

Highend Data Acquisition Systems

ZAHNER

M E S S Y S T E M E

Made in Germany

Scientific Instrumentation for Batteries & Fuel Cells



ZAHNER EL1000

electronic load



EL1000

Electronic Load EL1000

Electronic loads are indispensable tools in several fields of electrochemistry, for example in the research of batteries and fuel cells. Due to the limited potential span resulting from the combination of chemical elements or compounds, a huge number of cells have to be stacked to achieve a technical practicable voltage, say for instance 100 V.

The EL 1000 was designed to investigate complete stacks, either as stand-alone device under PC control or in combination with a workstation IM6 or Zennium for instance for impedance measurements.

Adding an additional external electronic load, the power can be raised up – adding the PAD4 to the controlling workstation, individual segments of the stack can be investigated separately.

Specifications

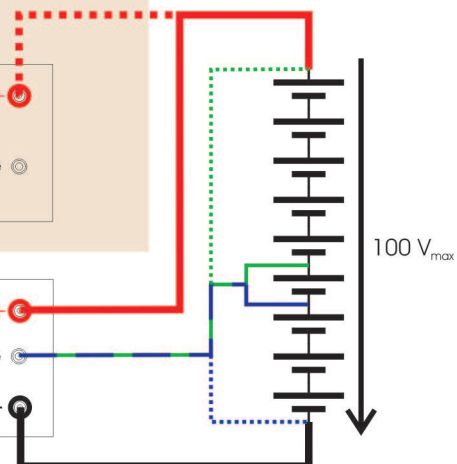
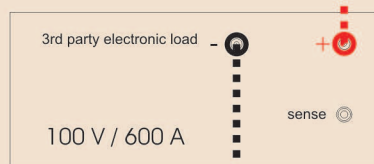
Frequency range	10 μ Hz - 100 kHz
Current range	200 A / 600 A (with 3 rd party electronic load)
Voltage range	± 4 V / ± 100 V
Maximum power	1.000 W (stand-alone) scaleable with 3 rd party electronic load
Dimensions	470 x 160 x 446 mm

Optional:
electrochemical workstation
IM6/Zennium
for dynamic measurements

- impedance spectra (EIS)
- series EIS



Optional:
additional electronic load
for high power (< 600 A)



ZAHNER ZENNIUM / IM6

parallel impedance add-on

PAD4: 4 Channel Synchronous A/D Converter

True Parallel Synchronous Impedance

Save time - measure up to 17 stack-cells in one run - no time mismatch between impedance spectra - record anodic, cathodic & total impedance simultaneously - measure additional transfer function signals...

The Zahner PAD4 is a 4-channel add-on card for Zahner Electrochemical Workstations. It introduces four additional parallel sampled signal inputs for cell voltage and impedance in fuel cell stacks and battery packs, with a common current. The Zahner Zennium supports up to two PAD4-cards for up to nine parallel channels, while the IM6 can control up to four cards for a maximum count of 17 parallel channels.

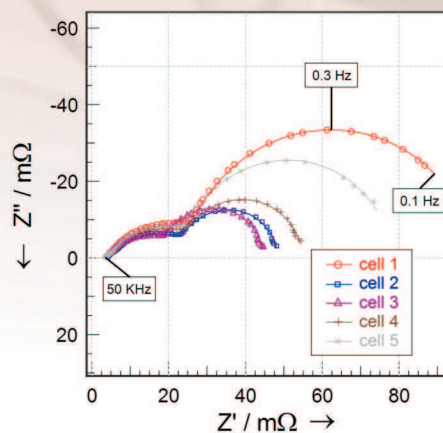
PAD4-cards are plug 'n' play - they are detected automatically on start-up. The PAD4 may be combined with the basic ECW or with the ECW controlling a slave potentiostat or an electronic load, finally providing tests on stacks of up to 100V/ 600A/ 50 KW.

Additional Methods

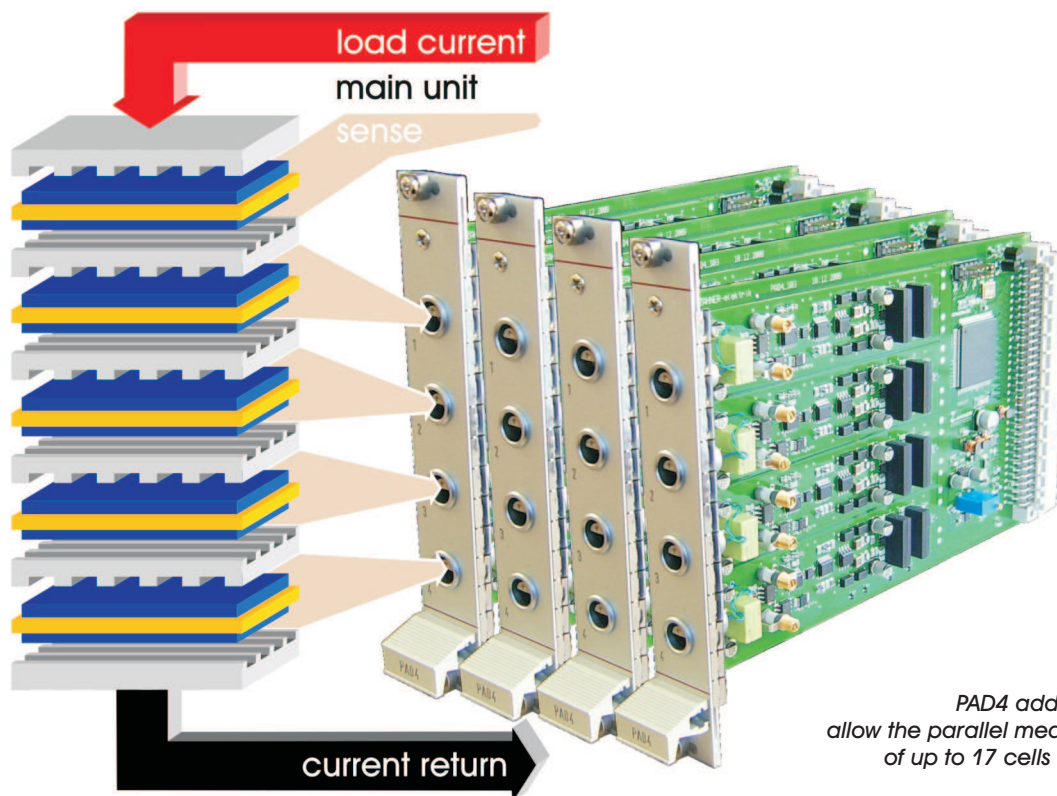
- parallel electrochemical impedance spectroscopy
- parallel impedance/parameter capacitance/voltage curves
- parallel testsampling online display and logging

