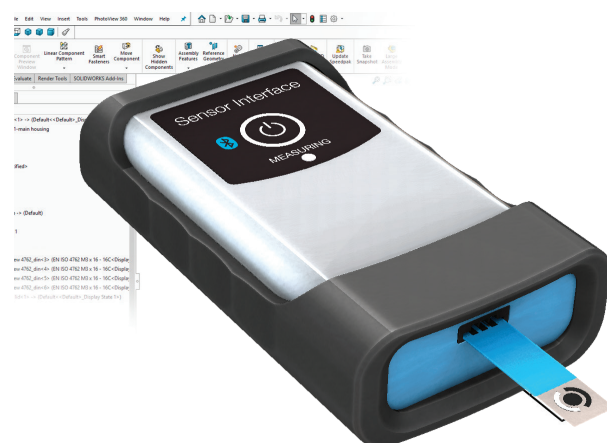
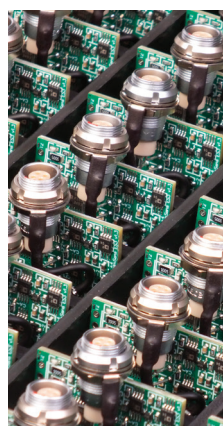




## Potentiostats for OEM and Tailored Solutions



food quality / water monitoring / point-of-care / medical diagnostics / corrosion detection / wearables

# EmStat<sup>3</sup> and 3+ <sup>TM</sup>

## Embedded Potentiostat modules

The EmStat-series is designed to meet OEM's requirement to incorporate a potentiostat into their product. EmStat provides all major potentiostatic techniques with automatic current ranging and peripheral control.

The EmStat (Embedded potentioStat) is highly suitable for use in dedicated electrochemical instruments.

Examples are:

- point-of-care instrument
- measurements at remote sites
- water quality monitoring
- voltammetric analyzer
- gas detection system

## Supported Techniques

The EmStat module is able to perform the following electrochemical measurement techniques on-board:

### Voltammetric techniques

- |                                  |     |
|----------------------------------|-----|
| ▪ Linear Sweep Voltammetry       | LSV |
| ▪ Differential Pulse Voltammetry | DPV |
| ▪ Square Wave Voltammetry        | SWV |
| ▪ Normal Pulse Voltammetry       | NPV |
| ▪ Cyclic Voltammetry             | CV  |

### Techniques as a function of time

- |   |          |
|---|----------|
| ▪ Amperometric Detection or Chronoamperometry | AD<br>CA |
| ▪ Pulsed Amperometric Detection               | PAD      |
| ▪ Multiple Pulse Amperometric Detection       | MPAD     |
| ▪ Open Circuit Potentiometry                  | OCP      |

Other techniques can be performed by manual cell control or combining multiple measurements.

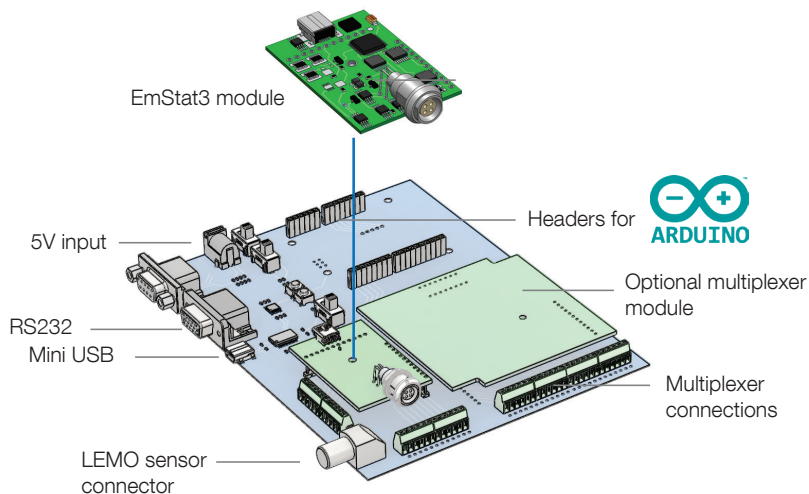
## Interfacing

The EmStat module supports communication via:

- USB
- Serial TTL (Rx/Tx for UART)
- RS232 (by means of additional TTL <> RS232 converter)
- Virtual COM port (the EmStat's USB port is recognized as generic virtual COM port)
- A Bluetooth module for use with the Serial Port Profile (SPP) or a Wifi module can be connected to the +5V, GND and Rx/Tx lines

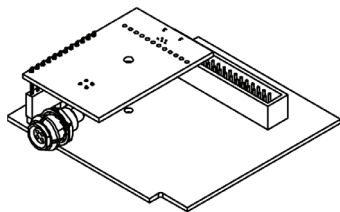
## Development Board

The EmStat Development Boards is the most convenient way to start developing your EmStat application.



