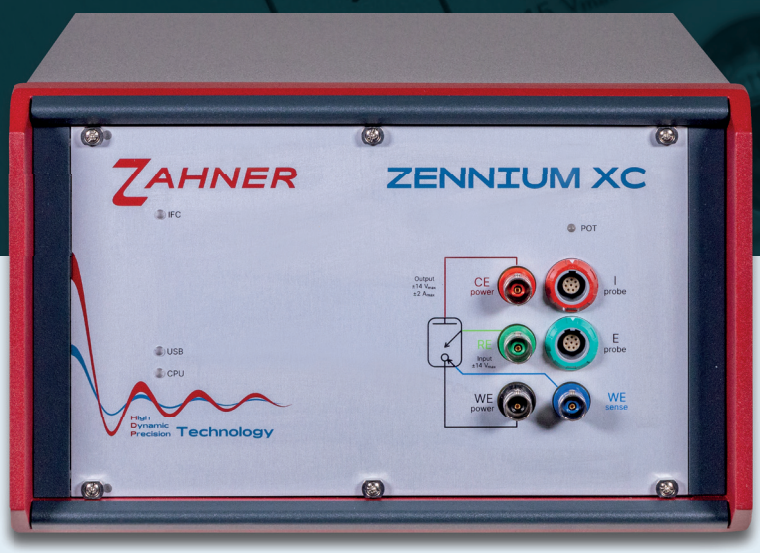
ZAHNER

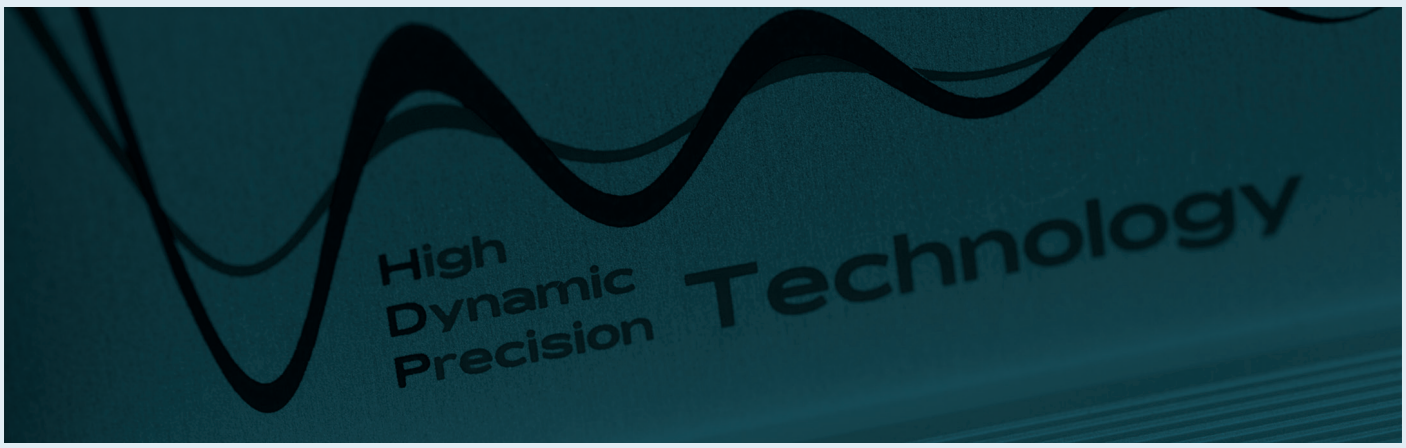
PRECISION IN ELECTROCHEMISTRY



ZENNIUM XC - Made in Germany

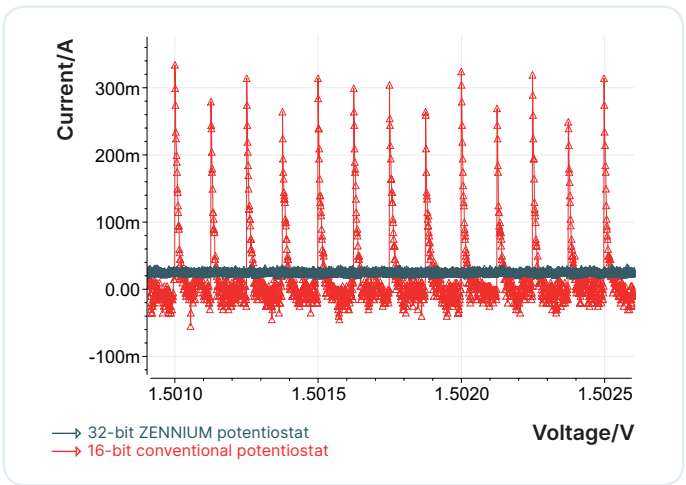
ZENNIUM XC

THE COMPACT POTENTIOSTAT

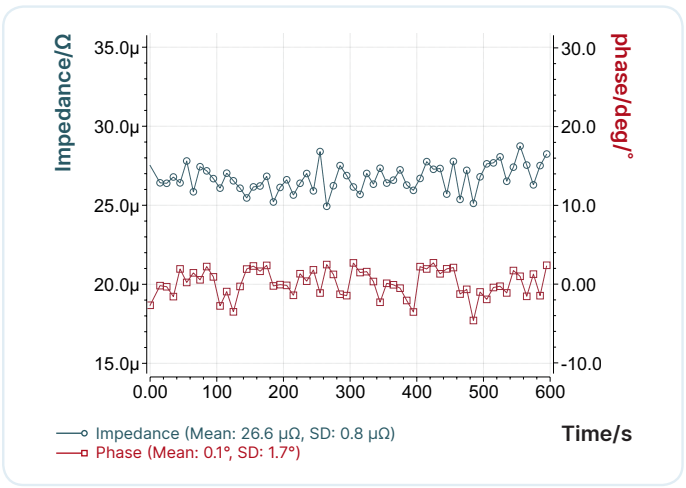


Main Specifications

- EIS frequency range 10 µHz – 5 MHz
- 32-bit DC and 24-bit AC resolution
- ±5 V / ±14 V voltage range
- ±2 A over 12 current ranges
- Online data processing for outstanding EIS



Slow CV scans with a scan rate of 10 µV/s on a highly capacitive system with the ZENNIUM potentiostat (32-bit DAC resolution) and a conventional potentiostat (16-bit DAC resolution).



