

# EMSTAT 4T™

programmable  
potentiostat / galvanostat / impedance analyzer  
with touchscreen



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➤ See for more information:  
[www.palmsens.com/emstat4t](http://www.palmsens.com/emstat4t)

## Potentiostat with a programmable touchscreen

The EmStat4T is a programmable handheld potentiostat with a touchscreen, which is ideal for sensor research and sensor-based applications. It offers two main modes of operation:

1. **Remote Control:** where it functions as a conventional potentiostat, controlled directly by our PStouch software for Windows or PStouch app for Android. These applications allow you to run measurements, view results, and perform data analysis.
2. **Standalone:** where the instrument is controlled via its touch interface to run a wizard-style app for electrochemical analysis. Compose custom apps easily using the Visual MethodSCRIPT Editor included in PStouch for Windows. Apps eliminate the need for a computer, tablet, or smartphone. This makes the EmStat4T an ideal solution for point-of-care applications and field research such as environmental analysis or corrosion monitoring.

## Main Features



Main Specifications	
potential range	±3 V
compliance voltage	±5 V
current ranges	1 nA to 10 mA (8 ranges)
max. current	±30 mA
electrode connections (SNS module)	WE, RE, CE, and GND 2 mm banana pins

## Ideal for sensor applications

The Cell Connection Module at the front can be exchanged by the user. This allows you to transform your lab instrument with cell cable to a cable-less solution for use in the field. The EmStat4T is supplied with either the SNS Connection Module for use with the standard 1-meter cell cable, or with the SPE Connection Module designed for use with most common screen-printed electrodes.



SPE Connection Module	
sensor pitch	2.54 mm
electrode connections	RE, WE, CE
allowed sensor thickness	Between 0.1 mm and 0.8 mm
maximum sensor width	10 mm

See section *System Specifications* on page 8 for more detailed specifications.

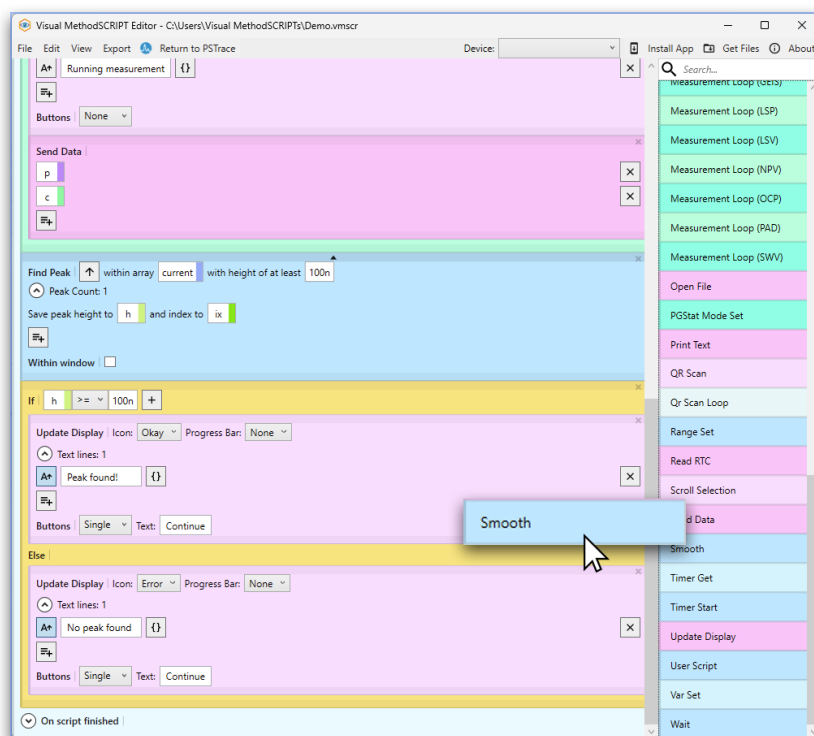
## Integrated QR and barcode scanner

The integrated QR and barcode scanner is ideal for linking metadata to your sample, such as a sample ID or tracking code. It can also provide the EmStat4T and any apps running on it with sensor-specific information, including sensor type, shelf life, and calibration data. The advanced imaging engine supports a broad array of 1D and 2D barcode formats, offering precision down to 0.1 mm (4 mil) and a reliable depth of field up to 400 mm for seamless scanning in mobile, point-of-care, or custom OEM-integrated setups.



