HIOKI

EIS MEASUREMENT SYSTEM ALDAS-Mini

Visualizing Dynamic Characteristics of Electrolysis Cells and Fuel Cells

Exploring optimization parameters to minimize EC / FC operational costs

CE

Innovation is electrolysis cell and fuel cell evelopment

ALDAS-Mini

5 Key Benefits

Insights into the internal state of the cell while in operation

Cell impedance measurement during electrolysis or generation

Easy connection and setup

No modifications to the system needed

Compare individual cells under identical conditions

Simultaneous measurement of up to 8 cells in a stack

Delivers consistent, reproducible analysis

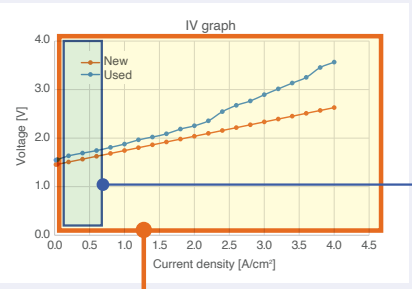
High-precision measurements in noisy environments

One tool for all cell-types

Supports various electrolysis cells (PEMEC, SOEC, AWE, etc.)

Cell impedance measurement

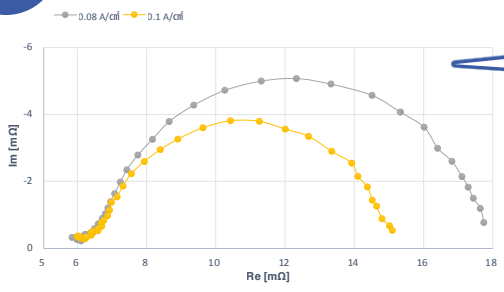
Accelerate cell development via high-current operational testing



Without ALDAS

Max. 50 A operational current

Only small-scale R&D cells can be measured



Standard FRAs* have limited range

Application examples

- Small electrolysis cell evaluation (1 cm²)
- Research of electrolysis cell materials
- Operation assessment at low-current density

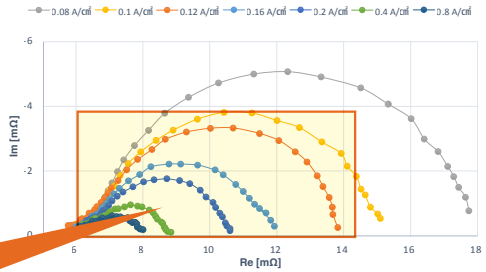
*FRA: Frequency Response Analyzer

With ALDAS

Max. 2000 A electrolysis or load current

Evaluate industrial-scale cells or cell stacks during actual operation

Expand EIS into the high-current region



Application examples

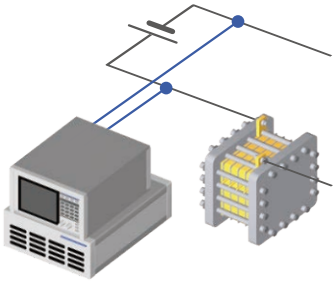
- Large cell evaluation (100 cm²)
- Evaluation of material properties under actual operating conditions
- Analyze cell health throughout its life-cycle to optimize operating conditions

No modifications to the system needed

Connect to a system already in use

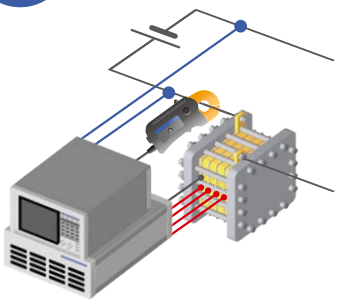
No modification to your system is needed to set up the ALDAS-Mini.
Unlike conventional booster-equipped FRA devices, the ALDAS-Mini operates seamlessly alongside the cells' DC power supplies and electronic loads.

STEP 1 Applied current connection



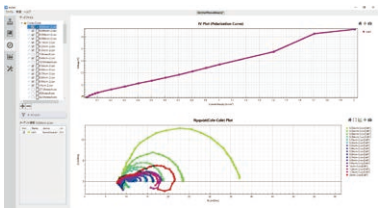
Connect the SOURCE MODULE to the cell's power source terminal with the SOURCE CABLE. The SOURCE MODULE applies AC current for measurement.