# Multiplexer

A MUX8 or MUX16 multiplexer module can be added to switch over 8 or 16 channels. The MUX8 can switch 8x RE, 8x WE and 8x CE electrodes. The MUX16 can switch 16x WE and 16x RE+CE (combined) electrodes. The EmStat module is placed directly on the MUX module forming a very compact combination.




The EmStat3 module connected to a MUX module: 74x76x20 mm

# Software Development


Our collection of libraries with examples allows for developing EmStat-powered applications on the most popular (embedded) platforms:


- Windows 7, 8, 10
- Universal Windows Apps (Windows 10 / IoT)
- Android (using Xamarin)
- Raspberry Pi
- Arduino
- MATLAB
- C / C++


The PalmSens.Core library is based on .NET Core for cross-platform development. The C/C++ library can be used for Arduino or other microcontroller platforms. Another option is to use the Communications Protocol for direct serial communications with an EmStat without any library.

 Visual Studio

WinForms   Xamarin (Android)   UWP

 MATLAB

 LabVIEW

 C/C++

Shared Core Library  
PalmSens.Core.DLL (.NET)

For PalmSens and EmStat instruments

Embedded C Library

For EmStat instruments

### Or Do It Yourself



Serial Communications Protocol for EmStat  
(write your own code for any platform)

# Specifications

The EmStat module is available in two versions:

module:	EmStat3	EmStat3+
- dc-potential range	± 3.000 V	± 4.000 V
- compliance voltage	± 5 V	± 8 V
- applied dc-potential resolution	0.1 mV	0.125 mV
- max. dc-offset error	2 mV	3 mV
- accuracy	≤ 0.2 %	≤ 0.3 %
- current ranges	1 nA to 10 mA (8 ranges)	1 nA to 100 mA (9 ranges)
- maximum measured current	± 20 mA typical ± 15 mA minimum	± 100 mA typical
- current resolution	0.1 % of current range 1 pA on lowest current range	
- accuracy	≤ 1 % of current range at 1 nA ≤ 0.5 % at 10 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	
- power	ES3: 5V, max. 130 mA ES3+: 5V, max. 500 mA	
- external I/O options	analog: 1 input and 1 output channel both 0 V- 4.096 V  digital: 4 output, 1 input max. rating: -0.3 V to 5.3 V	
- PCB dimensions	ES3: 51.5 x 34 mm ES3+: 55 x 41 mm	

# Auxiliary Input

The analog input on the EmStat module can be used for auxiliary inputs like a LM35 or Pt1000 temperature sensor or Differential Electrometer Amplifier (DEA) for measuring a floating potential between two electrodes.

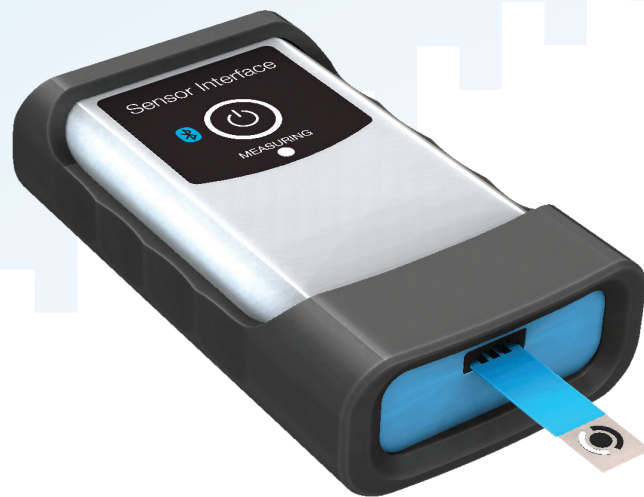
# EmStat GO<sup>TM</sup>

Tailored OEM potentiostat for *Point-of-Care* sensor applications

The EmStat GO is a battery powered\*, handheld potentiostat which consists of a standard base unit and a customer-specific Sensor Extension module. The extension module can be equipped with one or more sensor connectors, temperature sensor, or other interface units you require for your sensor application.

