EmStat GO ™

Tailored potentiostat for sensor applications

Contents

> See for more information:
> **www.palmsens.com/go**

PalmSens

A Versatile Hand-Held Reader

The EmStat Go is a battery or USB powered, handheld potentiostat which consists of a standard base unit and a customizable Sensor Extension module. The enclosure is made from aluminium and is very rugged, yet light weight.
The extension module can be equipped with one or more sensor (SPE) connectors, temperature sensor, or other interface units you require for your sensor application.
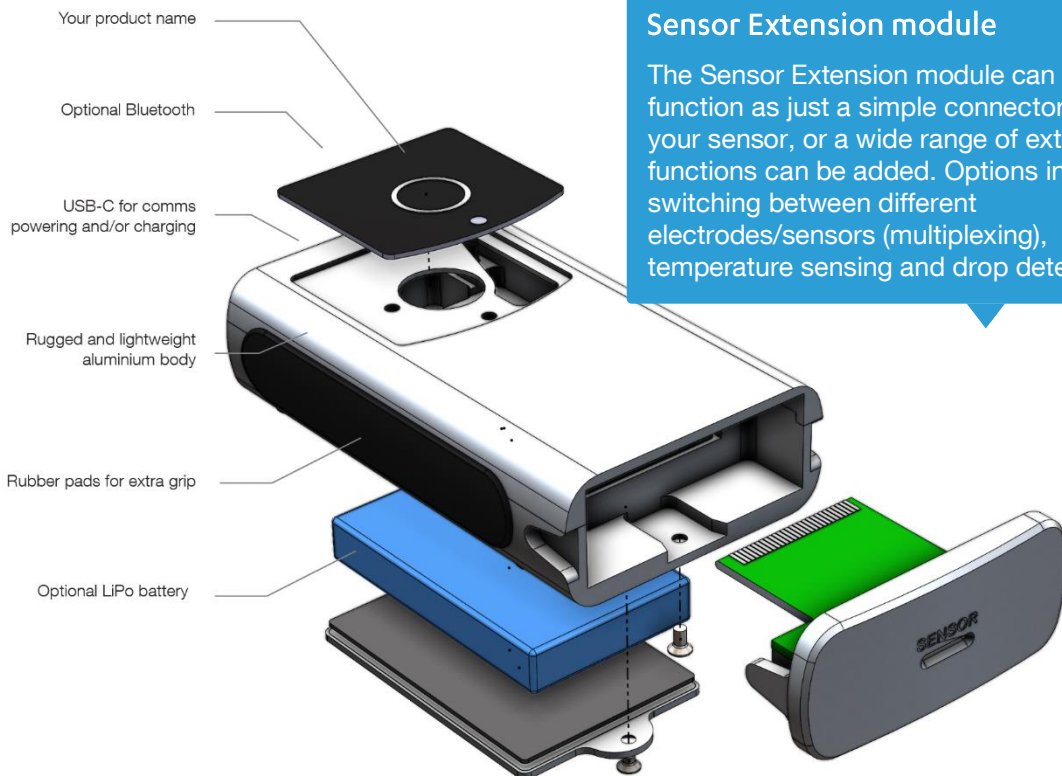
Highly Customizable

The EmStat Go reader is highly customizable, making it suitable for a wide range of sensor applications. Its customization options allow you to tailor it to match your unique brand identity perfectly.

See page 3 for more details.

Software

The reader works out-of-the box with our standard research software for Windows and Android. Our SDKs, code examples and extensive MethodSCRIPT™ documentation allow you to build your own applications for the reader.

See page 8 and 9 for more details.

Your product name

Optional Bluetooth

USB-C for comms powering and/or charging

Rugged and lightweight aluminium body

Rubber pads for extra grip

Optional LiPo battery

Sensor Extension module

The Sensor Extension module can function as just a simple connector to your sensor, or a wide range of extra functions can be added. Options include switching between different electrodes/sensors (multiplexing), temperature sensing and drop detection.

