PalmSens
Compact Electrochemical Interfaces

Multi Em·Stat

4, 8 or 12 channel potentiostat

v. 9-2018

Contents

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*Multi*Em|Stat

4, 8 or 12 channel potentiostat

The MultiEmStat is a versatile device with 4, 8 or 12 independent EmStat3 or EmStat3+ potentiostats, each with its own Working, Reference and Counter electrodes.

Supported Techniques

Voltammetric techniques
- Linear Sweep Voltammetry   LSV
- Differential Pulse Voltammetry   DPV
- Square Wave Voltammetry   SWV
- Normal Pulse Voltammetry   NPV
- Cyclic Voltammetry   CV

Note: these techniques can also be used for stripping voltammetry

Techniques as a function of time
- Amperometric Detection   AD
- Pulsed Amperometric Detection   PAD
- Multiple Pulse Amperometric Detection   MPAD
- Open Circuit Potentiometry   OCP
- Multistep Amperometry   MA

*4, 8 or 12 channel MultiEmStat*

4 channel MultiEmStat

Where possible, the electrochemical techniques can be applied using **auto ranging** which means that the instrument automatically sets the optimal current range. The user can specify the highest as well as lowest current range which might be selected automatically.
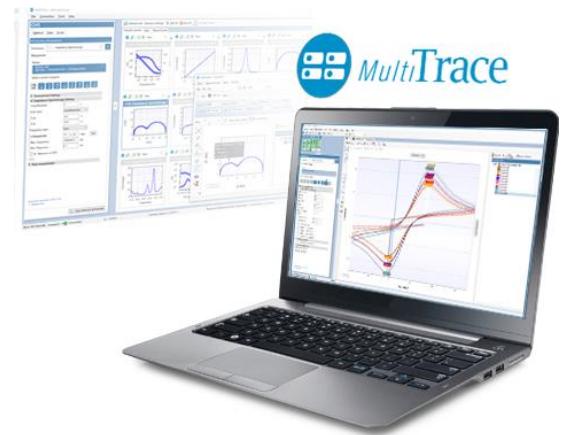
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MultiTrace software

The MultiTrace software controls the individual potentiostats of the multi-channel instruments. MultiTrace is based on the PSTrace program for the PalmSens and EmStat instruments. The software allows you to control the multi-channel potentiostat in two different modes:

Simultaneous mode

All potentiostats run the same measurement.
The measured curves are displayed in a single plot and stored in a single data file.
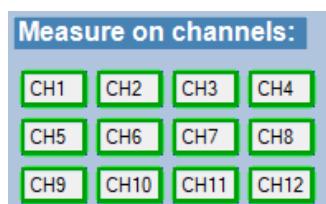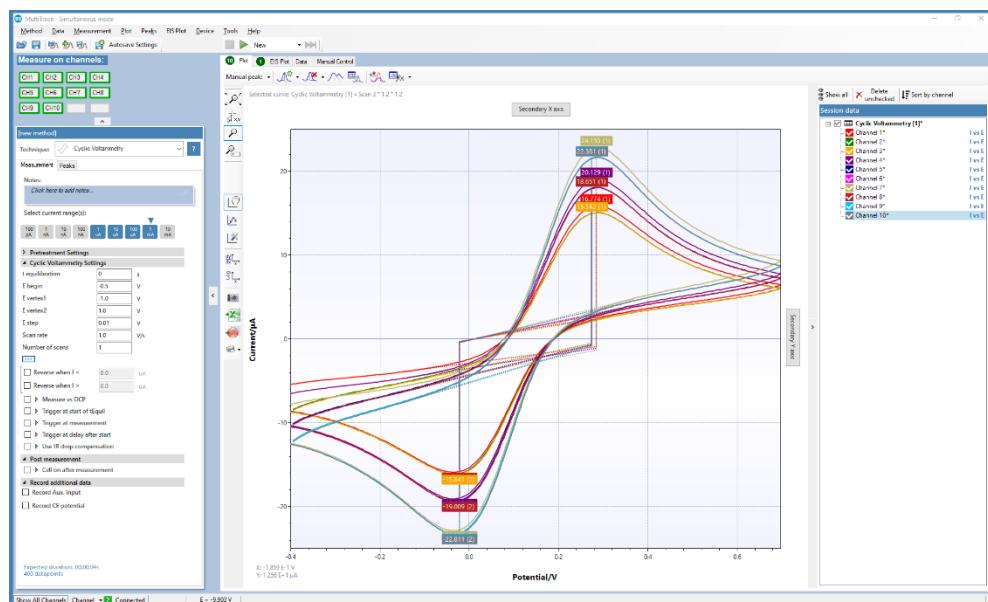
This panel gives a button for each available channel and allows channels to be left out with a measurement.