The EmStat GO allows you to go to market as soon as your electrochemical sensor is ready for it.

*\*battery is optional*



## Reduce your time-to-market

The EmStat Go can be used with our PStTrace software for generic research. This means that as soon as your application is solid, we can provide you with a custom potentiostat and dedicated software or an app in a short amount of time. The universal base unit allows us to provide you with your own hardware for economical prices at low minimum order quantities.

## Hardware specifications

The EmStat Go has an EmStat3 potentiostat module inside to carry out measurements. Specifications of the EmStat3 potentiostat can be found on page three.

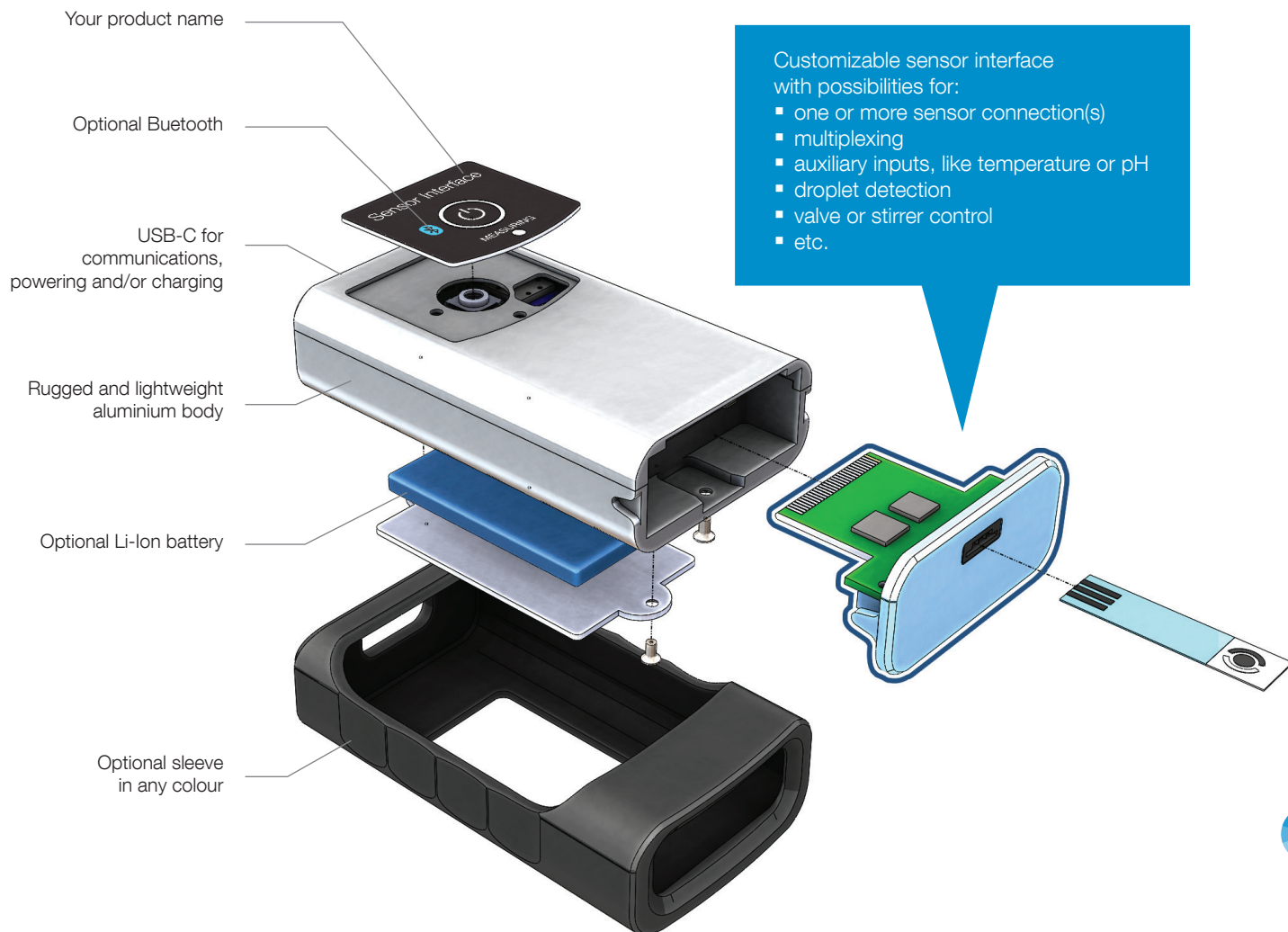
## Sensor Extension module

The Sensor Extension module can simply just host a screen printed electrode connector, or a wide range of extra functions can be added. Options include temperature sensing and drop detection. The EmStat Go's modular design allow 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.

