

Electrochemical Impedance Spectroscopymeter



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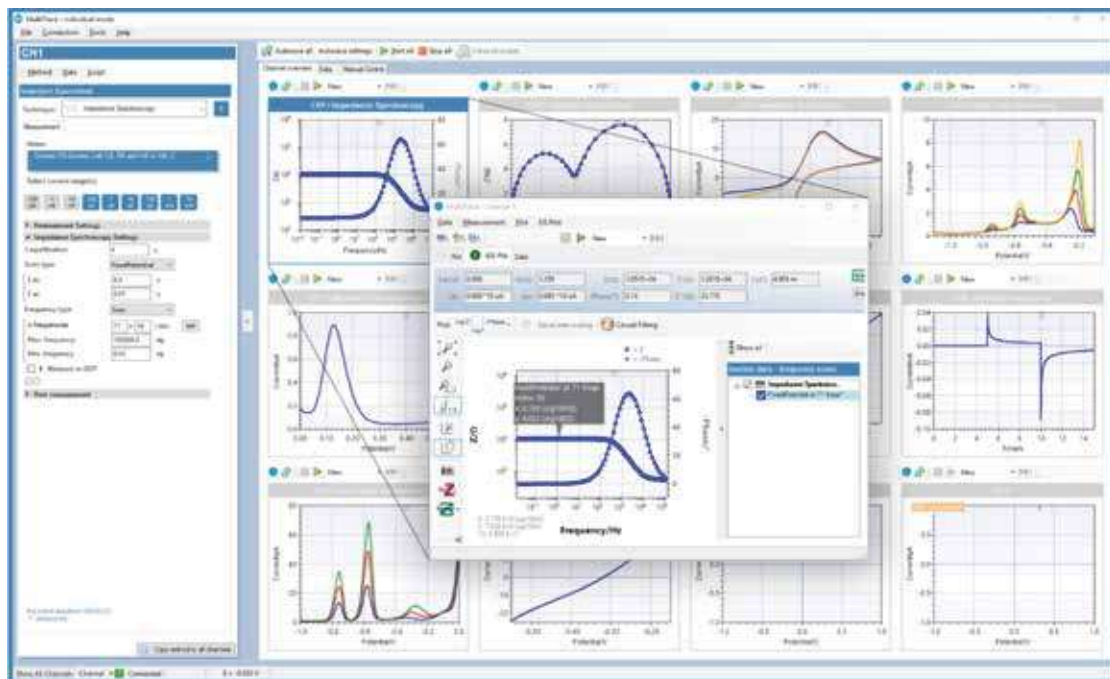
▶▶ MultiTrace: Software for Windows

MultiTrace can run in two different modes:

- **Individual Mode**, where each channel can run a measurement or script independently from the other channels
- **Simultaneous Mode**, where all channels run the same measurement.

