

General

Overall Bandwidth	DC 5 MHz
ADC Resolution	18 bit
Harmonic Reject	> 60 dB @ 0.5 full scale
Potentiostat Modes	Potentiostatic, galvanostatic, pseudo-galvanostatic, rest potential, off
Cell Connection	2-, 3-, 4-terminal Kelvin
Shell	ground
Extension Slots	4
PC interface	USB 1.1 / 2.0
Dimensions	364 x 160 x 376 mm
Weight	12 kg
Accessories	U-buffer, 2 cell cable set, USB-cable, power cord, manual
Power supply	115/ 230 V, 50/60 Hz
Ambient temperature	+10° C to +30° C
Humidity	< 60% without derating

Frequency Generator & Analyzer

Frequency Range	10 μ Hz to 4 MHz
Accuracy	< 0.0025%
Resolution	0.0025%, 10.000 steps/decade

Output Potentiostatic

Controlled Voltage	Pot	± 4 V
	U-buffer	± 10 V
Resolution	Pot	125 μ V
	U-buffer	320 μ V
Accuracy	Pot	± 250 μ V
	U-buffer	± 1 mV
Temperature Stability		< 25 μ V/°C
Compliance Voltage	Pot	± 14 V
	CVB120	± 120 V
AC-Amplitude		1 mV to 1 V
Bandwidth		4 MHz @ 33 Ω load
IR Compensation	Method	Auto AC Impedance Technique
	Range	0 to 10 M Ω
	Resolution	0.012%
Small Signal Rise Time		250 ns to 200 μ s in 5 steps, automatic range selection
Slew Rate		15 MV/s
Phase Shift		10 deg @ 200 kHz

Output Galvanostatic

Controlled current		± 2.5 A
Current Range	Pot	± 100 nA to ± 2.5 A in 8 steps
	HiZ	± 1 nA to ± 0.5 A in 10 steps
Min. Resolution		0.025%
Accuracy		0.1% @ > 2 μ A to 100 mA
		1% @ < 2 μ A or > 100 mA

Input

Potential Ranges	Pot	$\pm 1, \pm 2, \pm 4$ V
	U-buffer	± 10 V
Potential Resolution		256.000 steps per range
Offset Voltage		< 100 μ V
Offset Temperature Stability		< 20 μ V/°C
Current Range	Pot	± 100 nA to ± 2.5 A in 24 steps, automatic range selection
	HiZ	± 1 nA to ± 0.5 A in 26 steps, automatic range selection
Accuracy		0.1% @ > 2 μ A to 100 mA
		1% @ < 2 μ A or > 100 mA
Input Bias Current	Pot	10 pA
	HiZ	12 fA
Current Resolution	Pot	2.5 pA
	HiZ	25 fA
Input Impedance	Pot	1 T Ω // ± 5 pF (typical), 50 M Ω // ± 5 pF (min.)
	HiZ	10 T Ω // ± 1 pF (typical), 1 T Ω // ± 1 pF (min.)
Impedance Range	Pot	1 m Ω to 1 G Ω / 2%
		100 m Ω to 10 M Ω / 0.2%
	HiZ	100 m Ω to 100 G Ω / 3%
	Gal	30 μ Ω to 1 G Ω / 2%
Common Mode Rejection		> 86 dB @ 10 μ Hz to 100 kHz
		> 66 dB @ 100 kHz to 4 MHz
Input Channel Phase-Tracking accuracy		± 0.1 deg @ 10 μ Hz to 100 kHz
		± 0.25 deg @ 100 kHz to 4 MHz
Equiv. Effective Input Noise		20 μ V rms / 2 pA rms @ 1 mHz to 10 Hz

ZAHNER ZENNIUM



Universal Electrochemical Workstation

Milestones In Electrochemical Instrumentation

ZAHNER ZENNIUM electrochemical workstation

ZAHNER ZENNIUM electrochemical workstation

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Introduction

Our R&D team managed to create a completely new instrument with outstanding features, state-of-the-art hardware and a widely extended software as an advancement of the world-valued IM6eX. The result is a milestone in electrochemical instrumentation. ZENNIUM was developed using our 30 years of experience in producing high-precision electrochemical workstations of the high-end class. It provides a wider frequency range up to 4 MHz, an output current up to ± 2.5 A and fast signal processing. Special measurement techniques guarantee an ultra high accuracy and a minimal interference with the test object.

ZENNIUM comes bundled with the outstanding Thales Z (zennium release) software package which offers all standard methods and more at a mouse click. This is why the ZENNIUM can easily be adapted to very different measurement requirements. Furthermore, with the manifold options available, the ZENNIUM is able to grow with its tasks. It is best suited for investigations on fuel cells, batteries and solar cells as well as on membranes and sensors or on coatings and laminates to name only a few.

Zahner is known to provide the most competent service all around the world. Our 30-years experience does not only cover the electronics but also the scientific share with its partially complex applications.

