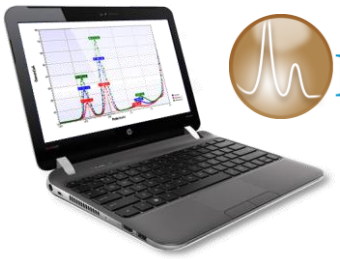
PalmSens

Compact Electrochemical Interfaces

EmStat *MUX8* and *MUX16*

USB potentiostat with multiplexer

Rev. 3-2014



PSTrace

EmStat *MUX8* and *MUX16*

USB potentiostat with integrated multiplexer

The EmStat MUX8 and EmStat MUX16 are the smallest integrated potentiostat and multiplexer available.
The potentiostat is the standard EmStat device, which provides most of the relevant electroanalytical measurement techniques and is controlled by means of a single USB connection.

PSTrace for Windows provides all requirements for using EmStat MUX.

EmStat MUX8:
The MUX8 multiplexer allows users to connect up to eight electrochemical cells or sensors to the EmStat potentiostat. This multiplexer can be used with different electrode or sensor configurations:

1 Eight separate cell or sensors each with a working, reference and counter electrode
2 Eight separate cell or sensors each with a working and combined reference and counter electrode
3 Cell or sensor array with eight working electrodes sharing one reference and one counter electrode
4 Cell or sensor array with eight working electrodes sharing one combined reference/counter electrode

In all configurations the cells can be multiplexed, leaving the non-selected cells or sensors at open circuit.
Configurations 2, 3 and 4 also have the possibility to apply the specified potential to all cells or sensors continuously.

EmStat MUX16:
The MUX multiplexer allows users to connect up to sixteen working electrodes to the EmStat potentiostat. This multiplexer can be used with different electrode or sensor configurations:

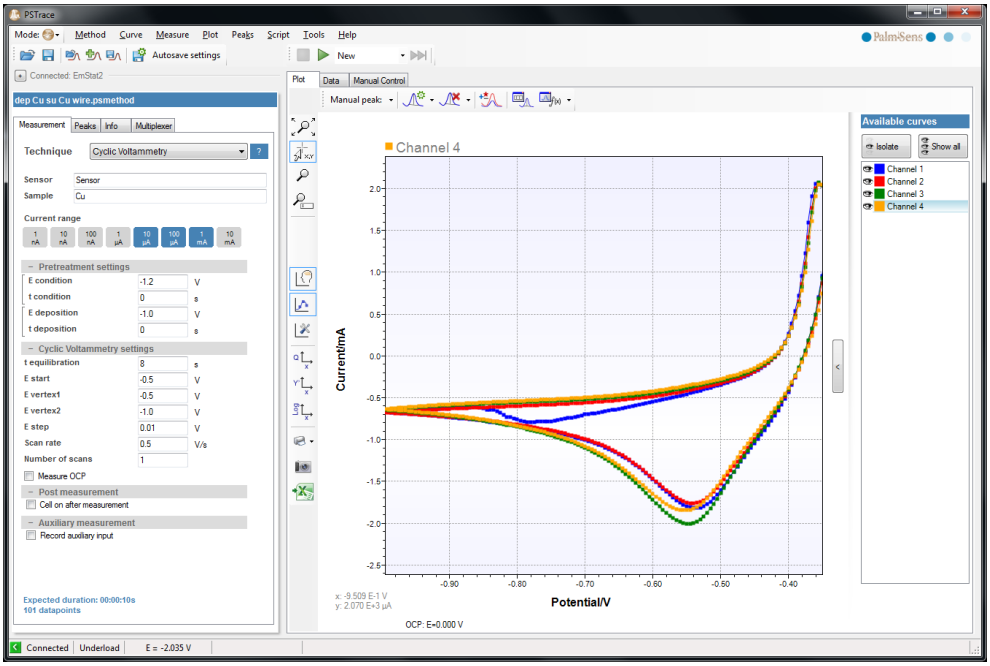
1 Sixteen separate cells or sensors each with a working and combined reference and counter electrode
2 Cell or sensor array with sixteen working electrodes sharing one reference and one counter electrode
3 Cell or sensor array with sixteen working electrodes all sharing one combined reference/counter electrode

In all configurations the electrodes can be multiplexed, leaving the non-selected electrodes at open circuit or having the potential applied to all working electrodes continuously.
The configuration is set by means of some jumpers on the board of the instrument. The user guide explains the jumper settings.