Pop-up window shown when clicking a Curve in the legend

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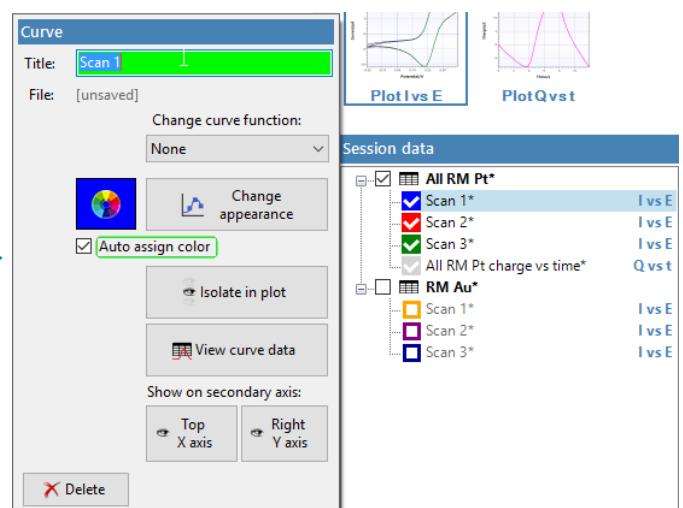
Individual mode

In this mode all potentiostats are used independently. Each measurement is started separately and the measured curve is shown in its own plot. Data files are stored separately.
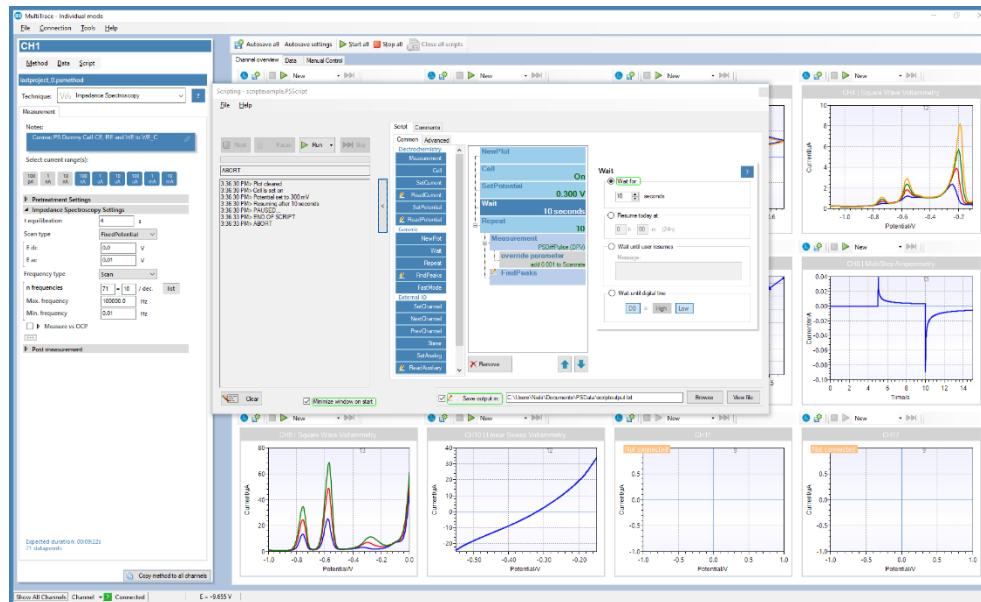
The Individual mode is for use when each channel should run a different technique or method. For example, each channel can be set up with parameters for a Differential Pulse Voltammetry method, but each with slightly different parameters.

