EMSTAT 4T™

programmable
potentiostat / galvanostat / impedance analyzer
with touchscreen

PalmSens

Rev. 8-2025-002

Contents

› See for more information:
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 PSTrace 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 PSTrace 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

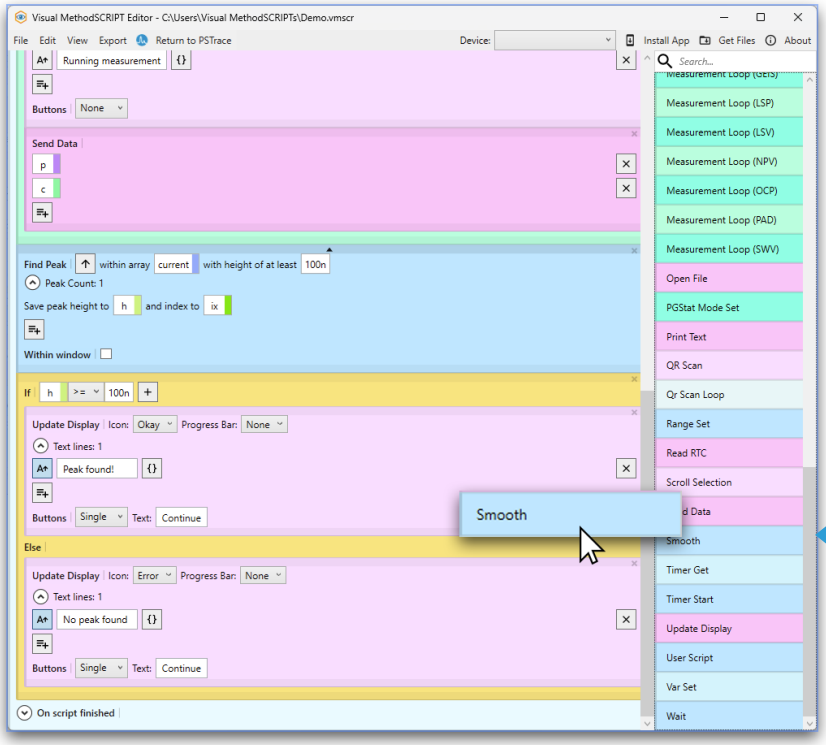
See section *System Specifications* on page 8 for more detailed specifications.

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 with sensor-specific information, including sensor type, shelf life, and calibration data. This information can then be used as input by the app running on the EmStat4T.

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.

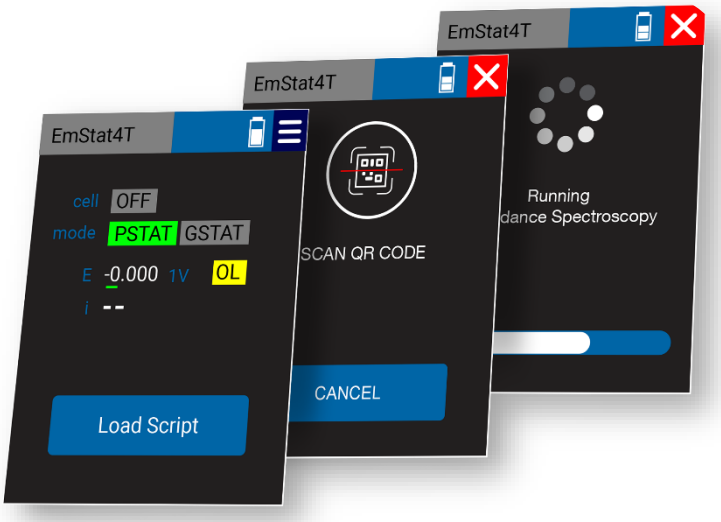


MethodSCRIPT™ by PalmSens

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 — EIS/GEIS
  - fixed potential or fixed current
  - scanning potential or scanning current
  - time
- Fast EIS/GEIS — FEIS/FGEIS
  Very low interval fixed-frequency measurements