Configuration Options

Enclosure options

Standard	Ruggedized

Strong and robust alumnium body. Easy to wipe making it more suitable for lab work and point-of-care applications.

Strong and robust alumnium body. Extra ruggedized with a thick silicone rubber sleeve for field work.

Customization

Besides having your logo on the instrument, also its colors can be tailored to match your brand identity.

Embedded potentiostat module options

EmStat4M LR	EmStat Pico

The EmStat4M LR is a high-end potentiostat / galvanostat / EIS analyzer module allowing for measuring very low-current and low-noise measurements up to 30 mA.

The EmStat Pico module is a cost-effective potentiostat / EIS analyzer module suitable for most sensor applications.

See pages 5 and 6 for more detailed specifications and module comparison.

Connectivity options

USB-C + Wireless

The version with USB-C and Wireless allows users to connect wirelessly or via USB-C. The internal LiPo battery is charged via the USB-C port. A fully charged battery allows the EmStat Go to run >6h of continuous measurements.
Allows for connecting wirelessly to Windows, Android and iOS.

USB-C only

With USB-C for powering and communications, a battery and battery lid is not included.

Battery charge status

The battery charge status can be read in software to inform the user when the battery needs to be re-charged.

Extension Module options

The extension module can simply act as an adapter for a bespoke sensor design, but can also be extended with additional functionality, including:

- Automatic drop detection
- Multiplexing
- Temperature sensing
- Extra Indicator LED

Modular design

The EmStat Go's modular design allows the Sensor Extension module to be easily replaced in the field. This enables your customers to upgrade the reader they already have without the need to send it back.

Supported Techniques

The EmStat Go can either host the EmStat Pico potentiostat module, or the EmStat4M LR potentiostat module.

Voltammetric Techniques		EmStat4M	EmStat Pico
▪ 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	FA	✓	-
▪ Pulsed Amperometric Detection	PAD	✓	✓
▪ Multiple-Pulse Amperometric Detection	MPAD	✓	-

Galvanostatic Techniques			
▪ Linear Sweep Potentiometry	LSP	✓	-
▪ Chronopotentiometry	CP	✓	-
▪ MultiStep Potentiometry	MP	✓	-
▪ Open Circuit Potentiometry	OCP	✓	✓

Other Techniques			
▪ Mixed Mode	MM	✓	-
▪ Potentiostatic Impedance Spectroscopy	EIS	✓	✓
▪ Galvanostatic Impedance Spectroscopy	GEIS	✓	-

Where possible, electrochemical techniques can be applied using auto ranging which means that the instrument automatically sets the optimal current range.

❯ See page 6 for system specifications.

System Specifications

The EmStat Go can either host the EmStat Pico or the EmStat4M LR potentiostat module.

General		
	EmStat4M	**EmStat Pico**
▪ dc-potential range	±3.000 V	-1.7 to +2 V
▪ compliance voltage	±5 V	-2.0 to +2.3 V [1]
▪ max. measured current	±30 mA	±3 mA
▪ measured potential resolution	96 µV (gain 1) 48 µV (gain 2) 19.2 µV (gain 5) 9.6 µV (gain 10) 4.8 µV (gain 20)	56 µV
▪ measured potential accuracy	≤ 0.2%, ±1 mV offset	≤ 0.1%, ±2 mV offset
▪ max. acquisition rate	1M samples/s	1000 samples/s

Potentiostat (controlled potential mode)		
	EmStat4M	**EmStat Pico**
▪ applied dc-potential resolution	100 µV	537 µV
▪ applied potential accuracy	≤ 0.2%, ±1 mV offset	< 0.2% ±1 mV offset
▪ current ranges	1 nA to 10 mA, 8 ranges	100 nA to 5 mA 10 or 12 ranges [2]
▪ measured current accuracy	≤ 0.2% of current ±0.1% of range	< 1% of current ±0.1% of range
▪ measured current resolution	0.009% of CR 92 fA on lowest	0.006% of CR 5.5 pA on lowest