Scripting

The individual mode also supports the option to run a sequence of measurements on a specific channel by using Scripting. Such a sequence can include different techniques and provides control commands for manual cell control or digital input or output lines[1].

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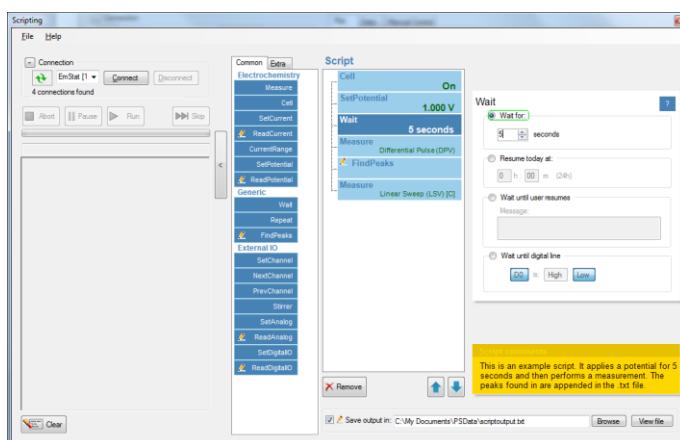
[1] Additional digital input or output lines, e.g. for stirrer control requires to be specified on ordering.

Combining different instruments

MultiTrace supports all instruments provided by PalmSens BV. A collection of different instruments can be combined for control by MultiTrace in both Individual and Simultaneous mode. Either multiple multi-channel or single channel instruments can be combined.
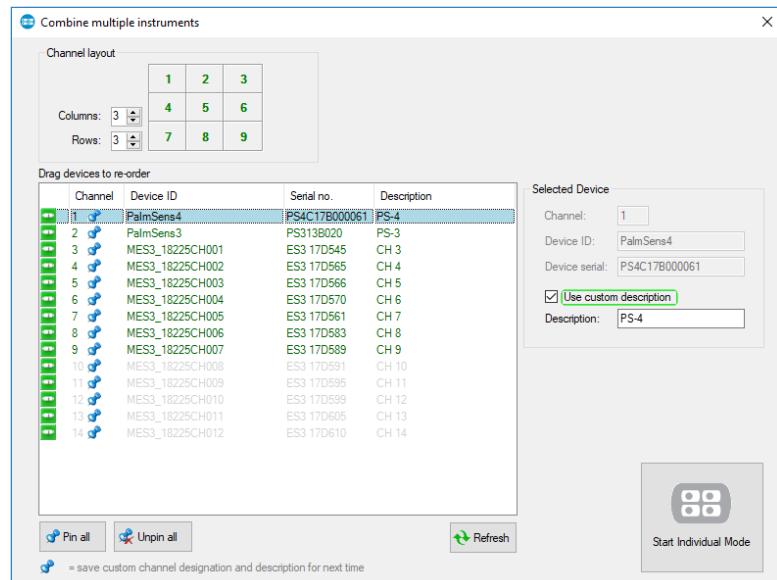
Other functions in MultiTrace

- Advanced automatic and manual peak detection
- Scripting
- Open your data in Origin and Excel with one click of a button
- Save all available curves, measurement data and methods to a single file
- Direct validation on method parameters settings
- Equivalent Circuit Fitting on EIS data

Integration with third-party software:
- Excel
- Origin
- Matlab
- ZView

System requirements

Minimum PC requirements are:
- Windows Vista, 7, 8, or 10 (32-bit or 64-bit)
- 1 GHz or faster 32-bit (x86) or 64-bit (x64) processor
- 1 GB RAM (32-bit) or 2 GB RAM (64-bit)

For more information about software visit www.palmsens.com/software

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Specifications of general parameters

