient; all specs given for 25 °C ambient
Power Source:	100-240 VAC, 50/60 Hz (auto select)
Size (bench-top enclosure):	1 kW: 17" W x 10" H x 19" D (43 x 25 x 48 cm <sup>3</sup> ) 2 kW: 17" W x 18" H x 19" D (43 x 46 x 48 cm <sup>3</sup> )

### Safety Features:

Emergency Stop button for manual operator shutdown

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