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 µV 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 µV step)	500 V/s (200 mV step)
▪ FCV	scan rate	0.1 mV/s (100 µV 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)	-
	interval time	0.4 ms	4294 s
▪ FAM	interval time	1 µs	60 s
	run time	3 µs	34 days (60 s interval) 50 ms (1 µs interval)
	N data points	3	50000
▪ Fast EIS	interval time between points at fixed frequency	~1 ms (typical)	-

System Specifications

General	
dc-potential range	±3 V
compliance voltage	±5 V
maximum current	±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 uA range 230 kHz in 10 uA and 100 uA range > 500 kHz in ranges 1 mA and higher

Potentiostat (controlled potential mode)	
applied potential resolution	100 µV
applied potential accuracy	≤ 0.2% ±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 ±20 pA ±0.2% of range

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

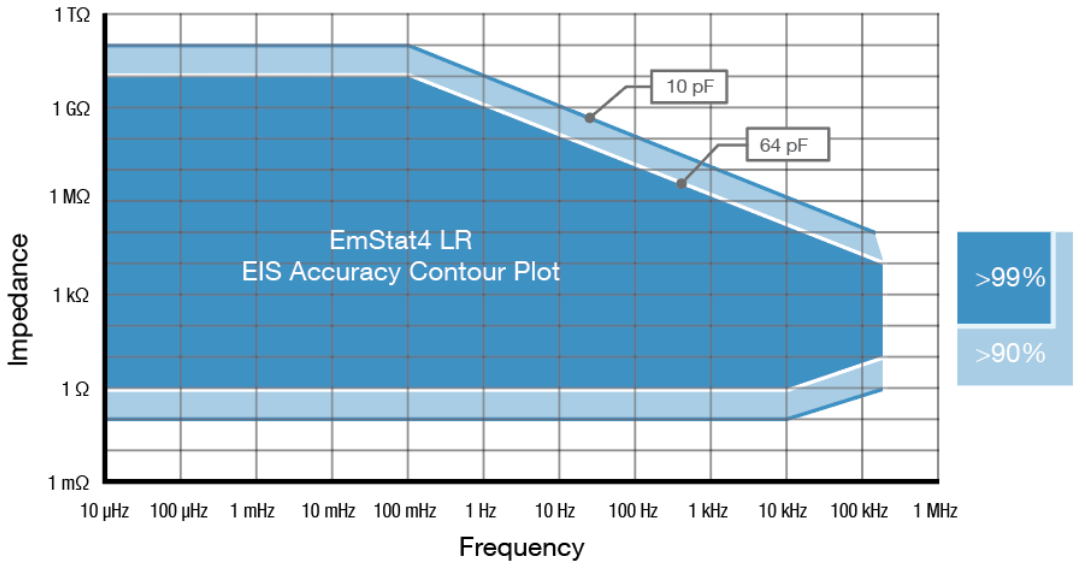
Optional: FRA / EIS (impedance measurements)	
frequency range	10 µHz to 200 kHz
ac-amplitude range	1 mV to 900 mV rms, or 2.5 V p-p

Optional: GEIS (galvanostatic impedance measurements)	
frequency range	10 µHz to 100 kHz
applied amplitude	0.002 × current range to 0.9 × current range (rms)

Electrometer	
electrometer amplifier input	> 1 TΩ // 10 pF
bandwidth	500 kHz

Other	
communication	USB-C or wireless
housing	aluminium body only: 13 x 6.2 x 3.3 cm^3
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 mA ~5.5 h continuous measurement at max. Output
internal storage space	500 MB, equivalent to >15M datapoints or ~1000 measurement files (whichever comes first)

EmStat4T EIS Accuracy Contour Plot



Note
The accuracy contour plots were determined with an ac-amplitude of ≤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