## Create your EmStat4T apps

The powerful MethodSCRIPT™ language allows for easily creating your own applications to run on the EmStat4T. Compose apps using our Visual MethodSCRIPT Editor which generates the MethodSCRIPT for you.

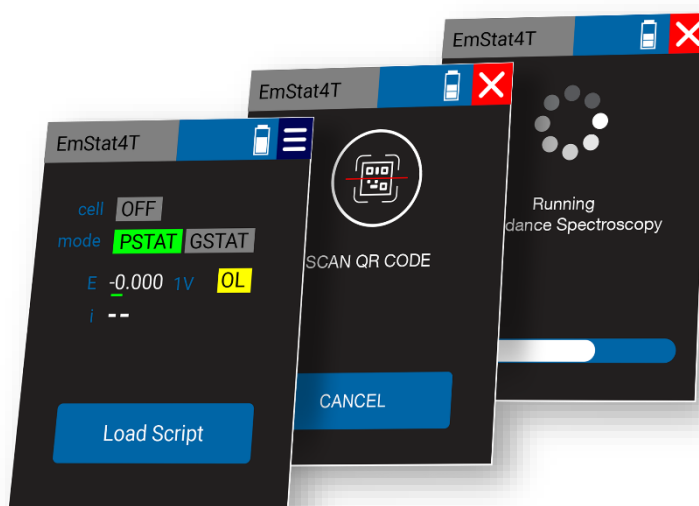


**MethodSCRIPT™**  
by PalmSens

Create your own EmStat4T app by dragging and dropping commands to your script.

MethodSCRIPT™ allows for:

- running electrochemical techniques
- controlling the displaying and buttons
- using variables, loops, conditions, limits
- data analysis, smoothing, and peak search
- scanning and parsing QR codes
- storing data
- and much more



## Supported Techniques

The EmStat4T supports the following electrochemical techniques.

### Voltammetric techniques

- Linear Sweep Voltammetry LSV
- Cyclic Voltammetry CV
- Fast Cyclic Voltammetry FCV
- AC Voltammetry ACV

### Pulsed techniques

- Differential Pulse Voltammetry DPV
- Square Wave Voltammetry SWV
- Normal Pulse Voltammetry NPV

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

### Amperometric techniques

- Chronoamperometry CA
- Zero Resistance Amperometry ZRA
- Chronocoulometry CC
- MultiStep Amperometry MA
- Fast Amperometry FAM
- Pulsed Amperometric Detection PAD

### Galvanostatic techniques

- Linear Sweep Potentiometry LSP
- Chronopotentiometry CP
- MultiStep Potentiometry MP
- Open Circuit Potentiometry OCP

### Impedimetric techniques

- Potentiostatic/Galvanostatic Impedance spectroscopy at fixed frequency or frequency scan vs
  - fixed potential or fixed current
  - scanning potential or scanning current
  - time
 EIS/GEIS
- Fast EIS/GEIS Very low interval fixed-frequency measurements FEIS/FGEIS

### Other

- Mixed Mode MM
- Custom techniques (MethodSCRIPT) MS

MethodSCRIPT™ allows for developing custom techniques.



MethodSCRIPT™  
by PalmSens

## Measurement Specifications

The following table shows limits for some technique-specific parameters.