PSTrace main features

Multiplexer support

PSTrace supports use of the multiplexers (MUX8 and MUX16) for EmStat. Voltammetric scans can be measured on all 16 or 8 channels consecutively and stored in a single data file. Amperometric detection can be done simultaneously on all channels, with a minimum interval time of 0.25 s (MUX8) or 0.5 s (MUX16).



PSTrace in Scientific mode (default)

Data analysis

PSTrace 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

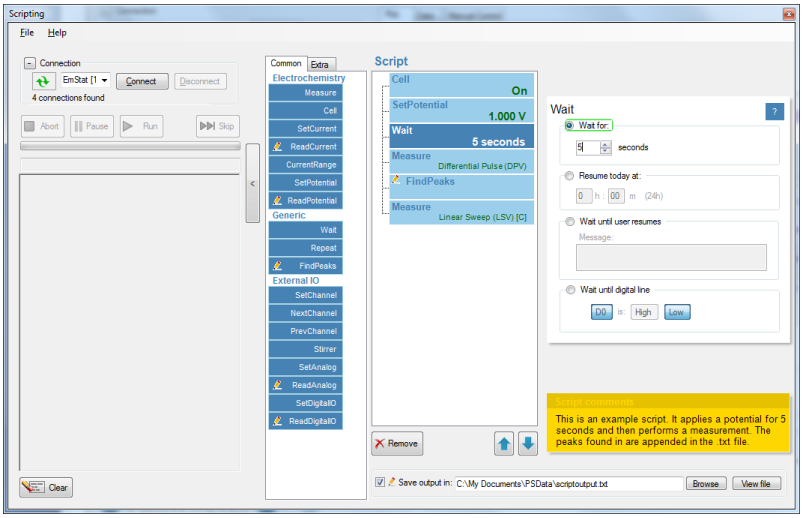
Data files can be stored (automatically) and loaded. These files are standard ASCII files and can easily be imported in other programs. With each data file a file with the method parameters is created and the user can create an additional text file (in Word format) with personal comments or information.

Excel

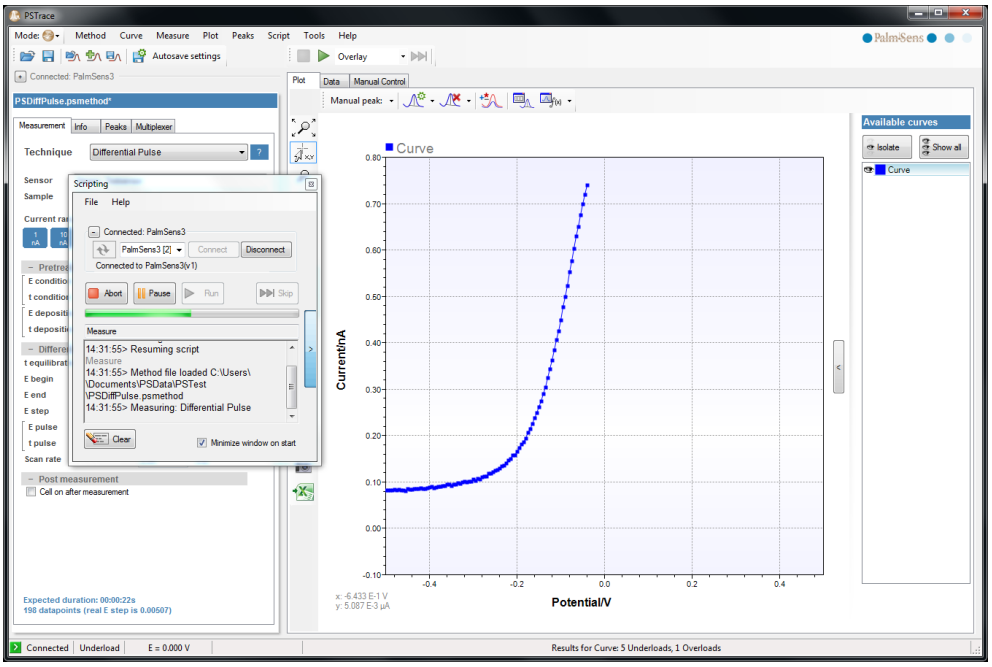
With one click of a button the measured curves are exported from PSTrace to Excel and converted to a (Excel native) graph object.