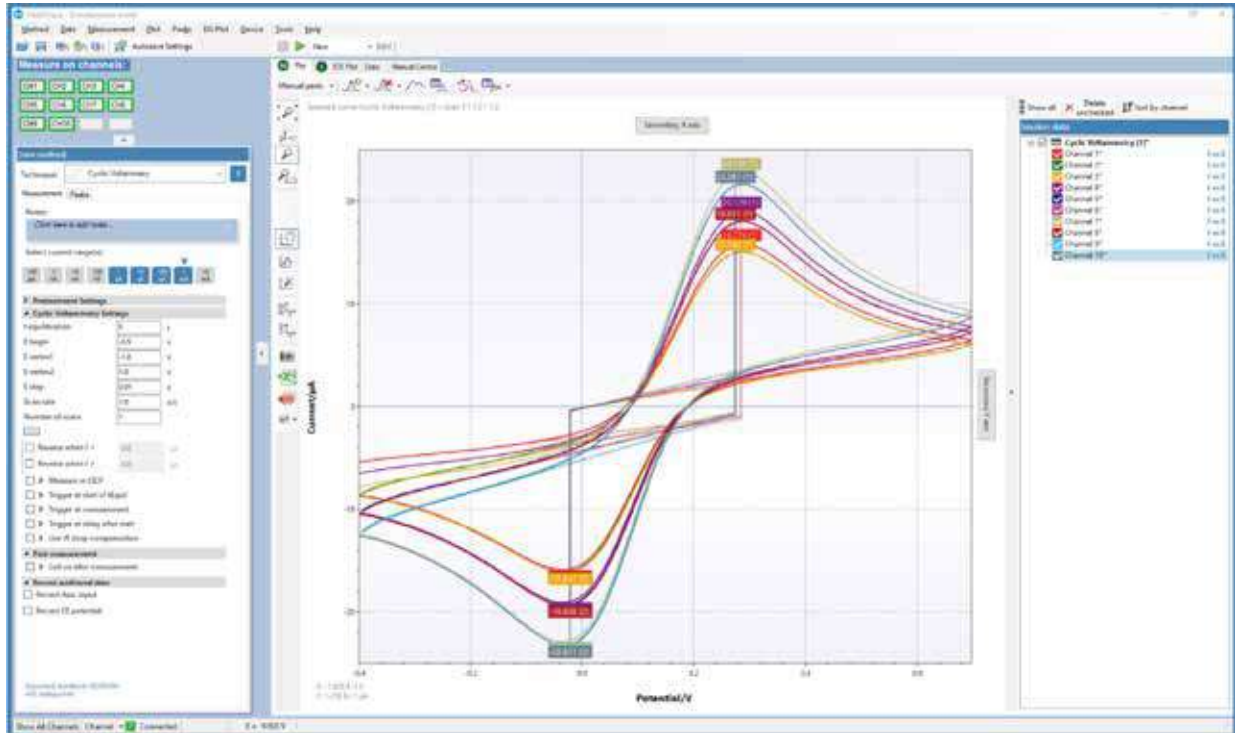
» Individual Mode

The individual mode shows an overview of all channels. Each channel can be selected separately and can run a measurement independently in parallel with the other channels. You can also run a separate script on each channel or control peripherals like a multiplexer.



» **Simultaneous Mode**

In the Simultaneous Mode the MultiPalmSens4 works with all channels running the same measurement in parallel at the same time. There is only one active method in the Method Editor which is started on all channels simultaneously upon start.



» **Measurement Specifications**

- **General pretreatment:**
Apply conditioning, deposition or initial potential for: 0 – 1600 s
- **General voltammetric parameters:**

Channel configuration (see page 2):	MPS4.F0.05 MPS4.F1.05 MPS4.F2.05	MPS4.F0.10 MPS4.F1.10 MPS4.F2.10
Potential range:	-5 V to +5 V	-10 V to +10 V
Step potential:	0.075 mV to 250 mV	0.075 mV to 250 mV
Pulse potential:	0.075 mV to 250 mV	0.075 mV to 250 mV

- Limits of some technique specific parameters for PalmSens4:

Normal Pulse and Differential Pulse Voltammetry:	Scan rate: 0.1 mV/s (75 μ V step) to 100 mV/s (5 mV step) Pulse time: 10 ms to 300 ms
Square Wave Voltammetry and AC Voltammetry:	Frequency: 1 Hz to 2000 Hz ¹
Linear Sweep and Cyclic Voltammetry:	Scan rate: 0.01 mV/s (75 μ V step) to 500 V/s (10 mV step)
Pulsed Amperometric Detection:	Interval time: 50 ms to 300 s Pulse time: 1 ms to 1 s Maximum run time: 640000 s (> 7 days at 10 s interval)
Multiple Pulse Amperometric Detection:	Pulse times: 100 ms to 2 s Run time: 10 s to 100000 s Number of potential levels: 3
ChronoAmperometry, ChronoPotentiometry and Open Circuit Potentiometry:	Interval time: 0.25 ms to 300 s Maximum run time: 1000000 s (> 10 days at 300 s interval)
Multistep Amperometry Multistep Potentiometry and Mixed Mode:	Interval time: 0.25 ms to 300 s Level switching overhead time: \pm 80 ms Number of levels: 1 to 255 Number of cycles: 1 to 20000 Maximum run time: > 1 year
Fast Amperometry:	Interval time: 0.02 ms to 1 s Maximum run time: 30 s Maximum number of points: 65000 (4000 for interval time < 0.2 ms)