	Parameter	Min	Max
All techniques (unless otherwise specified)	conditioning time	0	4000 s
	deposition time	0	4000 s
	equilibration time	0	4000 s
	step potential	0.100 mV	250 mV
	N data points	3	1 000 000
• NPV • DPV	scan rate	0.1 mV/s (100 $\mu$ V step)	1 V/s (5 mV step)
	pulse time	0.4 ms	300 ms
• SWV	frequency	1 Hz	1250 Hz
• LSV • CV	scan rate	0.01 mV/s (100 $\mu$ V step)	500 V/s (200 mV step)
• FCV	scan rate	0.1 mV/s (100 $\mu$ V step)	500 V/s (50 mV step)
	N averaged scans	1	65535
	N equil. scans	0	65535
• PAD	interval time	50 ms	4294 s
	pulse time	1 ms	1 s
	N data points	3	1 000 000 (> 100 days at 10 s interval)
• CA • CP • OCP	interval time	0.4 ms	4294 s
	run time	1 ms	> year
• MM • MA • MP	N cycles	1	20000
	N levels	1	255
	level switching overhead time	~1 ms (typical)	N/A
	interval time	0.4 ms	4294 s
• FAM	interval time	1 $\mu$ s	60 s
	run time	3 $\mu$ s	34 days (60 s interval) 50 ms (1 $\mu$ s interval)
	N data points	3	50000
• Fast EIS	interval time between points at fixed frequency	~1 ms (typical)	N/A

## System Specifications

General	
dc-potential range	$\pm 3$ V
compliance voltage	$\pm 5$ V
maximum current	$\pm 30$ mA
max. data acquisition rate	1M points/s
control loop bandwidth (stability setting)	32 Hz, 320 Hz, 3.2 kHz, 30 kHz, or 570 kHz
current follower bandwidth	23 Hz in 1 nA and 10 nA range 2.3 kHz in 100 nA and 1 $\mu$ A range 230 kHz in 10 $\mu$ A and 100 $\mu$ A range > 500 kHz in ranges 1 mA and higher

Potentiostat (controlled potential mode)	
applied potential resolution	100 $\mu$ V
applied potential accuracy	$\leq 0.2\% \pm 1$ mV offset
current ranges	1 nA to 10 mA (8 ranges)
measured current resolution	0.009% of range (92 fA on 1 nA range)
measured current accuracy	< 0.2% of current $\pm 20$ pA $\pm 0.2\%$ of range

Galvanostat (controlled current mode)	
current ranges	10 nA, 1 $\mu$ A, 100 $\mu$ A, 10 mA (4 ranges)
applied dc-current	$\pm 3$ * range
applied dc-current resolution	0.01% of range
applied dc-current accuracy	< 0.4% of current $\pm 20$ pA $\pm 0.2\%$ of range
potential ranges	50 mV, 100 mV, 200 mV, 500 mV, 1 V
measured dc-potential resolution	96 $\mu$ V at $\pm 3$ V (1 V range) 48 $\mu$ V at $\pm 1.5$ V (500 mV) 19.2 $\mu$ V at $\pm 0.6$ V (200 mV) 9.6 $\mu$ V at $\pm 0.3$ V (100 mV) 4.8 $\mu$ V at $\pm 0.150$ V (50 mV)
measured dc-potential accuracy	$\leq 0.2\%$ potential, $\pm 1$ mV offset

## Optional: FRA / EIS (impedance measurements)

frequency range	10 $\mu$ Hz to 200 kHz
ac-amplitude range	1 mV to 900 mV rms, or 2.5 V p-p

## Optional: GEIS (galvanostatic impedance measurements)

frequency range	10 $\mu$ Hz to 100 kHz
applied amplitude	0.002 $\times$ current range to 0.9 $\times$ current range (rms)