Option	Function	ext	int	EPC42 needed
TEMP/U	2 inputs for thermocouples + 2 voltage inputs		X	
DA4	4 analog outputs		X	
RMux	Relay multiplexer for the internal potentiostat		X	
PwrMux	Power multiplexer for the PP series potentiostats	X	X	
TRBM	Transient recorder up to 40 MHz		X	
HIZ probe	High impedance probe set		X	
LoZ	Cable set for low impedances	X		
EPC42	Control module for up to 4 external potentiostats		X	
XPot	External standard potentiostat	X		X
PP series	External power potentiostats	X		X
EL series	External electronic one quadrant potentiostats	X		X
NProbe	Probe set for measuring electrochemical noise	X		X
COLT	Set-up for coating and laminate testing			
CIMPS	Set-up for photo-intensity controlled IMPS	X		X
EIChem Cells	KMZ and AMZ type cells for various applications			

Hardware

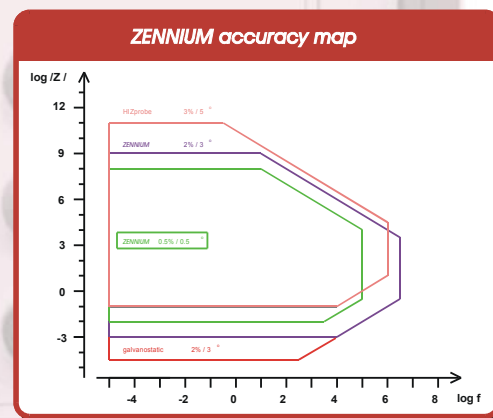
General

The hardware of the ZENNIUM provides

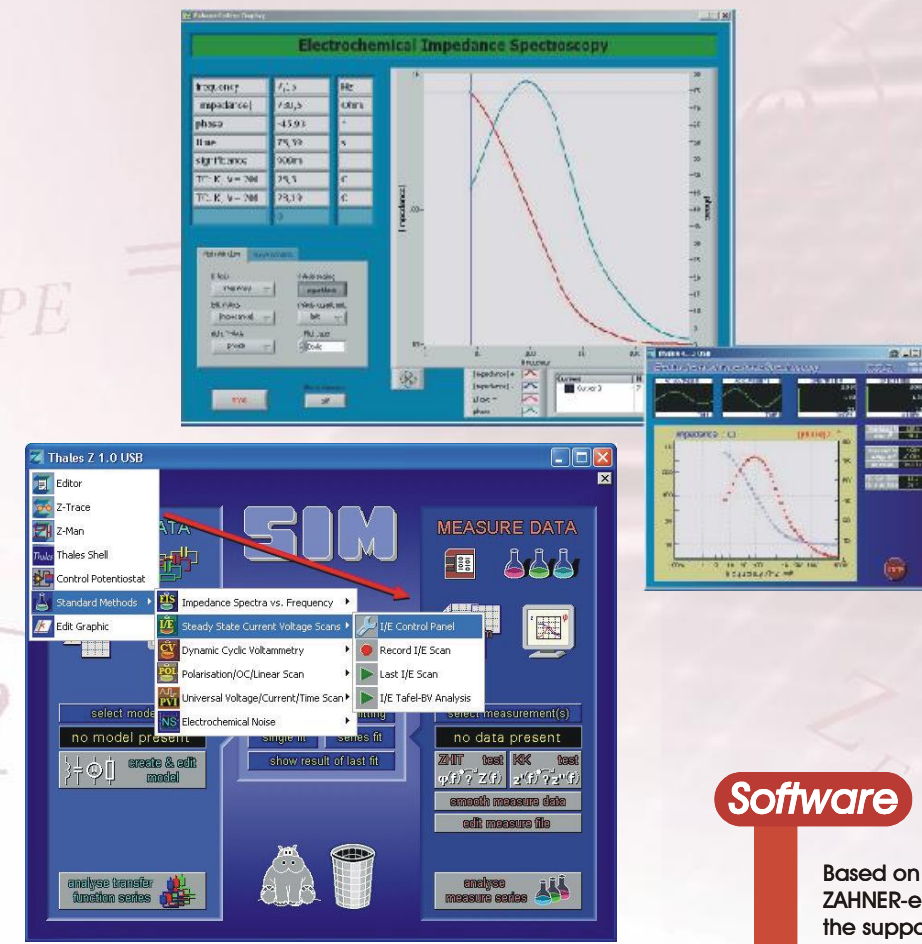
- ultra low-noise potentiostat
- wide frequency range dual DDS FRA
- high CMRR precision U/I-amplifiers
- PulSAR® state-of-the-art differential 18 bit ADCs for AC
- Connectors optimized for High Z & Low Z
- 4 Extension Card Slots
- 410 MIPS (Dhrystone 2.1) V4e ColdFire® signal processor
- Floating USB Interface

Accuracy

The highest priorities for the development and production of the ZENNIUM instruments are accuracy and reliability. The accuracy map of the ZENNIUM clearly shows the high quality of the hardware. For that reason we do not waste paper with senseless specifications like a "virtual" resolution calculated from the resolution of the AD converter. The ZENNIUM specifications are real ones relevant to the use in practice, based on the high-end components we use.