## Connectivity

The instrument has a USB-C connector for connecting to a PC or charging the battery (if present). A wireless Bluetooth connection for connecting to a tablet or phone is also available.

# A potentiostat tailored to your application



More information: [www.palmsens.com/esgo](http://www.palmsens.com/esgo)



Our collection of libraries with examples allows for developing applications on the most popular (embedded) platforms:

- Windows 7, 8, 10
- Universal Windows Apps (Windows 10 / IoT)
- Android (using Xamarin)
- Raspberry Pi
- Arduino
- MATLAB
- C / C++

## Libraries and examples

All SDKs based on the Shared Core Library PalmSens.Core.dll for .NET come with examples written in C#.

PalmSens and EmStat instruments are supported by these SDKs.

The examples with the SDKs show how to:

- connect to instruments;
- run measurements;
- receive measured data;
- save measured data;
- control the potentiostat manually;
- and to plot data.

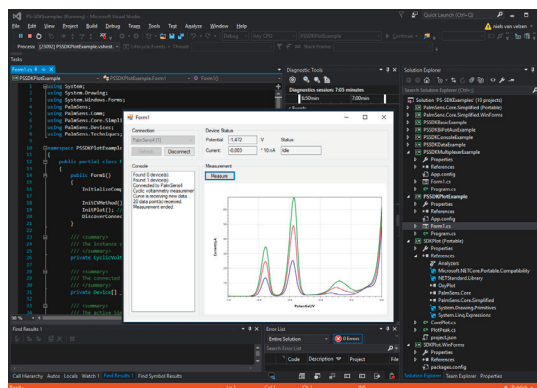


Or Do It Yourself

Serial Communications Protocol for EmStat  
(write your own code for any platform)

## Open source

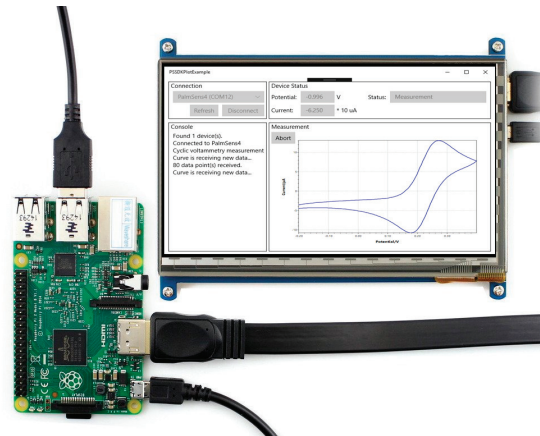
Parts of the SDKs are open-source. This allows for better understanding of how the SDKs work and it allows for making changes to the SDK, in case other functionality is needed.



## Communications Protocol

The EmStat Communications Protocol document describes how to communicate with the EmStat directly. This means you can use any platform or language you like that allows for serial communication.

# Develop your own application-specific software in no-time



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

Using the PalmSens SDK for Xamarin you can create an Android (mobile) application for wireless Bluetooth communication with EmStat powered devices.

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

Rapid prototyping a (mobile) touchscreen application for monitoring systems, or point-of-care testing is easy using the PalmSens SDK for UWP on Raspberry Pi.

Your application can run on Windows 10 for IOT using the .NET libraries.

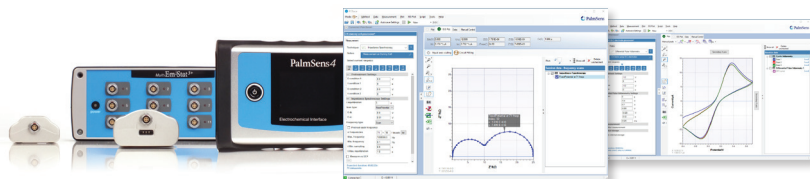
Or it can run on Linux or any other embedded platform by using our EmStat Communications Protocol and C library.



More information: [www.palmsens.com/oem](http://www.palmsens.com/oem)

# www.palmsens.com

Instruments, accessories and software



Screen printed and classical electrodes



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