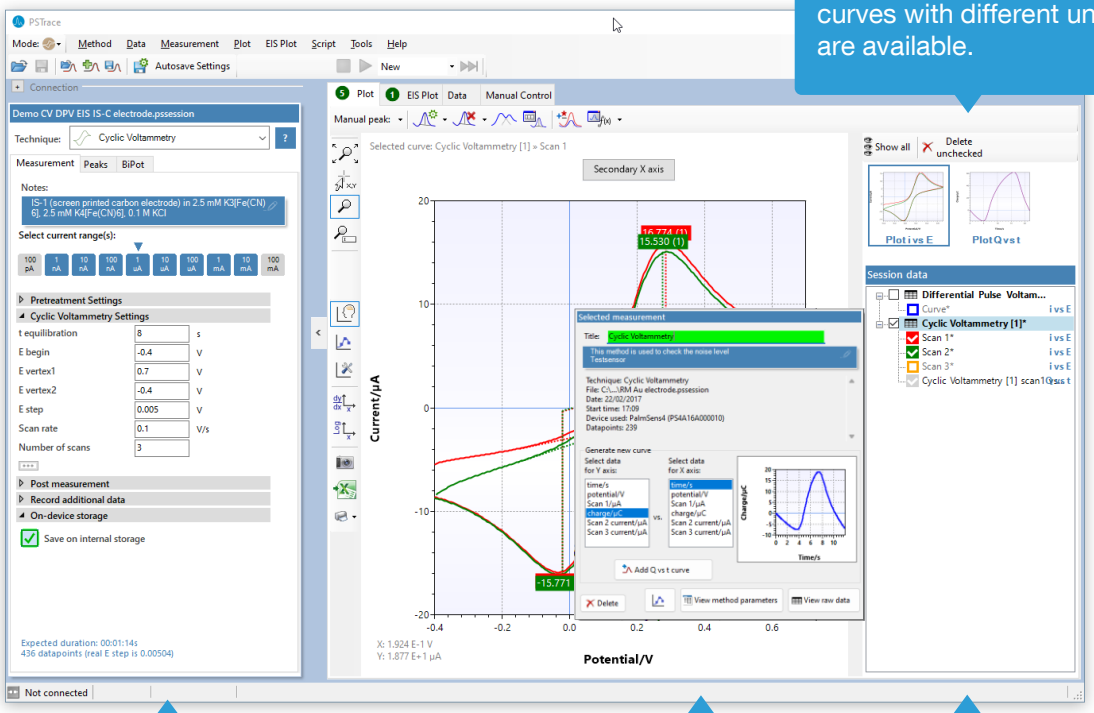
Also included:

- PSTrace 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.

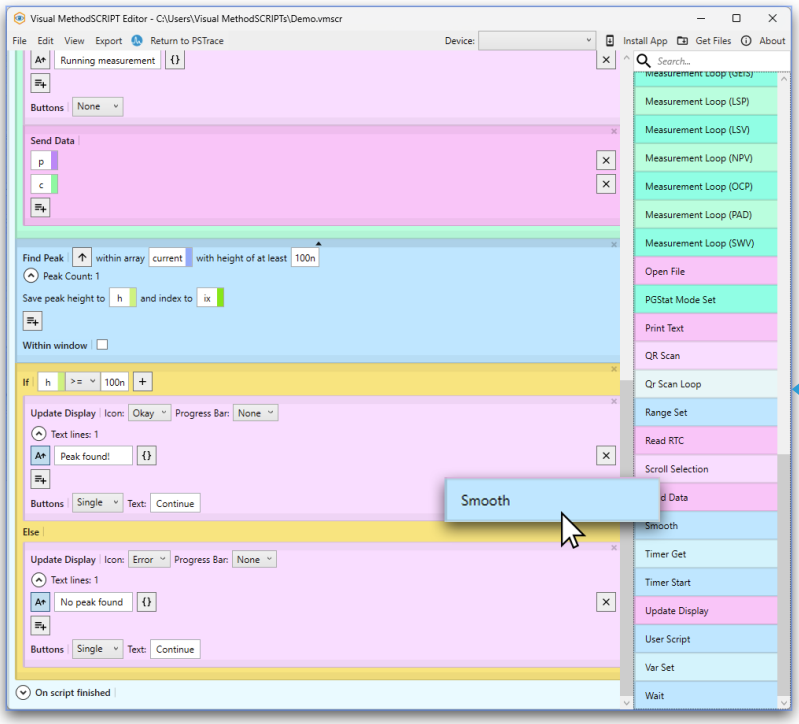


Integration with third-party software

Export your measurement data easily to:

