PalmSens
Compact Electrochemical Interfaces

EmStat³4WE
polypotentiostat with up to four working electrodes

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The EmStat³ 4WE consist of a standard EmStat³ potentiostat and additonally three '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.

The embedded software of the EmStat³ instruments provides all relevant methods for electrochemical sensors.

Voltammetry

The available voltammetric methods are:
- Differential pulse voltammetry   DPV
- Normal pulse voltammetry   NPV
- Square wave voltammetry   SWV
- Linear sweep and cyclic voltammetry   LSV and CV

These methods can all be used in their stripping modes which are applied for (ultra-) trace analysis.

Amperometry

The amperometric methods are:
- Amperometric detection   AD
- Pulsed amperometric detection   PAD
- Multiple pulse amperometric detection   MPAD
- Multistep amperometry   MA
- Open Circuit Potentiometry   OCP

The additional WE's can each individually be used in two different modes:

1: The potential of the additional WE has a constant dc-potential offset with respect to WE1
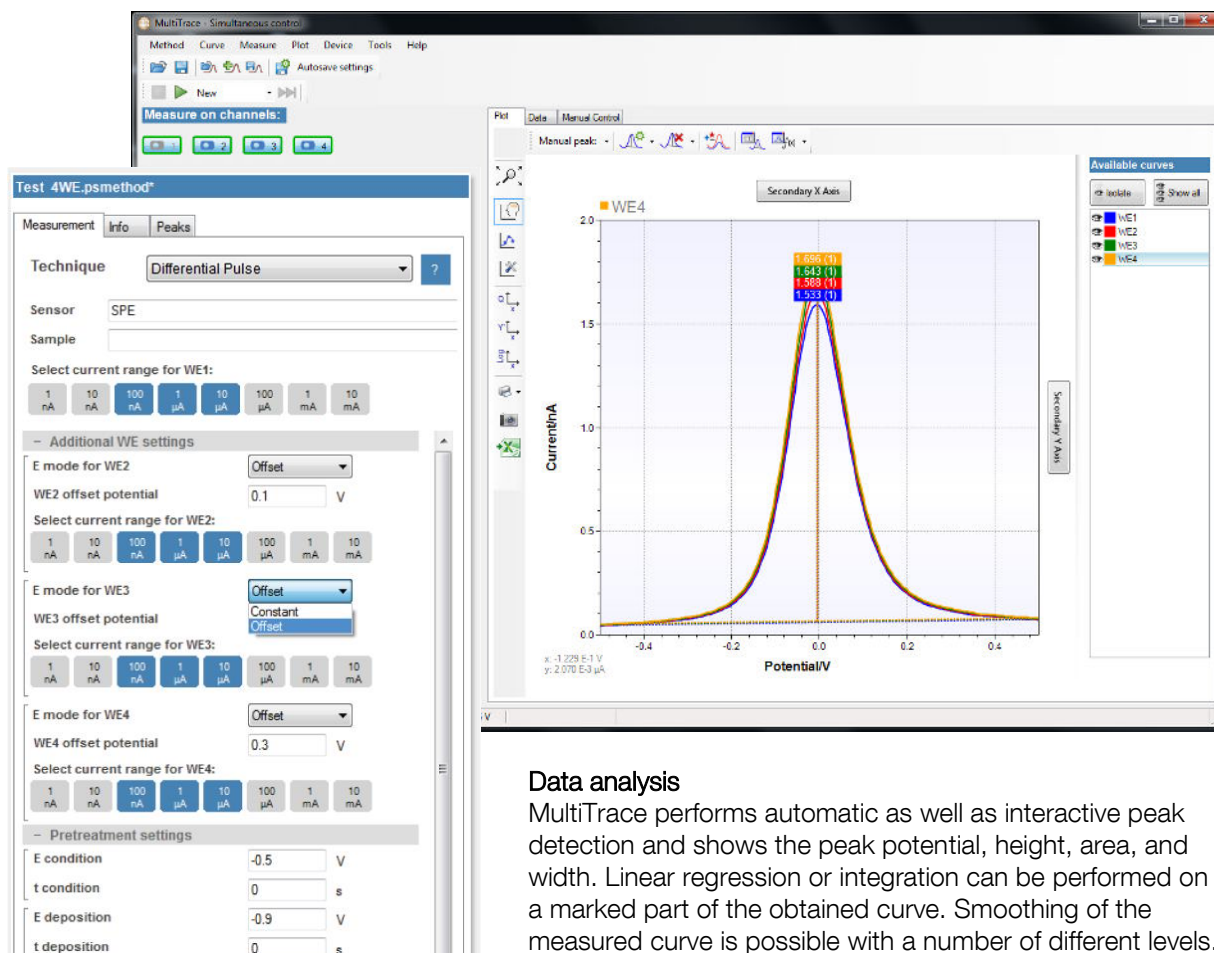2: The potential of the additional WE has an independent fixed dc-potential

Each potentiostat has eight current ranges: 1 nA to 10 mA with a resolution of 1 pA at the lowest current range and can automatically select the optimal current range.