General pretreatment

Apply conditioning, deposition or begin potential for: 0 – 1600 s

General voltammetric parameters

Potential range for MultiEmStat3   -3.000 V to +3.000 V
Potential range for MultiEmStat3+:   -4.000 V to +4.000 V
Step potential: 0.125 mV to 250 mV
Pulse potential: 0.125 mV to 250 mV

Limits of some technique specific parameters for MultiEmStat3 and MultiEmStat3+

NPV and DPV:	Scan rate: Pulse time:	0.025 mV/s (0.125 mV step) to 50 mV/s (5 mV step) 5 ms to 300 ms
SWV[1]:	Frequency:	1 Hz to 500 Hz [1]
LSV and CV:	Scan rate:	0.01 mV/s (0.1 mV step) to 5 V/s (5 mV step)
AD:	Interval time: Run time:	1 ms to 300 s 1 s to hours
PAD:	Interval time: Pulse time: Run time:	50 ms to 300 s 1 ms to 1 s 10 s to hours
MPAD:	Pulse times: Run time: Number of potential levels:	100 ms to 2 s 10 s to hours 3
Potentiometry at open circuit (OCP):	Interval time: Maximum run time:	1 ms to 30 s hours
Multistep Amperometry:	Interval time: Number of potential levels: Number of cycles: Maximum run time:	1 ms to 30 s 1 to 255 1 to 20000 hours

Note: some limits of parameters are set for practical reasons and can be modified on request.
[1] MultiTrace provides the option to measure forward and reverse currents separately.

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System specifications

	Multi Em Stat *3*	*Multi* Em Stat *3+*
- compliance voltage	± 5 V	± 8 V
- dc-potential range	± 3.000 V	± 4.000 V
- applied dc-potential resolution	0.1 mV	0.125 mV
- applied dc-potential accuracy	≤ 0.2 % with max 2 mV offset	≤ 0.3 % with max 3 mV offset
- current ranges	1 nA to 10 mA (8 ranges)	1 nA to 100 mA (9 ranges)
- maximum measured current	± 20 mA typical and ± 15 mA minimum	± 100 mA typical

Current is measured using a ZRA (zero resistance ammeter)

- current resolution	0.1 % of current range
	1 pA on lowest current range
- accuracy	≤ 0.5 % of current range at 10 nA and ≤ 1 % at 1 nA
	≤ 0.2 % at 100 nA to 100 uA
	≤ 0.5 % at 1 mA, 10 mA and 100 mA
	all with additional 0.2 % offset error
- electrometer amplifier input	> 100 Gohm // 4 pF
- rise time	approx. 100 µs

Housing for MultiEmStat3 - 4 channel:
- material: aluminum
- dimensions: 115 mm x 85 mm x 35 mm
- weight: +/- 260 g
- power: 5V external adapter

Housing for 8 and 12 channels:
- material: aluminum
- dimensions: 120 mm x 210 mm x 75 mm
- weight: +/- 2000 g
- power: 9V external adapter

- interfacing   USB
- sensor connection   shielded cable with circular connector for
                           WE, Sense (MultiEmStat3+ only), RE and CE.
- external I/O options[2] analog: 1 input and 1 output channel (both 0 V - 4.096 V)
                           digital: 1 input/output and 3 output lines
                           (maximum rating: -0.3 V to 5.3 V)

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[2] External I/O line do not come as standard, requires to be specified on ordering

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Options

Galvanic isolation

For each MultiEmStat galvanic isolation (G.I.) is optional. Galvanic isolation is available for the whole system where all individual channels share the same floating ground or for each channel individually where each channel has its own floating ground.

Magnetic stirrers

Each channel can be used with a magnetic stirrer for stripping voltammetry. The stirrer is controlled by means of the Switchbox.

EmStat3-4WE Polypotentiostat

The EmStat3-4WE is a versatile device with a standard EmStat3 potentiostat and additionally 1, 2, or 3 bipotentiostat modules.
The instrument is used for electrochemical systems with 1, 2, 3, or 4 working electrodes (WE1 - 4) all sharing the same counter (CE) and reference electrodes (RE) or combined CE/RE.

Please do not hesitate to contact PalmSens for more details:
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