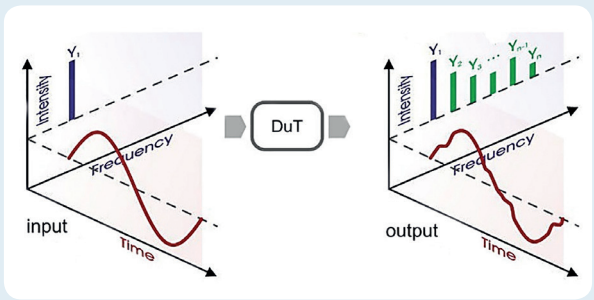
Single frequency (1 Hz), single period impedance measurements on a 25 µΩ resistor vs. time. The measurement is carried out with 1 A amplitude.

"THE HIGH-END POTENTIOSTAT"

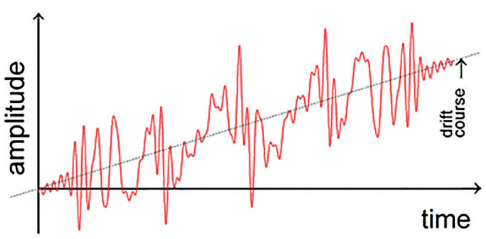
Our Strengths

Zahner potentiostats can carry out advance electrochemical measurements like NFRA and intelligent multi sine EIS measurement besides traditional electrochemical measurements.

For more information:



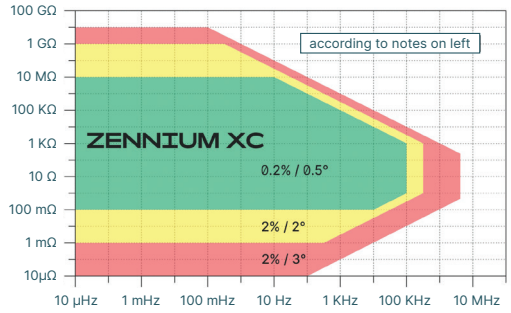
NFRA: ZENNIUM potentiostats can measure harmonics during the impedance measurement, making it capable to carry out non-linear frequency response analysis.