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ColdFire® is a registered trademark of Motorola, Inc.



Supported Method	Module	Option
Electrochemical Impedance Spectroscopy	EIS	-
EIS Series Measurements vs. Parameters	EIS	-
Impedance Network Analysis, Simulation & Fitting	SIM	-
Impedance/Parameter, Capacity/Voltage Curves	C/E	-
AC Voltammetry	C/E	-
Cyclic Voltammetry	CV	-
Steady State Current/Voltage Curves	IE	-
Multi-Cell Current/Voltage Curves	MI/E	PP
Corrosion / Polarisation Measurement	POL	-
Chronoamperometry	PVI	-
Linear Sweep Voltammetry	PVI	-
Electrochemical Noise	NOISE	Noise
CorrEINoise	NOISE	Noise
Tast Polarography	PGY	-
Differential Pulse Polarography	PGY	-
Differential Pulse Voltammetry	PGY	-
Stripping Voltammetry	PGY	-
Standard Addition Measurement & Analysis	PGY	-
Universal Measurement Data Acquisition & Control	ACQ	NET*
Universal Frequency Response Analysis	FRA	-
AC-DC-AC Tests	COLT	COLT
Layer Quality Test / Bi-Layer Test	COLT	COLT
Fast Pulse & Transient Recording	TRC	TR8M
High Current Interrupt Measurements	PULSE	HCI
Relaxation Voltammetry	RV	Noise
Controlled Intensity Modulated Photo-Spectroscopy	CIMPS	CIMPS
Programmable Procedures	SCRIPT	-

Software

Based on the approved Thales software package, ZAHNER-elektrik advances the functionality, improves the supported methods and brushes up the look and feel.

All these innovations join in Thales Z 1.0 (zennium release).

General fields of application

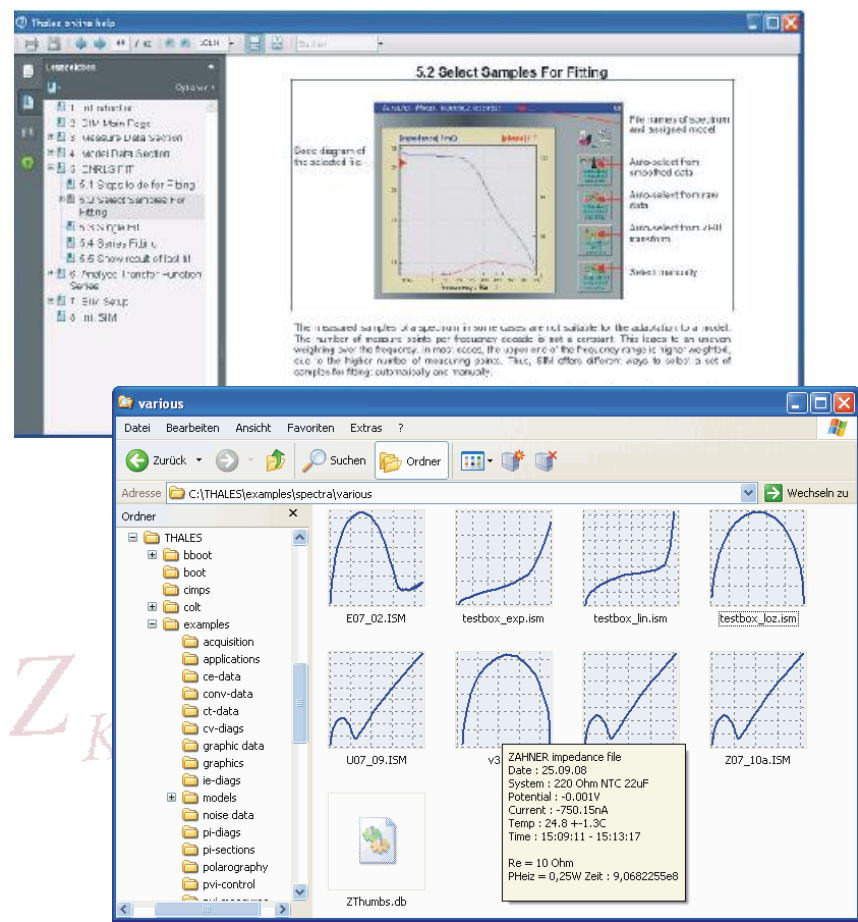
- Low impedance applications (fuel cells, batteries, super-caps)
- High impedance applications (coatings, laminates, membranes, sensors, corrosion)
- Photoelectrochemical applications (solar cells, dye-sensitized SC, photosensors)

Look & Feel

- Free scaleable application window
- Windows® tooltips
- Thalesviewer (Windows® Explorer Extensions)
- Fast online help system
- Direct access pull down menu
- Child windows for configurable online measurement display

Special Functionalities

- Fast multiple filter for impedance and photovoltage/current spectra
- Special modeling support for solar cells
- Joint multiple transfer function fitting
- SCRIPT procedures for userdefined measurement, analysis- and documentation tasks
- Remote control via LabVIEW® VI



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LabVIEW® is a registered trademark of National Instruments Corporation.