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[1] The compliance voltage is the maximum potential between Working and Counter electrode and depends on the selected mode.
[2] The number of ranges depend on the operating mode (see EmStat Pico product page for more details)

Electrometer		
	EmStat4M	EmStat Pico
▪ electrometer amplifier input	> 1 TΩ // 10 pF	> 1 TΩ // 10 pF
▪ bandwidth	500 kHz	250 kHz

| Other	
▪ housing	Standard: 112 x 64 x 28 mm Ruggedized: 118 x 69 x 33 mm
▪ weight	~250 g (depending on configuration)
▪ power supply	battery or USB-powered
▪ communication	USB or Wireless
▪ digital and analog options for extension module	- analog input and output - 4 digital outputs, 1 digital input - 5 V output (max. 50 mA), digital and analog ground
▪ temperature range	0 °C to +40 °C
▪ battery life	>6 hours with cell on at 10 mA current (can be extended to >24 hours with external power bank) charging up to 80% takes approx. 3.5 hours a full charge takes approx. 5 hours

Reduce your time-to-market

The EmStat Go can be used with our **PSTrace software** for generic research. As soon as you have found the optimal settings for your sensor application you can easily transfer them to an application optimized for use by the sensor end-user.

Method Editor

Measurement data and curves
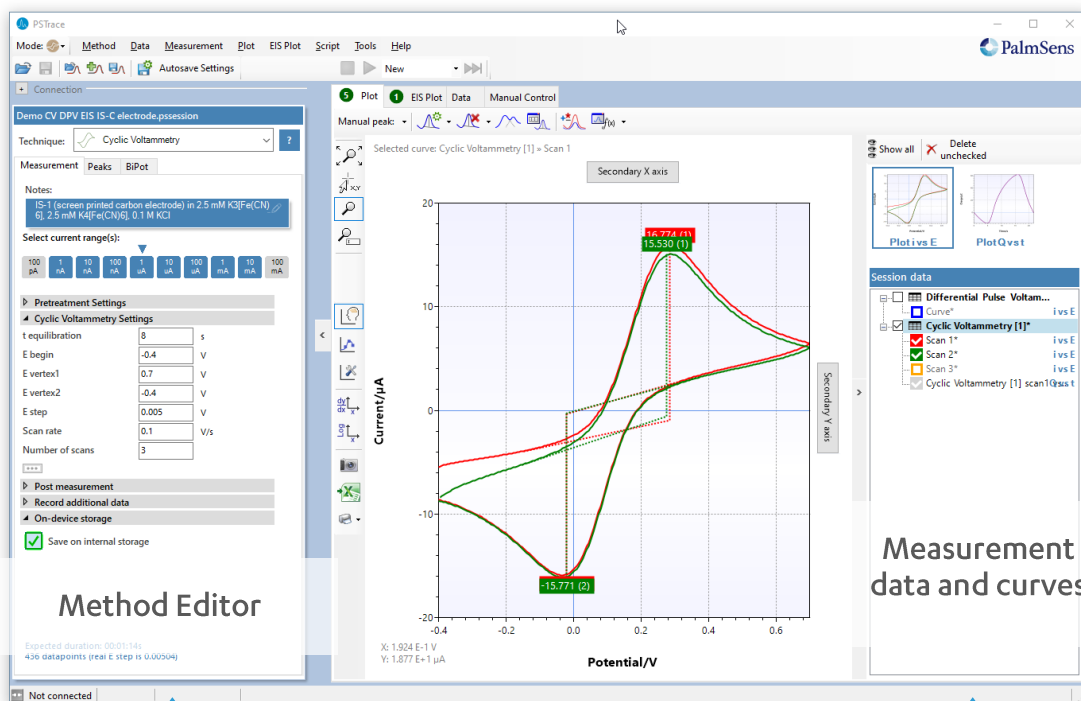
Select current ranges for auto ranging and the starting current range.

