



EmStat
EmStat
potentiostats

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EmStat3 and 3+ (Blue) potentiostats

The EmStat instrument series are the smallest electrochemical interfaces available on the market. The devices are general purpose potentiostats but are also available as separate module for OEM use in specific applications.

EmStat is always shipped in a rugged carrying case. See also page 6.

Differences between regular EmStat model and EmStat Blue model

	EmStat³ and 3+	EmStat³ and 3+ blue
		
Size (cm)	6.7 x 5.0 x 2.8	10.0 x 6.0 x 3.4
Weight	85 g	250 g
Battery	no	yes
Communication	USB	USB + Bluetooth
Auxiliary port	no	yes
Sensor connector	LEMO	LEMO + SPE ¹

See page 6 for system specifications.

software for Windows  and Android 



PSTrace for Windows provides support for all techniques and device functionalities.

PSTouch for Android supports all techniques supported by EmStat.

Minimum PC requirements for PSTrace: Windows XP (SP3), 2 GHz processor and 2 GB RAM.

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

¹ The SPE connector allows for direct insertion of the most popular types of Screen Printed Electrodes.

Supported techniques

The following techniques are supported by the EmStat series:

Voltammetric techniques

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

The above techniques can also be used for stripping voltammetry

Techniques as a function of time

- | | |
|---|------|
| ▪ Amperometric Detection / | AD |
| Chronoamperometry | CA |
| ▪ Chronocoulometry | CC |
| ▪ Pulsed Amperometric Detection | PAD |
| ▪ Multiple Pulse Amperometric Detection | MPAD |
| ▪ Open Circuit Potentiometry | OCP |
| ▪ Multistep Amperometry | MA |

The current is measured using a **zero resistance ammeter (ZRA)**.

Where possible, the electrochemical techniques can be applied using **auto ranging** which means that the instrument automatically sets the optimal current range. The user can specify a highest and lowest current range in which the most appropriate range is selected automatically.

See page 5 for system specifications.

Specifications of general parameters

General pretreatment

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

General voltammetric parameters

Potential range for EmStat3: -3.000 V to +3.000 V

Potential range for EmStat3+: -4.000 V to +4.000 V

Step potential: 0.125 mV to 250 mV

Pulse potential: 0.125 mV to 250 mV

Limits of some technique specific parameters for EmStat3 and EmStat3+

NPV and DPV:	Scan rate:	0.025 mV/s (0.125 mV step) to 50 mV/s (5 mV step)
	Pulse time:	5 ms to 300 ms
SWV:	Frequency:	1 Hz to 500 Hz ¹
LSV and CV:	Scan rate:	0.01 mV/s (0.1 mV step) to 5 V/s (5 mV step)
AD:	Interval time:	1 ms to 300 s
	Run time:	1 s to hours
PAD:	Interval time:	50 ms to 300 s
	Pulse time:	1 ms to 1 s
	Run time:	10 s to hours
MPAD:	Pulse times:	100 ms to 2 s
	Run time:	10 s to hours
	Number of potential levels:	3
Potentiometry at open circuit (OCP):	Interval time:	1 ms to 30 s
	Maximum run time:	hours
Multistep Amperometry:	Interval time:	1 ms to 30 s
	Number of potential levels:	1 to 255
	Number of cycles:	1 to 20000
	Maximum run time:	hours

(1) PStTrace provides the option to measure forward and reverse currents separately.

Note: some limits of parameters are set for practical reasons and can be modified on request.

System specifications

	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
▪ applied potential accuracy	≤ 0.2 % with max. 2 mV offset error	≤ 0.3 % with max. 3 mV offset error
▪ current ranges	1 nA to 10 mA (8 ranges)	1 nA to 100 mA (9 ranges)
▪ maximum measured current	± 20 mA typical and ± 15 mA minimum	± 100 mA typical

EmStat 3 and 3+

- current resolution
0.1 % of current range
1 pA on lowest current range
- current accuracy (deviation)
≤ 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 max. 0.2 % offset error
- electrometer amplifier input
> 100 Gohm // 4 pF
- rise time
approx. 100 µs
- sensor connection
shielded cable with circular connector for WE, RE, CE and Sense*

EmStat 3 and 3+ regular model

- housing
anodized aluminium: 6.7 cm x 5.0 cm x (1.9 to 2.8 cm)
- weight
85 g
- power supply
USB
5 V, min. 130 mA (ES3) or 500 mA (ES3+)
- communication
USB
- auxiliary port present
no

EmStat 3 and 3+ Blue model

- housing
anodized aluminium: 100 mm x 60 mm x (27 to 34 mm)
- weight
250 g
- temperature range
0° C to +40° C
- power supply
USB or internal Li-Po battery
5 V, min. 130 mA (ES3) or 500 mA (ES3+)
- battery time
> 8 hours with cell off
> 6 hours with continuous cell on at 1uA current
full charge takes approx. 3 hours
- communication
USB or Bluetooth
- auxiliary port present
yes
- external I/O options
analog: 1 input and 1 output channel (both 0 V - 4.096 V)
digital: 1 input, 4 output lines
(maximum rating: -0.3 V to 5.3 V)

* Only available for EmStat3+ to be used with 100 mA range.

Standard EmStat configuration

The Emstat regular model comes in a carrying case size 23 x 20 x 5 cm.

The case includes:

- EmStat3 or EmStat3+
- Mini-USB cable
- Sensor cable
- Croc clips
- Test sensor

Also included:

- PSTrace software + manual
- Quick start document

Standard EmStat Blue configuration

The Emstat Blue model comes in a carrying case size 23 x 20 x 7 cm.

The case includes:

- EmStat 3 or 3+ Blue
- Mini-USB cable
- Sensor cable
- Croc clips
- Test sensor

Also included:

- PSTrace software + manual
- Quick start document

Optional:

- 7" tablet
- Tablet charger



EmStat3 Blue in standard carrying case showing optional tablet

EmStat Blue accessories

The following accessories can be used with the auxiliary port present on the EmStat Blue.



Magnetic stirrer

The magnetic stirrer controlled by EmStat Blue is ideal for stripping analysis applications. The stirrer is switched on during the conditioning and deposition stages by means of the Switchbox.



Pt1000

This temperature sensor allows the user to monitor the temperature during an experiment and record it via PSTrace. The convenient two point calibration allows to precisely calibrate the sensor for the required temperature range. The Pt1000 temperature sensor comes with a dongle for connection to the auxiliary port.



MUX8 or MUX16 multiplexer

The MUX8 is a multiplexer for use with 2 to 8 sensors or three-electrode cells. It is connected to the EmStat Blue instrument. This device allows application of sensor arrays with up to eight working electrodes sharing the reference and counter electrodes, but also with eight working, eight counter and eight reference electrodes. The device can also be used with two-electrode sensor arrays.

The MUX16 is a multiplexer for use with 16 working electrodes all sharing the same counter and same reference electrode in a single solution or for 16 working electrodes each with a combined reference/counter electrode in separate solutions.





Differential Electrometer Amplifier (DEA)

The Differential Electrometer Amplifier (DEA) is a general purpose input amplifier. It can be used as a floating voltage amplifier with differential input and single output to the auxiliary port of EmStat Blue.

Default range is -5V to 5V (1x gain). Possible gains are: 2x, 5x, 10x, 20x, 50x, 100x, etc.

EmStat: Embedded Potentiostat for OEM purposes



EmStat as OEM module

The EmStat PCB's are also available as bare module for OEM purposes.

See for more information:

www.palmsens.com/en/instruments/embedded-oem

Please do not hesitate to contact PalmSens for more details:
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