Scripting

PSTrace allows users to program a sequence of measurements by using Scripting. Such a sequence can include different techniques and provides **control commands for the multiplexer** as well as for the digital and analog input or output lines.



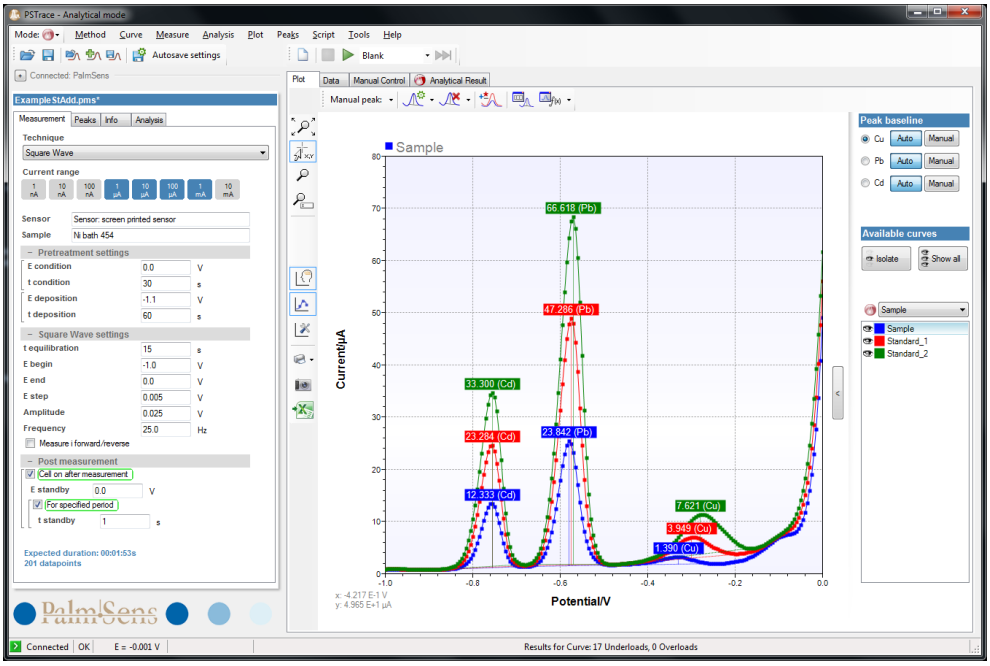
The script output and progress are shown during the run.



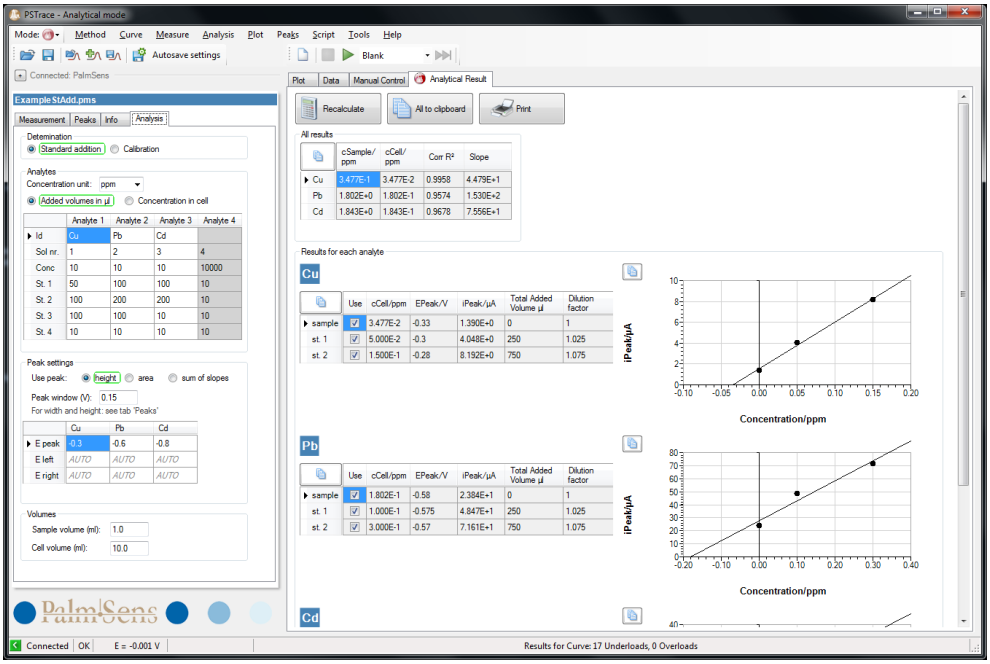
Output of the script is saved as curve files other readings or peak information is appended to a plain text file. A script can also be run directly from command prompt, making it easy to start a script from within a third party interface.