Switch between plots if curves with different units are available.
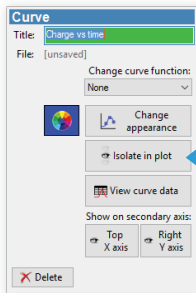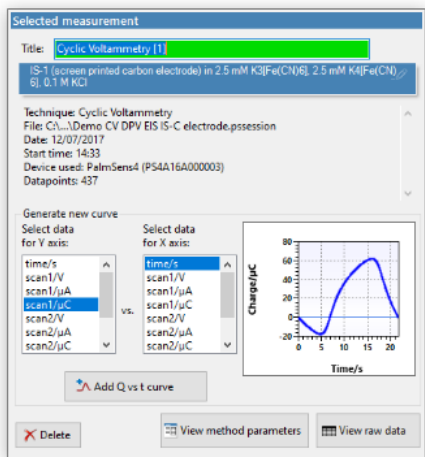
Click on a curve in the legend to change its title or appearance.

Click on a measurement in the legend to see the available data and to generate more curves.

❯ See for more information:
www.palmsens.com/**pstrace**

Custom Software Options

With the PalmSens SDKs you can develop user-friendly software for use with EmStat Go in a short amount of time.

Using the PalmSens SDK you can create an Android (mobile) application for your EmStat Go. The SDK comes with working code examples which can be used as a basis for your application.

The PalmSens SDK for WinForms or WPF allows you to build a Windows application for either wireless or USB connected devices.

See for more information:
www.palmsens.com/dev

EmStat Go works with MethodSCRIPT™

The MethodSCRIPT™ scripting language is designed to integrate our instruments and potentiostat (modules) effortlessly in your hardware setup, product, or experiment.

MethodSCRIPT™ gives you full control over your potentiostat. The simple script language is parsed on-board the instrument and allows for running all supported electrochemical techniques, making it easy to combine different measurements and other tasks.

MethodSCRIPT can be generated, edited, and executed in PSTrace.

MethodSCRIPT features include:
- Use of variables
- (Nested) loops and conditional logic support
- User code during a measurement iteration
- Exact timing control
- Simple math operations on variables (add, sub, mul, div)
- Digital I/O, for example for waiting for an external trigger
- Logging results to internal storage or external SD card
- Reading auxiliary values like pH or temperature
- and many more…

```
1  e
2  var c
3  var p
4  #Select bandwidth of 40 for 10 points per second
5  set_max_bandwidth 40
6  #Set current range to 1 mA
7  set_range ba 1m
8  #Enable autoranging, between current of 100 uA and 1 mA
9  set_autoranging ba 100u 1m
10 #Turn cell on for measurements
11 cell_on
12 #equilibrate at -0.5 V for 5 seconds, using a CA measurement
13 meas_loop_ca p c -500m 500m 5
14     pck_start
15     pck_add p
16     pck_add c
17     pck_end
18 endloop
19 #Start LSV measurement from -0.5 V to 1.5 V, with steps of 10 mV
20 #and a scan rate of 100 mV/s
21 meas_loop_lsv p c -500m 1500m 10m 100m
22     #Send package containing set potential and measured WE current.
23     pck_start
24     pck_add p
25     pck_add c
26     pck_end
27     #Abort if current exceeds 1200 uA
28     if c > 1200u
29     abort
30 endloop
31 #Turn off cell when done or aborted
32 on_finished:
33 cell_off
34
```
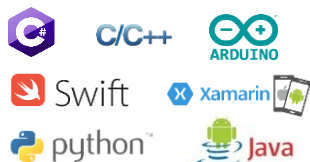
Online support on MethodSCRIPT

Write your own software and integrate (generated) MethodSCRIPTs. No libraries needed.

MethodSCRIPT is parsed on-board the instrument. No DLLs or other type of code libraries are required for using MethodSCRIPT™

Code examples for:

C# C/C++ ARDUINO

Swift Xamarin

python Java

❯ See for more information:
www.palmsens.com/methodscript

Please do not hesitate to contact PalmSens for more details:
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