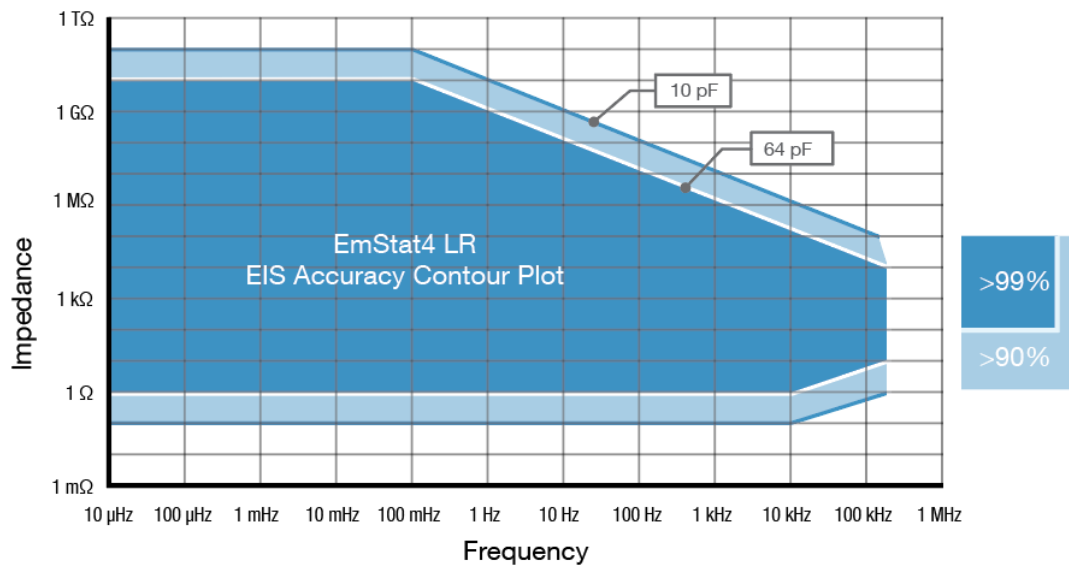
## Electrometer

electrometer amplifier input	$> 1 \text{ T}\Omega // 10 \text{ pF}$
bandwidth	500 kHz

## Other

communication	USB-C or wireless
housing	aluminium body only: 13 x 6.2 x 3.3 cm <sup>3</sup>
weight	~400 g
power source	USB-C or internal LiPo battery
battery	11.1 Wh capacity 80% charge in 2.5 hours, full charge in 3 hours
battery life	~8.5 h idle ~8 h continuous measurements $< 1 \text{ mA}$ ~5.5 h continuous measurement at max. output user configurable auto shutdown time is supported to preserve battery life
internal storage space	500 MB, equivalent to $>15\text{M}$ datapoints or ~1000 measurement files (whichever comes first)
barcode scanner	Integrated 1D/2D imaging engine; supports 22 major formats (including QR Code, Data Matrix, PDF417, and Code 39) with optical precision down to 0.1 mm (4 mil) and a depth of field up to 400 mm (visit the EmStat4T product webpage for full specifications).
digital and analog options for extension module	5 GPIO pins, I <sup>2</sup> C, analog input, 3.3 V and 5 V outputs

## EmStat4T EIS Accuracy Contour Plot



### Note

The accuracy contour plots were determined with an ac-amplitude of  $\leq 10$  mV rms for all limits, except for the high impedance limit, which was determined using an ac-amplitude of 250 mV. The standard 1-meter cell cables were used. Please note that the true limits of an impedance measurement are influenced by all components in the system, e.g. connections, the environment, and the cell.

## Standard EmStat4T Kit

The EmStat4T kit comes with:

- Soft-shell case
- EmStat4T SNS or SPE
- USB-C cable
- Dummy Cell

Also included:

- PStTrace software for Windows (on USB drive)
- Manual (hardcopy)
- Quick Start document
- Calibration report