Analytical mode for quantitative analytical determinations

The Analytical mode provides the possibility to perform quantitative voltammetric analysis by means of standard addition or using a calibration curve by means of (stripping) voltammetry.



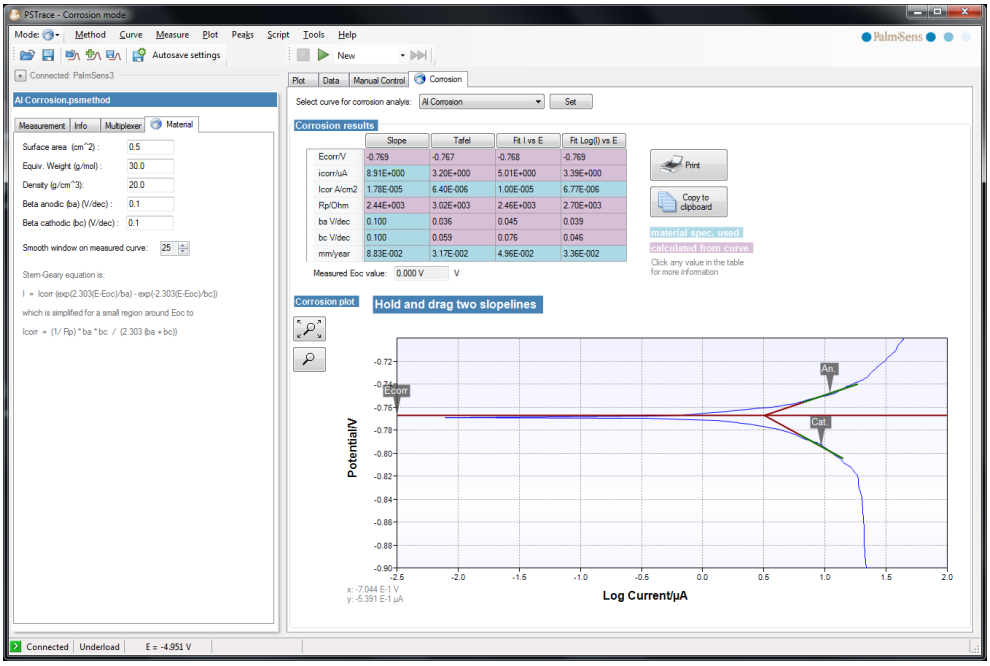
The program allows simultaneous determination of up to 4 components and with up to 4 standard additions or calibration curves. Background subtraction is also supported.



The plots and tables show the results of the voltammetric analysis.

Corrosion mode

The corrosion mode of PSTrace provides corrosion relevant data analysis:
- Linear polarization, from which the polarization resistance is obtained,
- Tafel plots, from which the corrosion rate is obtained.



The corrosion rate or polarization resistance can be obtained from the measured curve by means of drawing straight lines specified by the user or by means of a numerical fit method of the corrosion parameters using the theoretical Stern-Geary equation.

Specifications of general parameters

General pretreatment:

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

General voltammetric parameters:
Step potential: 0.1 mV to 250 mV
Pulse potential: 1 mV to 250 mV

For EmStat^2 the potential range is -2.000 V to +2.000 V
For EmStat^3 the potential range is -3.000 V to +3.000 V

Limits of some technique specific parameters for EmStat:

NPV and DPV:	Scan rate: Pulse time:	0.2 mV/s (1mV step) to 50 mV/s (5 mV step) 10 ms to 300 ms
SWV:	Frequency:	1 Hz to 250 Hz
LSV and CV:	Scan rate:	0.02 mV/s (0.1 mV step) to 5 V/s (5 mV step)
AD:	Interval time: Run time:	1 ms to 300 s 10 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: Maximum number of points:	100 ms to 2 s 10 s to 100000 s 3 65000
Potentiometry at open circuit:	Interval time: Maximum run time:	10 ms to 30 s 100000 s
Multistep Amperometry:	Interval time: Number of potential levels: Number of cycles: Maximum number of points:	100 ms to 30 s 1 to 255 1 to 20000 200000