The current is measured using a **zero resistance ammeter** (**ZRA**).

See page 4 for instrumental specifications.

MultiTrace software

The MultiTrace software controls the main potentiostat and the bipotentiostat modules. This program is based on the PSTrace software for the PalmSens and EmStat instruments.

Data analysis

MultiTrace performs automatic as well as interactive peak detection and shows the peak potential, height, area, and width. Linear regression or integration can be performed on a marked part of the obtained curve. Smoothing of the measured curve is possible with a number of different levels. Curves can be subtracted from each other or subtracted with a (non-)linear baseline.

Output

Data files can be stored (automatically) and loaded. These files are standard ASCII files and can easily be imported in other programs. With each data file a file with the method parameters is created and the user can create an additional text file (in Word format) with personal comments or information.

Excel

A data tab showing the raw measured data for each channel is available in both the simultaneous mode and the individual mode. This data can also be exported to Excel by means of a single click on the Export-to-Excel button next to the plot. A native Excel plot will be generated as well.

The manual control tab allows for controlling the cell and reading potentials and currents of each individual channel.

Specifications of general parameters

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

General voltammetric parameters:
Potential range for EmStat[3]:   -3.000 V to +3.000 V
Step potential: 0.1 mV to 250 mV
Pulse potential: 0.1 mV to 250 mV

Limits of some technique specific parameters for EmStat[3] 4WE:

NPV and DPV:	Scan rate:	0.025 mV/s (0.1 mV step) to 50 mV/s (5 mV step)
	Pulse time:	5 ms to 300 ms
SWV[1]:	Frequency:	1 Hz to 500 Hz
LSV and CV:	Scan rate:	0.01 mV/s (0.1 mV step) to 5 V/s (5 mV step)
AD:	Interval time:	1 ms to 300 s
	Run time:	1 s to > 5000 hours
PAD:	Interval time:	50 ms to 300 s
	Pulse time:	1 ms to 1 s
	Run time:	10 s to 5000 hours
MPAD:	Pulse times:	100 ms to 2 s
	Run time:	10 s to > 36 hours
	Number of potential levels:	3
Potentiometry at open circuit:	Interval time:	1 ms to 30 s
	Run time:	> 500 hours
Multistep Amperometry:	Interval time:	1 ms to 300 s
	Number of potential levels:	1 to 255
	Number of cycles:	1 to 20000
	Maximum number of points:	200000
	Run time:	>180 days

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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Instrumental specifications

Specifications of the main potentiostat:
- dc-potential range   ± 3.000 V
- compliance voltage   ± 5 V
- dc-potential resolution   0.1 mV
- max. dc-offset error   2 mV
- accuracy   ≤ 0.2 %
- current ranges   1 nA to 10 mA (8 ranges)
- maximum current   ± 20 mA typical and ± 15 mA minimum for the sum of WE1, WE2, WE3, and WE4
- 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
     all with additional 0.2 % offset error
- electrometer amplifier input   > 100 Gohm // 4 pF
- rise time   approx. 100 µs
- sensor connection shielded cable with circular connector for WE1, CE and RE

Specifications of the additional three polypotentiostat modules:
- dc-potential offset range   ± 3.000 V
- dc-potential resolution   0.1 mV
- max. dc-offset error   3 mV
- accuracy   ≤ 0.2 %
- current ranges   1 nA to 10 mA (8 ranges)
- maximum current   ± 20 mA typical and ± 15 mA minimum for the sum of WE1, WE2, WE3, and WE4
- 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- sensor connection shielded cable with circular connector for WE1, CE, and RE

Note: The sensor connection can also be made for specific sensorarray geometries.

Housing:
- dimensions   120 mm x 85 mm x 35 mm
- weight   250 g
- power   5 V external power supply (included)
- interfacing   USB

PC recommendations: - Windows XP, Vista, 7 or 8 (32-bit or 64-bit)
     - 1 gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor
     - 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)

Please contact PalmSens BV for more details or if case **customization** is required:
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