

Model 880 Frequency Response Analyzer for Electrochemical Impedance Spectroscopy and High Frequency Resistance Measurements

The Model 880 Frequency Response Analyzer (FRA) is available for integration with the Scribner's electronic load used in the 840 / 850 / 890 series of fuel cell test products. The 880 FRA meets or exceeds the performance and accuracy requirements needed for all fuel cell testing applications.

The 880 FRA and FuelCell[®] software facilitates continuous, single-frequency High Frequency Resistance (HFR) and full-frequency range Electrochemical Impedance Spectroscopy (EIS) analysis of an operating fuel cell. HFR can be performed concurrently with current interrupt (IR drop) measurement for orthogonal determination of the cell internal or ohmic resistance.

The 880 FRA can also be integrated with the Model 910 Multi-Channel Microelectrode Analyzer (MMA) for impedance spectroscopy of electrode and sensor arrays.

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| • Generator Frequency Range | 1 mHz to 10 kHz |
| • Frequency Error | < 0.01% |
| • Amplitude Range | ±10 mV to ±3.000 V |
| • Amplitude Resolution | 1 part in 32,768 |
| • Amplitude Error | < 1% ± 1 digit |
| • Distortion | < 0.02% |
| • Analyzer Type | Quadrature method (digital correlation) |
| • Input Ranges(RMS) | 30 mV, 300 mV, 3 V RMS |
| • Full Scale Peak Input | 50 mV, 500 mV, 5 V |
| • Cross Channel Isolation | > 100 dB |
| • Measurement Time, minimum: | Longer of 1 cycle or 10 ms |
| • Measurement Cycles: | Dependent on integration setting |
| • Error Limits: | 0.5% Magnitude error (1 mHz to 10 kHz)
0.5 ° Phase error (1 mHz to 10 kHz) |



Available for 840, 850 and 890 Fuel Cell Test Systems and the MMA 910 Array Analyzer

Specifications:

Electronic Load:

Maximum Load Current:	5, 15, 25, 50 or 125 A (configuration dependent)
Maximum Load Power:	125 W (15, 25, 50 A units) 100 W (5 A unit); 500 W (125 A unit)
Minimum Load Resistance:	< 2 m Ω for 125/50 A, <3 m Ω for 25 A unit
Current Resolution:	1 mA on 5 and 15 A units. 10 mA on 25, 50 and 125 A units.
Current Accuracy:	$\pm 0.3\%$ of full scale current rating.

Voltage Measurement and Data Acquisition:

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

Fuel Interface:

Outputs for anode, cathode MFCs:	Two, Analog (0-5 V)
Alarm Inputs:	Six: Three for gas pressures, three auxiliary.
Fuel Solenoid Control:	One 5 V output (external relay needed)

Temperature Controllers:

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

Environment:

Operating Temperature:	0 to 40 °C ambient
Power Source:	100-240 V _{AC} , 50/60 Hz (auto select)
Size:	3U standard rack mount, 19"W x 5.25"H x 21"D

Configuration Options at Manufacture:

Reformat outputs:	Up to 5 additional channels available
Current Range:	Select 5, 15, 25, 50 or 125 A
Temperature Control Channels:	Standard configuration of 3 controllers

Hardware Notes:

Thermocouple connector types:	Miniature connectors, T, K or S type
Enclosure	Aluminum chassis, polymer panel overlay

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

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