



ZAHNER[®]

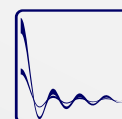
SCIENTIFIC INSTRUMENTS



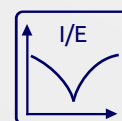
METHODS



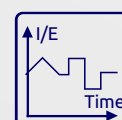
Cyclic Voltammetry



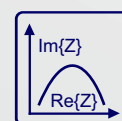
Electrochemical
Impedance
Spectroscopy



Steady-State
Voltammetry



Time domain /
Chronovoltammetry



Simulation

APPLICATIONS



Electrochemistry



Batteries
& Fuel Cells



Corrosion

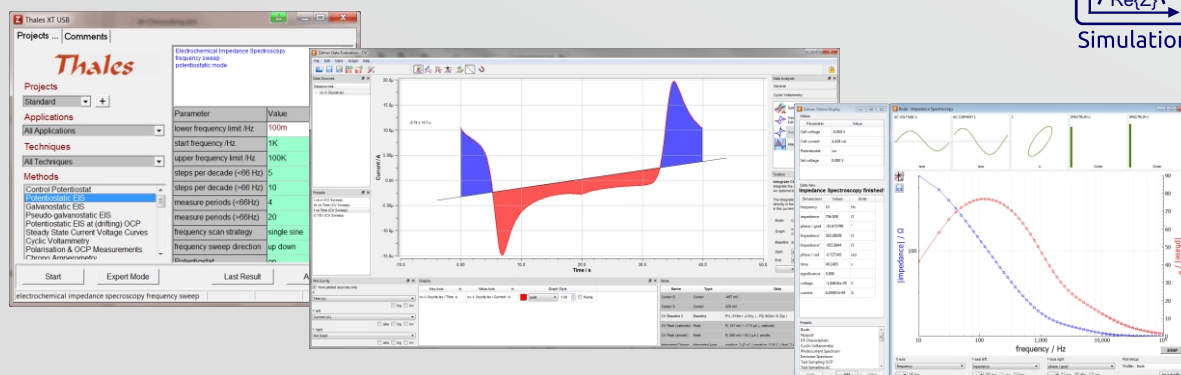


Photo-
electrochemistry

ZENNIUM^{pro}

The All-Purpose Electrochemical Workstation

- Electrochemical Impedance Spectroscopy ranging **10 μ Hz - 8 MHz**
- **32 bit converter resolution** for exceptional DC accuracy
- **$\pm 5 / \pm 15$ V controlled voltage**, switchable by software
- **± 28 V compliance voltage**
- **± 3 A maximum current** range at full compliance
- **High Dynamic Precision (HDP)** technology with **24 bit AC resolution**
- **Floating / grounded** mode switchable for measuring on a wide range of objects
- **Modular concept** for high flexibility and expandability
- **Bipotentiostat** module optional
- **New THALES XT Software Suite** providing features such as **highly flexible** Windows[®]-conform online visualization and **intuitive** offline data analysis





ZENNIUM pro

The All-Purpose Electrochemical Workstation

Applications

- Highly accurate electrochemical investigations
- Electrochemical analytics
- High power battery research (>3 V/per cell)
- Supercaps and fuel cells

Methods

- Cyclic voltammetry
- Electrochemical impedance spectroscopy
- Polarization methods
- Noise measurements
- Current potential curves (UI)
- Time domain methods
- Capacity/potential measurements
- Customized methods

Specifications*

Potentiostatic modes	potentiostatic, galvanostatic, pseudo-galvanostatic, rest potential, off	
ADC resolution	32 bit	
Function generator	digital (analog: ADF option)	
Harmonic reject	> 60 db @ ½ full scale	
Cell connection	2-, 3-, 4-terminal kelvin	
Ground reference	grounded, floating	
Extension slots	5	

Frequency generator & analyzer	low range	high range
EIS Frequency range	10 µHz to 8 MHz	
AC amplitude	0 to 2 V, 18 bit resolution	0 to 6 V, 18 bit resolution
Frequency accuracy	< 0.0025%	
Frequency resolution	0.0025%, 10000 steps/decade	
Input resolution	24 bit, 2 nV, 2 aA	

Output potentiostatic	low range	high range
Controlled voltage	±5 V	±15 V
Resolution	2.5 nV	7.5 nV
Accuracy	±100 µV ± 10 ppm of reading	±500 µV ± 10 ppm of reading
Integral nonlinearity	typ. 2 ppm, max. 4 ppm	typ. 6 ppm, max. 12 ppm
Compliance voltage	±14 V	±28 V
Bandwidth	DC - 10 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	±3 A
Current range	±1 nA to ±3 A
Resolution	32 bit, ±0.2 ppb of FS (1 ppm @ 1pA)
Accuracy	0.02% of FS ± 0.05% of reading ≥ 1 µA to 100 mA 0.1% of FS ± 0.2% of reading < 1 µA or > 100 mA

Input	low range	high range
Max. Input voltage	±5.5 V	±16 V
Voltage resolution	2.5 nV	7.5 nV
Voltage accuracy	±50 µV ± 5 ppm of reading	±100 µV ± 10 ppm of reading
DC current range	±1 nA to ±3 A in 12 steps, automatic range selection	
DC current resolution	±5 aA (32 bit)	
DC current accuracy	± 0.02% of FS @ 1 µA ... 100 mA ± 0.2% of FS @ 100 mA ... 3 A ± 0.2% of FS @ 1 nA ... 1 µA	
Input impedance	> 10 TΩ ±5 pF (Main, typical)	> 1000 TΩ ±1 pF (HiZ Probe, typical)
Input leakage current	< ±2 pA max., < ±200 fA typ.	
Impedance range	potentiostatic 1 mΩ to 10 GΩ / 2% galvanostatic 10 µΩ to 1 GΩ / 2%	100 mΩ to 10 MΩ / 0.2% 1 mΩ to 10 MΩ / 0.2%
Common mode rejection	> 86 dB @ 10 µHz to 100 kHz	
Input channel phase-tracking acc.	±0.05° @ 10 µHz to 100 kHz ±0.125° @ 100 µHz to 8 MHz	
Equivalent effective input noise	10 µV rms / 1pA rms @ 1 mHz to 10 Hz	

General

PC interface	USB 2.0
Dimensions / Weight	364 x 160 x 376 mm / 11.4 kg
Power supply	100/115/230 VAC, 50/60 Hz
Ambient temperature / humidity	+10 °C to +30 °C / < 60% without derating

* preliminary