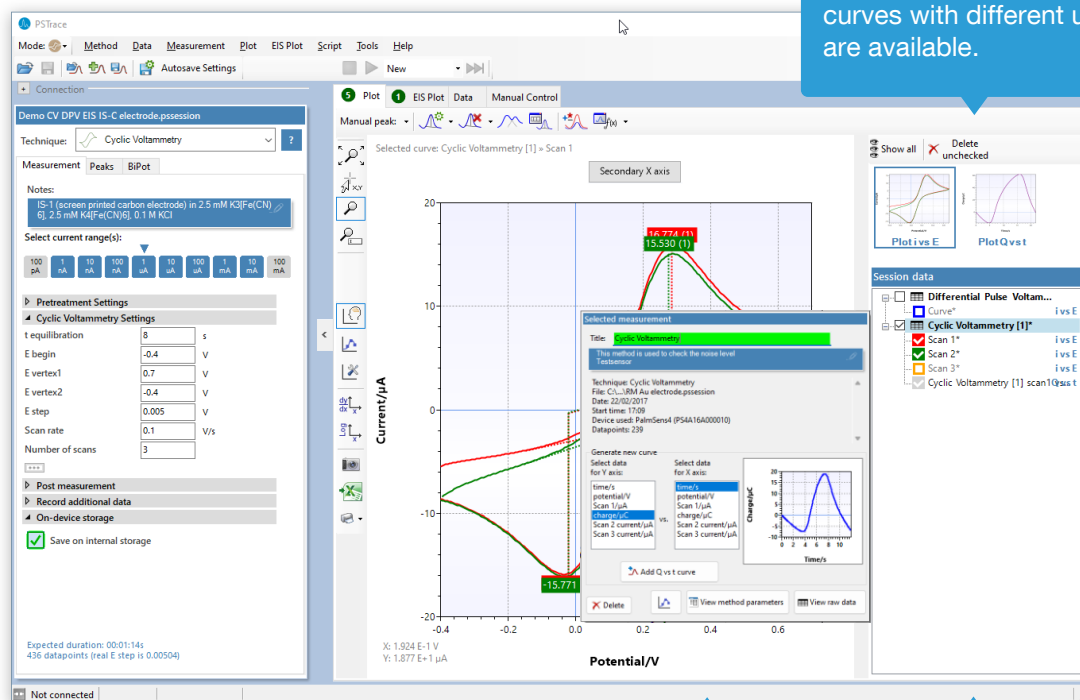


## PSTrace software for Windows

The EmStat4T operates seamlessly with PSTrace, a free software compatible with all our potentiostats. Additionally, all future updates are provided at no cost.

PSTrace is designed to get the most out of your instrument right after installation, without going through a long learning period. It has three modes:

1. **Scientific mode**, which allows you to run all the techniques our instruments have to offer;
2. **Corrosion mode**, suitable for corrosion analysis with corrosionists terminology and specific curve operations;
3. **Analytical mode**, designed for use with (bio)sensors and allows you to do concentration determinations.



Switch between plots if curves with different units are available.

Setup your measurement easily and get immediate feedback on validity of parameters.

Click on a measurement for detailed information or generating new curves.

Quickly toggle the visibility of curves or groups of curves.

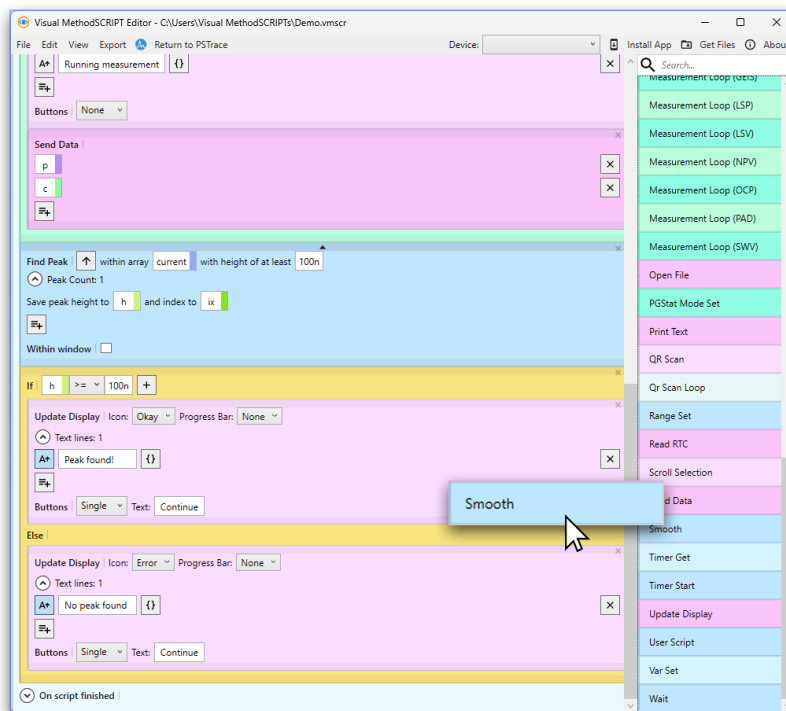
## Integration with third-party software