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

EmStat *MUX8* and *MUX16*

Instrumental specifications

EmStat potentiostat:

- dc-potential range	EmStat^2: ± 2.000 V EmStat^3: ± 3.000 V
- compliance voltage	± 5.0 V
- dc-potential resolution	EmStat^2: 1 mV EmStat^3: 0.1 mV
- max. dc-offset error	2 mV
- accuracy	≤ 0.2 %
- current ranges	1 nA to 100 µA (6 ranges) using a ZRA (zero resistance ammeter)
- maximum output current	± 20 mA typical
- current resolution	0.1 % of current range 1 pA on lowest current range
- accuracy	≤ 0.2 % of current range at 100 nA to 100 µA ≤ 0.5 % at 10 nA and ≤ 1 % at 1 nA all with additional 0.2 % offset error
- electrometer amplifier input	> 100 Gohm // 4 pF
- rise time	approx. 200 µs
- sensor connection	shielded cable with circular connector

MUX8 multiplexer:

- number of channels	2 - 8
- multiplexer	switches 8 x (WE, CE and RE)
- on resistance	2 ohm typical
- charge injection	1 pC typical
- leakage current	10 pA typical at 25 °C
- cable	shielded flat cable for 8 x WE, 8 x CE and 8 x RE or optionally the MUX8 Terminal Block with screw terminals. - 8 x WE - 8 x RE - 8 x CE - 1 x CE-Direct, used when all WE's share one counter electrode - 1 x RE-Direct, used when all WE's share one reference electrode

MUX16 multiplexer:

- number of channels	2 - 16
- multiplexer	16 x WE only, CE and RE are not switched
- on resistance	2 ohm typical
- charge injection	1 pC typical
- leakage current	10 pA typical at 25 °C
- cable	shielded flat cable for 16 x WE, 1 x CE and 1 x RE or optionally the MUX16 Terminal Block with screw terminals. - 16 x WE - 1 x CE-Direct - 1 x RE-Direct

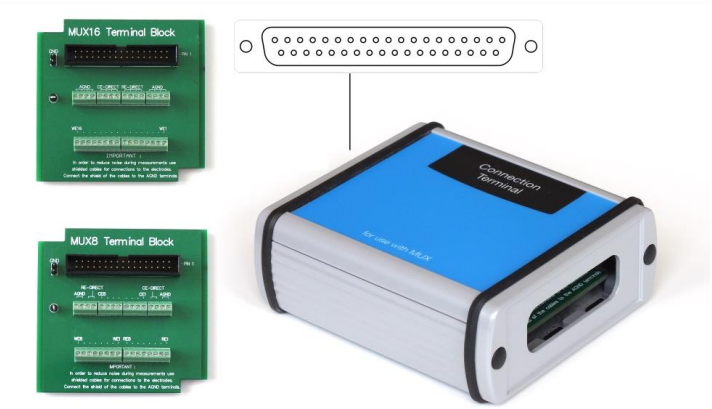
General:

- interfacing	USB
- power	5 V and 60 to 100 mA max. from USB connector
- dimensions	8.9 cm x 3.5 cm x 8.5 cm
- weight	0.3 kg

Note:
EmStat boards are also available as OEM product for integration in other instruments.

Optional Connection Terminal

The optional Connection Terminal is an easy to handle PCB to manage your own cable connections. The connection PCB comes in a grounded metal housing.



The Connection Terminal can be connected to the EmStatMUX8 or EmStatMUX16 via a D-Sub cable or the two devices can be directly joined together via their D-Sub connectors.

The Connection Terminal is also available equipped with 8 sensor cables for use with the EmStatMUX8:

Please do not hesitate to contact PalmSens for more details:
info@palmsens.com

PalmSens BV
The Netherlands
www.palmsens.com

DISCLAIMER

Changes in specifications and typing errors preserved. Every effort has been made to ensure the accuracy of this description. However no rights can be claimed by the contents of this description.