STEP 2 Measurement line connection



Attach the current sensor to measure the current. Then, connect the SENSE CABLE to the cell to measure the voltage (both connected to the SENSE MODULE)

STEP 3 Start measurement



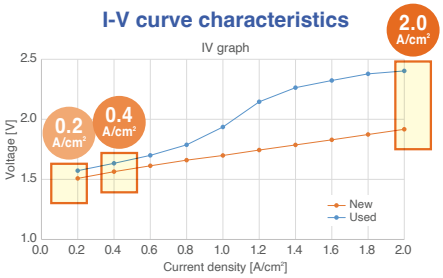
Start the measurement the I-V curve and Nyquist plot will be displayed in real-time during the measurement.

Find what causes degradation with I-V curve and Nyquist plot

ALDAS simultaneously generates the I-V curve and Nyquist plot, enabling measurement across a wide range of current densities. This means that you can now quantify and compare internal changes in cells of a wide range of currents.

Measurement examples

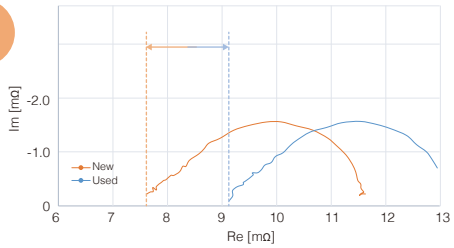
I-V curve characteristics



Comparison between new and used cells. At high current density, the used cell shows strongly nonlinear behavior.

Nyquist plot at various current densities

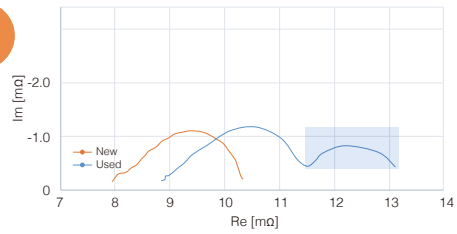
0.2 A/cm²



The ohmic resistance increases when the cell operates for a period of time. This causes the arc on the Nyquist plot to shift to the right.

▶ **Indicates cell degradation**

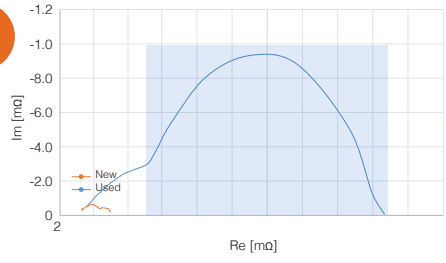
0.4 A/cm²



A similar arc for both cells indicates charge transfer resistance. Only the used cell shows a second arc indicating mass transfer resistance.

▶ **Indicates changes in catalytic activity**

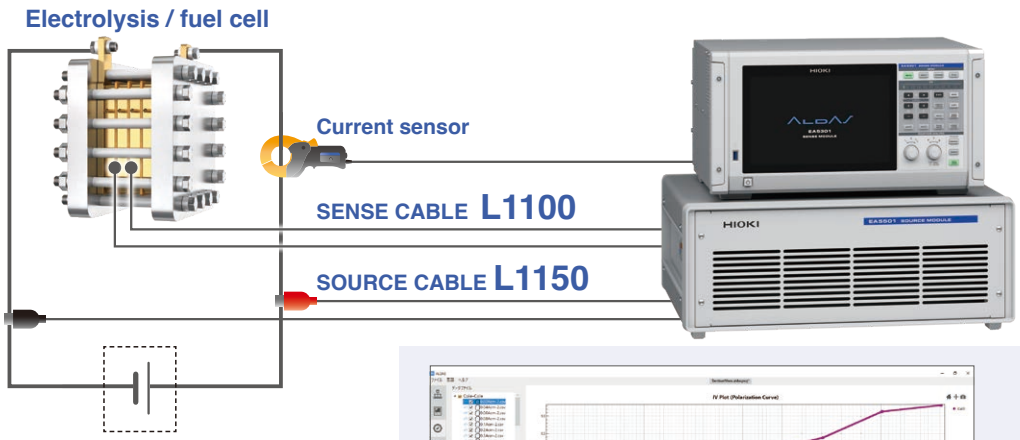
2.0 A/cm²



A significant increase in the size of the used cell arc (blue line) indicates a mass transfer resistance. This leads to lower operation efficiency.