- Excel
- Origin
- Matlab
- ZView

Visual MethodSCRIPT Editor

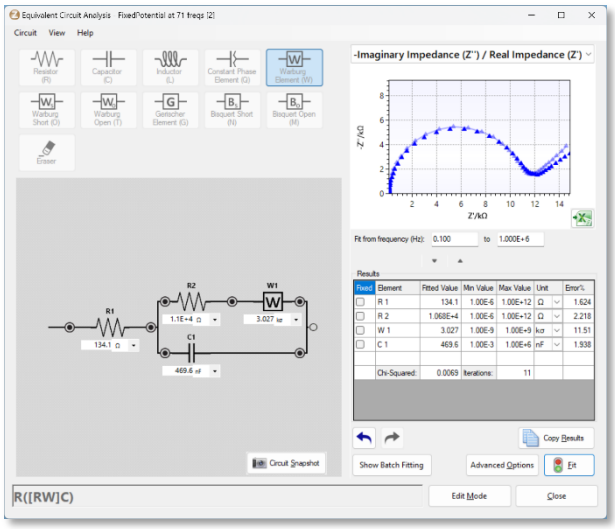


Visual MethodSCRIPT Editor

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

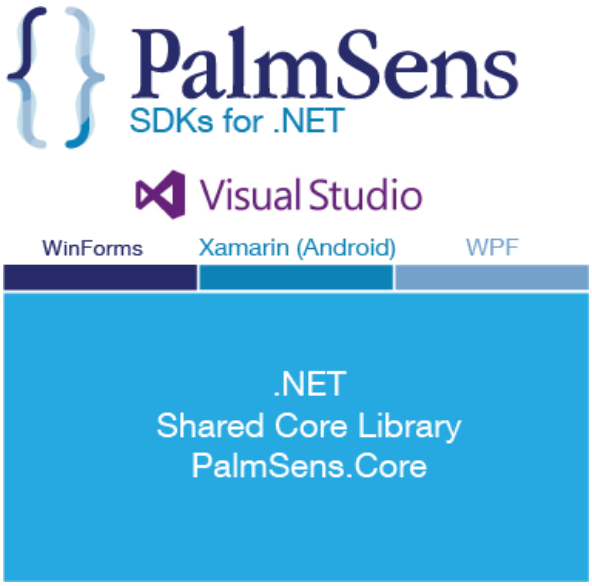
Minimum System Requirements

- 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

Software Development Kits for .NET

Develop your own application in no time for use with any PalmSens instrument or potentiostat (module). Our SDKs are free of charge.



There are three PalmSens Software Development Kits (SDKs) for .NET. Each SDK can be used with any of our instruments or OEM potentiostat modules to develop your own software. The SDK's come with a set of examples that shows how to use the libraries. PalmSens SDKs with examples are available for the following .NET Frameworks:

- WinForms
- Xamarin (Android)
- WPF

Each SDK comes with code examples for:

- Connecting
- Controlling the multiplexer
- Running measurements and plotting data
- Manual control of the cell
- Accessing and processing measured data
- Analyzing and handling data
- Peak detection
- Equivalent Circuit Fitting on impedance data
- Saving and loading files

```
/// <summary>
/// Initializes the EIS method.
/// </summary>
1 reference
private void InitMethod()
{
    _methodEIS = new ImpedimetricMethod();
    _methodEIS.ScanType = ImpedimetricMethod.enumScanT
    _methodEIS.Potential = 0.0f; //0.0V DC potential
    _methodEIS.Eac = 0.01f; //0.01V RMS AC potential a
    _methodEIS.FreqType = ImpedimetricMethod.enumFrequ
    _methodEIS.MaxFrequency = 1e5f; //Max frequency is
    _methodEIS.MinFrequency = 10f; //Min frequency is
    _methodEIS.nFrequencies = 11; //Sample at 11 diffe

    _methodEIS.EquilibrationTime = 1f; //Equilabrates
    _methodEIS.Ranging.StartCurrentRange = new Current
    _methodEIS.Ranging.MinimumCurrentRange = new Curre
    _methodEIS.Ranging.MaximumCurrentRange = new Curre
}
```

› See for more information:
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@palmsens.com

PalmSens BV has more than 40 distributors around the world.
Please contact us at **info@palmsens.com** or go to our website to get in touch with a distributor in your region.

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

PalmSens BV
The Netherlands
www.palmsens.com

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