IM-Sine: ZENNIUM potentiostats can carry out intelligent multi-sine EIS measurements, significantly decreasing the total measurement time.

Accuracy Contour Plot

- Z > 0.1 Ω: potentiostatic mode, amplitude 10 mV
- Z > 1 MΩ: potentiostatic mode, amplitude 50 mV, shielded
- Z < 0.1 Ω: galvanostatic mode, amplitude 100 mA
- Z < 0.01 Ω: galvanostatic mode, amplitude 1 A
- Without DC bias voltage/current
- Specified at the BNC terminals



Specifications

Potentiostatic modes	potentiostatic, galvanostatic, pseudo-galvanostatic, rest potential, ZRA, off
ADC resolution	32 bit
Function generator	digital (analog: option ADF for scan rates up to 10 kV/s)
Harmonic reject	> 60 dB @ ½ full scale
Cell connection	2-, 3-, 4-terminal kelvin
Ground reference	grounded, floating

Frequency generator & analyzer	Low range	High range
EIS frequency range	10 µHz to 5 MHz	
AC amplitude	0 to 2 V, 24 bit resolution	0 to 6 V, 24 bit resolution
Accuracy	< 0.0025%	
Resolution	0.0025%, 10,000 steps/decade	

Output potentiostatic	Low range	High range
Controlled voltage	±5 V	±14 V
Resolution	2.5 nV	7.5 nV
Accuracy	±200 µV ± 10 ppm of reading	±600 µV ± 10 ppm of reading
Integral nonlinearity	typ. 4 ppm, max. 8 ppm	typ. 12 ppm, max. 24 ppm
Compliance voltage	±14 V	±14 V
Bandwidth	DC to 6 MHz @ 33 Ω load	
IR compensation	auto AC impedance technique, range 0 to 10 MΩ, resolution 0.012%	
Small signal rise time	150 ns to 200 µs in 5 steps, automatic selection	
Slew rate	15 MV/s	
Phase shift	10° @ 500 kHz	

Output galvanostatic	
Controlled current	±2 A
Current range	±1.9 nA to ±2 A in 12 current ranges
Resolution	32 bit ± 0.2 ppb of FS
Accuracy	±0.1% of reading ± 0.04% of FS, ≥1 µA to 100 mA ±0.4% of reading ± 0.2% of FS, < 1 µA or > 100 mA

Input	Low range	High range
Max. Input voltage	±5 V	±14 V
Voltage resolution	2.5 nV	7.5 nV
Voltage accuracy	±100 µV ± 5 ppm of reading	±300 µV ± 10 ppm of reading
DC current resolution	2 aA (32 bit)	
DC current accuracy	±0.05% of reading ± 0.04% of FS @ 1 µA ... 100 mA ±0.5% of reading ± 0.4% of FS @ 100 mA ... 2 A ±0.5% of reading ± 0.4% of FS @ 10 nA ... 1 µA ±0.5% of reading ± 125 fA @ < |1 nA| (HiZ-Probe)	
Input impedance	> 10 TΩ || ±5 pF typ. (Main) / > 1000 TΩ || ±1 pF typ. (HiZ-Probe)	
Input leakage current	< ±200 fA typ., < ±5 pA max., / < ±10 fA typ. (HiZ-Probe)	
Impedance range	1 mΩ to 10 GΩ / 2% (Main) 100 mΩ to 10 MΩ / 0.2% 100 mΩ to 100 GΩ / 2% (HiZ-Probe) 10 µΩ to 1 GΩ / 2% (Gal) 1 mΩ to 10 MΩ / 0.2%	
Common mode rejection	> 86 dB @ 10 µHz to 100 kHz > 66 dB @ 100 kHz to 5 MHz	
Input channel phase-tracking acc.	±0.05° @ 10 µHz to 100 kHz ±0.125° @ 100 kHz to 5 MHz	
Equivalent effective input noise	1 µV rms / 100 fA rms @ 1 mHz to 10 Hz	

Remote integration possible via Python and C++. Check out complete API documentation.