Specifications

Channels / card	4 individually addressable
<i>Impedance measurement:</i>	
Frequency range	10 μ Hz to 250 kHz
<i>DC-potential measurement:</i>	
Voltage range	± 4 V
Common mode range	± 100 V
A/D converter resolution	18 bit



PAD4 Nyquist plot of a five cell SOFC stack



Up to four PAD4 add-on cards allow the parallel measurement of up to 17 cells of a stack

ZAHNER PP-Series

power potentiostats

PP2x1 Power Potentiostats



The PP-Series potentiostats are designed to apply and sink high currents up to $\pm 40\text{A}$ at a total power dissipation of up to 200W.

The PP-Series potentiostats are controlled by an EPC42, a plug-in module for the Electrochemical Workstations IM6 and Zennium.

Up to four EPC42 cards can be installed in an IM6 or an Zennium. In

total, up to 16 PPs can be controlled by one IM6/Zennium. Each potentiostat will hold the control parameters from one access to the next one, so that no potential or current disturbances can occur while scanning the potentiostats. If series measurements are performed with more than one PP-Series potentiostat, spectra are taken from all modules in a definable order.

The PP-Series is embedded completely in the IM6/Zennium environment. Thus, all acquisition and analysis techniques that run on the IM6/Zennium can be applied with the power potentiostats as well. The installation of one or more PP-Series potentiostat will upgrade your IM6/Zennium to an even more versatile, high-current electrochemical workstation.

The PP-Series potentiostats can also be controlled by a Windows®-PC. In this case they provide methods, summarized in the table below. They also work as a LabView® Virtual Instrument under the LabView® software. To implement the PP-Series potentiostats into existing test environment, a supporting DLL is available on demand.

You can control the PP-Series potentiostats in a mixed mode with an IM6/Zennium and a PC in parallel. Both devices can be connected and disconnected during operation.

Supported Methods with IM6/Zennium

- impedance spectroscopy
- simulation & model fitting
- cyclic voltammetry
- polarisation curves
- multicell multitasking voltammetry
- arbitrary current/potential/time measurements
- capacity/potential measurements
- automatic series measurements

Supported Methods with PC

- test sampling
- U vs. time, I vs. time
- current potential curves (U/I)
- cyclic voltammetry, CV at OCP
- charging/discharging, battery cycling
- LabView® virtual instrument
- DLL support available

Specifications

Model name	PP201	PP211	PP241
Operating modes	pot/gal/oc	pot/gal/oc	pot/gal/oc
Potential range	$\pm 10\text{V}$	$\pm 20\text{V}$	$\pm 5\text{V}$
Potential accuracy	$\pm 0.1\% / \pm 1\text{mV}$	$\pm 0.1\% / \pm 2\text{mV}$	$\pm 0.1\% / \pm 1\text{mV}$
Current range	$0\text{A} \dots \pm 20\text{A}$	$0\text{A} \dots \pm 10\text{A}$	$0\text{A} \dots \pm 40\text{A}$
Current accuracy	$\pm 0.25\% / \pm 1\text{mA}$	$\pm 0.25\% / \pm 1\text{mA}$	$\pm 0.25\% / \pm 1\text{mA}$
Output power	200 W	200 W	200 W
Frequency range	$10\ \mu\text{Hz} - 200\text{KHz}$	$10\ \mu\text{Hz} - 200\text{KHz}$	$10\ \mu\text{Hz} - 200\text{KHz}$
Impedance range	$1\ \mu\Omega - 1\text{K}\Omega$	$1\ \mu\Omega - 1\text{K}\Omega$	$1\ \mu\Omega - 1\text{K}\Omega$
Ambient temperature	$0\text{ }^\circ\text{C} \dots 30\text{ }^\circ\text{C}$	$0\text{ }^\circ\text{C} \dots 30\text{ }^\circ\text{C}$	$0\text{ }^\circ\text{C} \dots 30\text{ }^\circ\text{C}$
System requirements	IM6/Zennium+EPC42 or PC	IM6/Zennium+EPC42 or PC	IM6/Zennium+EPC42 or PC

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