Export your measurement data easily to:

- Excel
- Origin
- Matlab
- ZView



## Visual MethodSCRIPT Editor

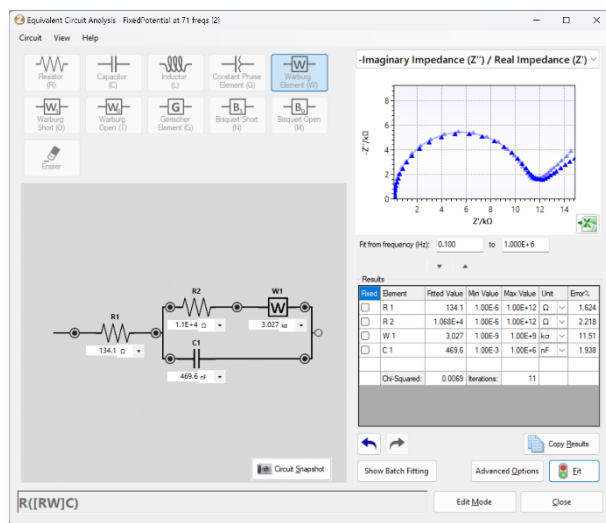


### Visual MethodSCRIPT Editor

Create your own EmStat4T app easily by dragging and dropping commands to your script in the Visual MethodSCRIPT Editor.

### Equivalent Circuit Fitting on EIS data

Use the graphical editor to draw the equivalent circuit or enter the CDC directly.



### Other PSTrace features

- Concentration determination
- Advanced peak search algorithms
- Corrosion mode
- 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
- Load measurements from the internal storage

### Minimum System Requirements

- Windows 10 or 11
- 1 GHz or faster 64-bit (x64) processor
- 4 GB RAM
- Screen resolution of 1280 x 800 pixels

➤ See for more information:  
[www.palmsens.com/pstrace](http://www.palmsens.com/pstrace)

## Integrate Electrochemistry into Your Own Applications

### Seamless Instrument Control

- Access all PalmSens potentiostats (single- and multi-channel) through our SDKs.
- Full control of measurement techniques, data acquisition, and real-time analysis.

### Cross-Platform Support

- **Python SDK**  
Script and automate experiments across platforms.
- **Windows .NET SDK**  
Easily integrate in C#, VB.NET, or any .NET language.
- **Android & iOS SDKs**  
Build mobile apps to run PalmSens instruments in the field.
- **LabVIEW & MATLAB examples**  
Quick start for engineers and researchers.



### Accelerate Development

- Pre-built code sample
- Clear documentation & active support
- Sample apps to get started within minutes



PalmSens SDKs  
put you in control  
from the lab to the field



MATLAB



LabVIEW



➤ See for more information:  
[www.palmsens.com/dev](http://www.palmsens.com/dev)

## Options for OEM

The EmStat4T can be customized and rebranded for use with your application or product.



Contact us for more information:  
[info@palmstens.com](mailto:info@palmstens.com)

PalmSens BV has more than 50 distributors around the world.  
Please contact us at [info@palmstens.com](mailto:info@palmstens.com) or go to our website to  
get in touch with a distributor in your region.



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