PC interface	USB 2.0
Dimensions / Weight	160 × 255 × 385 mm³ / 8 kg
Power supply	100/115/230 VAC, 50/60 Hz
Ambient temperature / humidity	+10 °C to +30 °C / < 60% without derating

Zahner Analysis

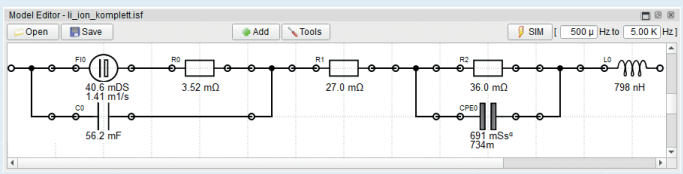
EIS fitting

- Create equivalent electrical circuits
- Fit impedance spectra
  - > Single fit
  - > Series fit
- ZHIT tool
- Significance plot
- Fitting accessible via API

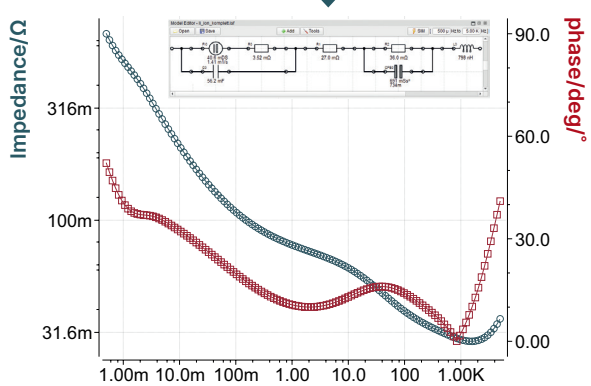
Other techniques

- Cyclic voltammetry
  - > Peak determination
  - > Charge integration
- Tafel slope measurements
- Butler-Volmer measurements
- Analysis of photoelectrochemical measurements

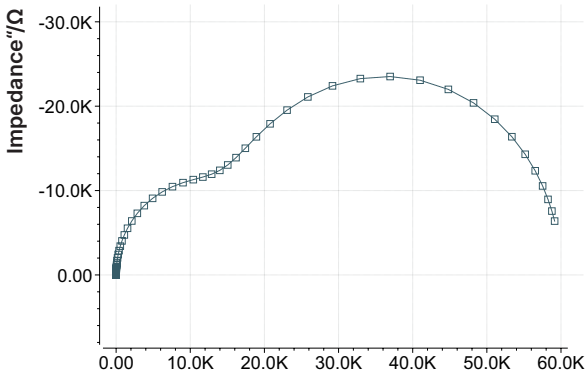
Check out Zahner Analysis videos:



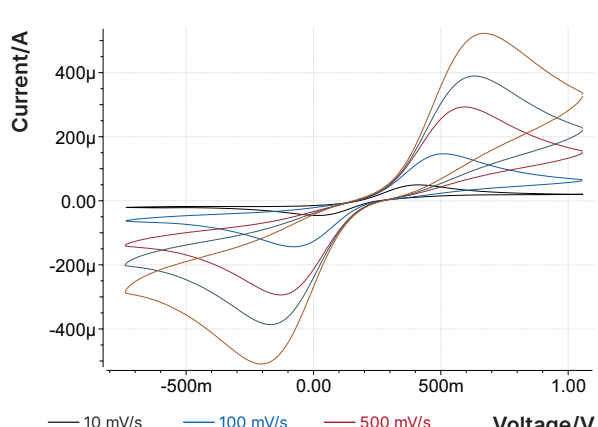
Create your own equivalent electric circuit for EIS fitting



Impedance spectrum (Bode plot) of a battery with the equivalent electrical circuit



Impedance spectrum (Nyquist plot) with two time constants



CV scans measured at different scan speeds

ZHIT

The Zahner Analysis software features the unique **ZHIT** tool, which helps identifying artifacts in impedance spectra and allows reconstruction of artifact-free impedance spectra for fitting.

Significance Plot

Zahner Analysis software features an exclusive tool called the **significance plot**, which evaluates the frequency-dependent significance of equivalent circuit elements in the fitting.

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