►► System Channel Specifications

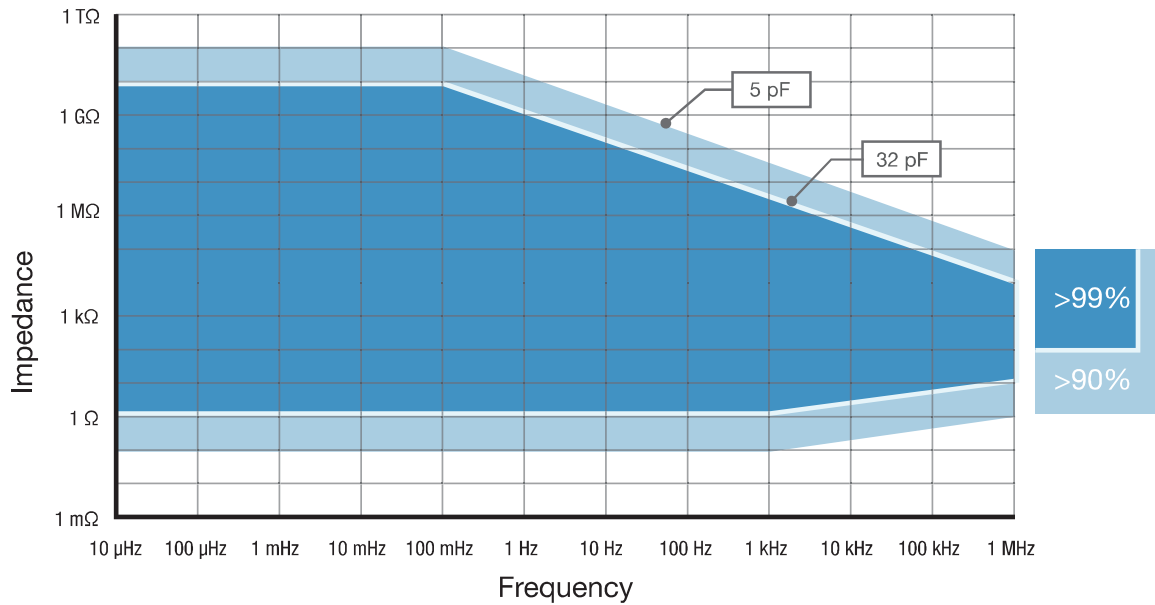
- General

dc-potential range	Channel config	MPS4.F#.05 \pm 5 V	MPS4.F#.10 \pm 10 V
compliance voltage		\pm 10 V	
maximum current		\pm 30 mA (typical)	
max. acquisition rate		150000 points/s	

- **Potentiostat (controlled potential mode)**
 - applied dc-potential resolution 75 μ V
 - applied potential accuracy $\leq 0.1\%$ ± 1 mV offset
 - current ranges 100 pA to 10 mA (9 ranges)
 - current accuracy $\leq 0.1\%$ at FSR¹
 - measured current resolution 0.006% of current range (5 fA on 100 pA range)
- **Galvanostat (controlled current mode)**
 - current ranges 1 nA to 10 mA (8 ranges)
 - applied dc-current range ± 6 times applied current range
 - applied dc-current resolution 0.005% of applied current range
 - measured dc-potential resolution 75 μ V at ± 10 V
7.5 μ V at ± 1 V
0.75 μ V at ± 0.1 V
- **FRA / Electrochemical Impedance Spectroscopy (impedance measurements)**

frequency range	Channel	MPS4.F1.##	MPS4.F2.##
	config		
		10 μ Hz to 100 kHz	10 μ Hz to 1 MHz
ac-amplitude range	1 mV to 0.25 V rms, or 0.6 V p-p		
- **Electrometer**
 - electrometer amplifier input > 1 T Ω // 10 pF
 - bandwidth 1 MHz
- **Other**
 - housing 15 x 25 x 25 cm³
 - weight +/- 4 kg
 - temperature range 0 $^{\circ}$ C to + 50 $^{\circ}$ C
 - power supply external 12 V AC/DC adapter
 - communication USB
 - internal storage space 8 GB per channel
or +/- 800000 measurements incl. method info
(assuming 200 data points per measurement)
- **Auxiliary port (D-Sub 15)**
 - analog input ± 10 V, 18 bit
 - analog output 0-10 V, 12 bit (1 kOhm output impedance)
 - 4 digital outputs 5 V
 - 1 digital input 5 V
 - I-out and E-out raw output of current and potential
E-out ± 10 V (1 kOhm output impedance)
I-out ± 6 V (1 kOhm output impedance)
 - power 5 V output (max. 150 mA)

►► **Electrochemical Impedance Spectroscopy Contour Accuracy Plot**



Note

The accuracy contour plot was determined under lab conditions and should be used for reference purposes. Please note that the true limits of an impedance measurement are influenced by all components in the system, e.g. cables, the environment, and the cell.

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 **Analytical**®
Technologies Limited

HPLC Solutions MultipleLabs Analytical Bio-Med Analytical Distributors Analytical Foundation (Trust)

Corporate & Regd. Office:
Analytical House, # E67 & E68,
Ravi Park, Vasna Road, Baroda,
Gujarat 390 015. INDIA

T: +91 265 2253620
+91 265 2252839
+91 265 2252370
F: +91 265 2254395

E: info@hplctechnologies.com
info@multiplelabs.com
info@analyticalgroup.net
info@analyticalbiomed.com

W. www.analycalgroup.net
www.hplctechnologies.com
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