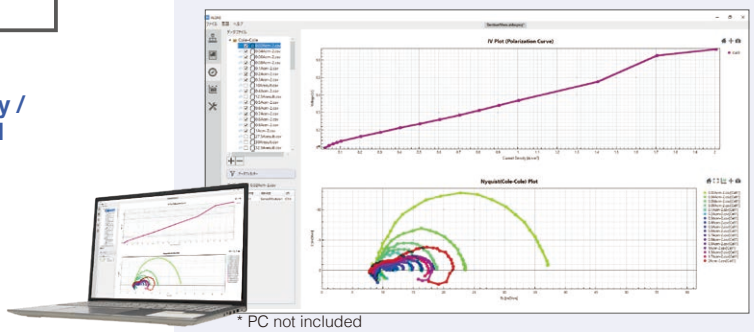
▶ **Indicates reduced operating efficiency due to mass transfer resistance**

System configuration



SENSE MODULE
EA5301
Measure current and voltage across each cell

SOURCE MODULE
EA5501
Inject AC measurement current



* PC not included

PC Software
EA5701
The I-V curve and Nyquist plot are displayed simultaneously in real-time, with impedance calculated from the measured current and voltage.
For equivalent circuit analysis, save file in Scribner ZView® format.

Specifications

Measurement target	Electrolysis cell, fuel cell, cell stack
Measurement parameters	Impedance (R, X, θ, Z) voltage (V), current (I)
Measurement modes	Logging Mode, EIS Mode
Display modes	Nyquist plot, Bode plot, logging plot
Measurement voltage range	250 mV to 60 V
Measurement current range	100 mA to 500 A (CT6845A) Maximum 2000 A (depending on the combination of sensors)
Max. applied measurement signal	40 Ap-p (at 5 V) Derating applies for voltages above 5 V
Measurement frequency range	10 mHz to 100 kHz
Number of input channels	1 to 8 channels
Dimensions and weight	SENSE Module EA5301 (with 8 channels): approx. 430W × 221H × 361D mm (16.9W × 8.7H × 14.2D in.) (excluding protruding parts), approx. 12.7 kg (28.0 lbs) SOURCE module EA5501: approx. 520W × 197H × 540D mm (20.5W × 7.8H × 21.3D in.) (excluding protruding parts), approx. 27.0 kg (59.5 lbs) (not including cables)
Power supply	100 V to 240 V AC, 50 Hz/60 Hz, 500 VA
PC requirements	OS: Windows 11 Interface: wired LAN

Options

Current sensor	Appearance	Model name	Rated measurement current	Accuracy	Core diameter
Pass-through types		CT6877A	2000 Arms	0.02 %rdg.	ϕ80 mm
		CT6904A	500 Arms	0.02 %rdg.	ϕ32 mm
		CT6876A	1000 Arms	0.02 %rdg.	ϕ36 mm
		CT6875A	500 Arms	0.04 %rdg.	ϕ36 mm
		CT6873	200 Arms	0.03 %rdg.	ϕ24 mm
		CT6872	50 Arms	0.03 %rdg.	ϕ24 mm
Clamp types		CT6847A	2000 Arms	±0.15% rdg.	ϕ50 mm
		CT6846A	1000 Arms	0.2 %rdg.	ϕ50 mm
		CT6845A	500 Arms	0.2 %rdg.	ϕ50 mm
		CT6844A	500 Arms	0.2 %rdg.	ϕ20 mm
		CT6843A	200 Arms	0.2 %rdg.	ϕ20 mm
		CT6841A	20 Arms	0.2 %rdg.	ϕ20 mm

SENSE CABLE L1100

Small alligator clip
2.2 m (7.2 ft.)

SOURCE CABLE L1150

Large alligator clip,
2 m (6.6 ft.)

HIOKI
HIOKI E.E. CORPORATION

HEADQUARTERS
81 Koizumi,
Ueda, Nagano 386-1192 Japan
https://www.hioki.com/

Scan for all regional contact information

DISTRIBUTED BY